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Online flow experiences, problematic Internet use and Internet procrastination

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Abstract

This study explores the theoretical and practical overlap between online procrastination, problematic Internet use, and flow on the Internet. At the theoretical level there is a great deal of interrelatedness between these three concepts (for example, all three concepts deal with issue of a lack of control over time spent online and acknowledge the distracting and entertaining properties of the Internet); yet, one can also argue that the concepts are theoretically distinct (for example, flow is a total absorption in the work at hand, whereas procrastination is the avoidance of the work at hand). All three concepts have been used to describe either desirable (flow) or undesirable (procrastination and problematic Internet use) states when online. In this study a sample of 1399 Internet users was obtained from a survey placed on a South African online information technology magazine. Using the problematic Internet use questionnaire (PIUQ), the distraction subscale of the online cognition scale (OCS), and a modified version of the Flow scale it was found that there were strong positive relationships between all three variables (the strongest relationship being between problematic Internet use and online procrastination). The results also suggested that procrastination may be a connector between PIU and flow; also that PIU is a connector between procrastination and flow, but that flow is independent of the relationship between PIU and procrastination. These results are discussed in relation to previous studies on problematic Internet use and in particular, whether these relationships are unique to respondents involved in the information technology sector.
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Keywords: Procrastination; Flow theory; Flow experiences; Problematic Internet use; Information technology workers

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1. Introduction

The use of the Internet (i.e. the World-Wide Web, email, and other associated online applications) for personal purposes while at work is said to cost organisations large amounts of time and money (Mahatanankoon, Anandarajan, & Igbaria, 2004). Most researchers have labelled the personal use of the Internet at work as deviant, using terms such as Internet abuse in the workplace (Anandarajan, 2002), problematic Internet use (Davis, Flett, & Besser, 2002), cyberloafing (Lim, 2002), and even Internet addiction (Griffiths, 2003a; Young & Case, 2004). This has resulted in organisations trying to control the amount of time that employees spend using company infrastructure, equipment and time. Interventions have included online monitoring, training, rehabilitative action (e.g. disciplinary action or counselling), or policy control, each with varying degrees of success (Whitty & Carr, 2006; Young & Case, 2004). On the other hand, Belanger and Van Slyke (2002) have argued that a certain level of play and experimentation (i.e. non-work use of the Internet) is desirable and can lead to learning that is of significant value to an organisation. Of course, this raises questions of how much time an employee should be allowed to spend online during work times for personal use and also what types of activities might lead to play and experimentation that would ultimately be beneficial to the organisation (Mahatanankoon et al., 2004). This view of online procrastination however, lacks empirical support. Empirical work suggests rather, that employees perform non-work activities out of habit (Lee, Lim, & Wong, 2005). There is some evidence that procrastination activities provide relaxation and escape opportunities which people perceive as positive (Woods & Griffiths, ~~in press~~).

There is now a large, and growing, body of work that has examined the causes, correlates, predictors, and outcomes of problematic Internet use (PIU). In addition, Davis et al. (2002) has conceptualised procrastination as another aspect of PIU. There is also a small, but growing, interest in examining optimal online experiences or online flow (Chen, 2006; Chen, Wigand, & Nilan, 1999; Hoffman & Novak, 1996; Pace, 2004; Wan & Chiou, 2006). As is shown in the following sections, superficially, there is a great deal of overlap in the definitions and practical conceptualisations of these three concepts; PIU, online flow experiences, and procrastination online. This study explores the theoretical and practical overlaps between these three concepts within a population of working adults.

1.1. Problematic Internet use (PIU)

In recent years there have been a wide variety of investigations examining the "addictive" use of the Internet and the predictors of Internet addiction in studies from around the world (Campbell, Cumming, & Hughes, 2006; Nalwa & Anand, 2003; Ng & Wiemer-Hastings, 2005; Palesh, Saltzman, & Koopman, 2004; Simkova & Cincera, 2004; Suhail & Barges, 2006; Whang, Lee, & Chang, 2003; Yang & Tung, 2006). A great deal of the debate has centred on whether the Internet is indeed "addictive" given that there is no psychiatric classification for "addictions" in the DSM-IV (American Psychiatric Association, 2000). Instead, there has been a proliferation of terms to describe the "overuse" or "abuse" of the Internet. Terms used have included "unregulated Internet use" (LaRose, Lin, & Eastin, 2003), "compulsive Internet use" (Meerkerk, Van Den Eijnden, & Garretsen, 2006), "Internet dependence" (Yuen & Lavin, 2004), "excessive Internet

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use'' (Suhail & Barges, 2006), ''pathological Internet use'' (Davis, 2001; Niemz, Griffiths, & Banyard, 2005), and ''problematic Internet use'' (Caplan, 2002; Davis et al., 2002). Alternatively, some researchers argue that a person's overuse or abuse of the Internet is a behavioural manifestation of other things that may be problematic in their lives (Caplan, 2002). For example, online gambling may rather be a sign of pathological gambling as opposed to Internet addiction, or spending excessive amounts of time searching for online pornography may be indicative of some form of sexual ''addiction''. Another contention is that spending an excessive amount of time online may be a way of avoiding marital or work problems or from escaping other social confrontations (Caplan, 2002).

The term ''problematic Internet use'' is preferred in this study because it specifically avoids emotive qualities that are attached to terms such as ''addiction'' and ''pathology'' (Caplan, 2002). Instead, we adopt LaRose et al. (2003) approach which is based on Bandura (1991) social cognitive theory of self-regulation. This approach takes the view that excessive behaviour (in one's self-monitoring, judgments, and self-reactions) is something that may periodically arise and that may, over time, be self-remedied. Within this theory an Internet user is not simply diagnosed as an Internet ''addict'' (also referred to as a ''dependent'' in some studies) or as ''normal''. Rather, a user may experience periods of deficient self-regulation (that manifests as overuse of the Internet) followed by periods of spontaneous self-regulated behaviour (or ''normal'' (Davis, 2001) use of the Internet). Deficient self-regulation occurs when a person believes they do not have the ability to be able to stop their behaviour. In the absence of efficient self-regulatory mechanisms individuals are unmotivated, bored, and remain uncertain about their own abilities. Bandura (1991) noted that in order to relieve these feelings that an individual would resort to self-anaesthetisation (e.g. taking drugs or other substances) or other means to escape from reality (i.e. spending excessive amounts of time avoiding an activity in which they lack self-efficacy).

Of course, the term ''problematic Internet use'' is rather ambiguous as it implies that all forms of online criminal, negligent, inappropriate, or excessive behaviour might be encompassed by the term. Here, we use Beard and Wolf (2001) definition of PIU as the ''use of the Internet that creates psychological, social, school, and/or work difficulties in a person's life'' (p. 378). Beard and Wolf (2001) specifically exclude Internet-related crimes (downloading or distributing illegal material, hacking, and online sexual harassment) from this definition. While these behaviours are certainly problematic they are also recognised in many countries as crimes, whereas the behaviours we wish to describe by PIU are socially or psychologically problematic for the individual engaging in these activities without being inherently ''crimes''. The definition of PIU might also include specific PIU such as excessive online gambling or spending excessive amounts of time viewing and downloading pornography (Griffiths, 2003a).

Within the ''addiction'' model of PIU, symptoms include some or all of the following: needing to spend increasing amounts of time online (Niemz et al., 2005), loss of control in the amount of time spent online (LaRose et al., 2003), unsuccessful attempts to reduce the amount of time spent online (Beard & Wolf, 2001), preoccupation with online activities (Beard, 2005), withdrawal symptoms (Niemz et al., 2005), changes in mood or anxiety levels (Campbell et al., 2006; Yang & Tung, 2007), denial or deception regarding the amount of time spent online (Caplan, 2002; Yang & Tung, 2007), and negative social, physical, financial or emotional consequences as a result of spending time online (Widyanto & McMurran, 2004). Within the self-regulation model the same symptoms are recognised

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as indicators of deficient self-regulation although this model recognises a continuum of deficient self-regulatory behaviours rather than the absolute presence/absence of a certain proportion of these symptoms as symptomatic of PIU (LaRose et al., 2003).

1.2. Internet procrastination

Procrastination refers to the inability of an individual to convert an intention to act into the actual performance of an act (Blunt & Pychyl, 2005). Lavoie and Pychyl (2001) noted that procrastination refers not to the complete avoidance of a task, but rather to delaying the commencement or completion of a task. There is still little consensus over whether procrastination is a personality trait or a consequence of a person's situational circumstances. The personality trait approach to procrastination shows mixed evidence for relationships between procrastination behaviour and numerous personality traits such as extraversion, low levels of conscientiousness, and external locus of control (Senécal, Lavoie, & Koestner, 1997; Steel, Brothen, & Wambach, 2001). The situational approach to procrastination notes that individuals tend to procrastinate more when the focus tasks are perceived as less enjoyable or intrinsically unpleasant (Blunt & Pychyl, 2005). Within this approach, if a task is made too difficult or boring then it would be perceived by individuals as unpleasant and would be avoided (Senécal et al., 1997). Similarly, procrastination is most likely to occur when a person is feeling anxious as a result of being evaluated or where they feel they lack control in completing a task (Senécal et al., 1997). It must be noted that procrastination is only remotely related to problems of time management as procrastinators often know exactly what they should be doing, but still fail to do it. Most, but not all, evidence suggests that procrastination is associated with poorer performance and negative work outcomes (Steel et al., 2001).

Procrastination using the Internet, also referred to as cyberslacking (Lavoie & Pychyl, 2001) or cyberloafing (Lim, 2002), usually refers to people using the Internet (at work) for non-work (personal interest) purposes in order to avoid doing work-tasks because these are perceived as boring, unpleasant, or too challenging. Lim (2002) argues that these types of online behaviours are part of production deviance in the workplace, resulting in lower employee outputs. Lavoie and Pychyl (2001) found that 51% of respondents in their survey reported frequent Internet procrastination. Also, Greenfield and Davis (2002) reported that employees in their sample spent more than 3 h/week online conducting non-work-related activities. The Internet provides people with a wealth of entertaining distractors such as emailing or chatting to friends and/or family online, as well as access to sports scores, entertainment news, and hobbies. The Internet is frequently perceived as entertaining and positively related to perceived stress relief (Lavoie & Pychyl, 2001). Lim (2002) suggested that using the Internet to procrastinate is relatively easy for most employees (especially those employees who are expected to use computers) to disguise, since ''cyberloafers'' have the appearance of being at work while actually engaging in non-work tasks.

1.3. Flow on the Internet

Flow describes a state of intrinsic enjoyment in the task at hand that occurs when a person's perceived skills closely match the perceived demands or challenges of that task (Csikszentmihalyi, 1997). Csikszentmihalyi (1997) listed eight components of flow; a clear goal, challenges that match an individual's skills, control over the task, immediate and effi-

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cient feedback, concentration and focus, loss of self-consciousness, loss of a sense of time, and an activity that becomes autotelic (i.e. a task is perceived worthy for its own sake). Flow is therefore a state of consciousness (usually characterised by a loss of a sense of time passing) that is sometimes experienced by individuals who are deeply involved in an activity they are enjoying. Flow is most often experienced by individuals as pleasure, satisfaction and as playfulness (Webster, Trevino, & Ryan 1993). Unfortunately, most studies inconsistently assess these eight factors. For example, Webster et al. (1993) only assessed the control, concentration and focus, and autotelic components. For employers, the state of flow is desirable if it refers to relevant work tasks. However, where employees need to attend to many different tasks (especially if the control element of flow is absent), or where the state of flow is on a non-work task, employers would consider flow to be non-desirable. Flow might have a negative impact on work performance if it not directed towards the person's required work task.

Numerous authors have applied flow to human–computer interactions (Sharafi, Hedman, & Montgomery, 2006; Webster et al., 1993) and to Internet usage (Chen, 2006; Chen et al., 1999; Hoffman & Novak, 1996; Pace, 2004; Wan & Chiou, 2006). Hoffman and Novak (1996) and Chen (2006) have argued that qualities of the World-Wide Web such as control, ease of use, immediate feedback, interactivity, and access to entertainment would inherently make the World-Wide Web open to flow experiences. Chen (2006) found that most World-Wide Web users therefore experience positive moods while online. In addition, Wan and Chiou (2006) have argued that the interactive and engaging properties of online games offer users the opportunity for optimal (flow) experiences. Chen et al. (1999) found that some of the most flow-inducing activities were information retrieval, reading and writing emails, creating webpages, playing online games, and chatting online. Pace (2004) also recognised that certain aspects (such as poor interface usability, interesting content, and offline distractors) of the online environment act as distractors to optimal flow experiences in online information-seeking, suggesting that there are also qualities of the Internet that act as potential procrastination distractors as well as qualities that encourage flow.

1.4. Overlaps between PIU, and Internet procrastination and flow on the Internet

Davis et al. (2002) consider the relationship between Internet procrastination and PIU to be so close that they include Internet procrastination in their Online Cognition Scale as part of the measure of PIU. The definition of procrastination involves escaping from work that is unpleasant, boring or too difficult. As the Internet is often described as entertaining and interesting, it is naturally assumed to be a good distractor to enable procrastination (Davis et al., 2002; Lavoie & Pychyl, 2001). Within the deficient self-regulatory approach to PIU (LaRose et al., 2003) the excessive use of the Internet may be a sign that someone is bored, unmotivated, or uncertain about their abilities in completing their work tasks and may therefore escape to non-work tasks on the Internet. In addition, some of the symptoms of PIU include issues of time management (i.e. unsuccessful attempts to reduce using the Internet and being deceitful about how much time is spent online). While time management is only loosely related to procrastination, problematic Internet users are often acutely aware of the excessive amount of time they spend online (as is someone who procrastinates). Furthermore, using the Internet to procrastinate at work could be an explanation for why problematic Internet users report productivity losses at work.

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Hypothesis 1: We expect a strong positive correlation between Internet procrastination and PIU.

There are quite a number of the characteristics of flow that are strongly reminiscent of PIU. The most obvious example of flow overlapping with PIU is time distortion (i.e. due to absorption in the task at hand). One of the symptoms of PIU is the loss of control over the amount of time spent online. Someone who is in a state of flow is characterised as being so deeply involved in the task at hand that they are unaware of time passing (Csikszentmihalyi, 1997). However, it is interesting to note that flow is most often characterised as a positive state, whereas PIU is characterised as a negative state. This is because flow usually refers to tasks relevant to the job being performed, whereas PIU implies engaging in non-relevant job tasks. However, if one is in a "state of flow" when engaging in a non-job-related task one might easily categorise this as resembling aspects of PIU. It is also possible for someone to be in a state of flow for work-related tasks and yet still exhibit symptoms of PIU. For example, if someone becomes so absorbed in their online work that they lose track of time it is possible that they may miss other social and family commitments. While this might be desirable for an organisation (at least in the short term) it may result in negative family or social consequences (one of the symptoms of PIU) over extended periods of time. However, there are also some characteristics of flow that are missing from PIU. In particular, problematic Internet users are not characterised as having a clear goal or a sense of control over the task at hand. Indeed, Wan and Chiou (2006) found that experiences of flow in online gaming were negatively correlated with an addictive inclination. However, Wan and Chiou (2006) found that "addicted" online gamers did not experience high flow states (in fact "addicts" flow states were significantly lower than "non-addicts"). This contradictory finding suggests that while a flow state might lead to more potentially problematic behaviours (like spending more time engaging in an activity), there are other factors that are better predictors of actual addiction.

Hypothesis 2: We would expect a weak negative relationship between PIU and flow.

1.5. PIU, Internet procrastination, and flow on the Internet for different Internet activities

A recent review would suggest that PIU for specific types of online activities (such as online gambling, cybersex, or online gaming) received more support than the contention that Internet addiction requires its own psychiatric classification (Yellowlees & Marks, 2007). Davis (2001) would refer to this as "specific pathological Internet use" (p. 188) in his cognitive-behavioural model. Evidence from a number of studies have shown that interactive activities (e.g. erotica, online chatting, online games, and online shopping) tend to result in higher levels of PIU than activities such as email and information-seeking (~~Leung,~~ 2004; Li & Chung, 2006; Meerkerk et al., 2006; Whang et al., 2003). On the other hand, Widyanto and McMurran (2004) found no relationship between PIU and the interactive activities of the Internet. Other researchers have supported these findings by focussing on populations of Internet users who engage in "higher risk" activities such as online gambling (Griffiths, 2003b) or online gaming (Ng & Wiemer-Hastings, 2005; Wan & Chiou, 2006). Evidence from the flow literature would also suggest that some activities are more flow-inducing than others (Ghani & Deshpande, 1994; Wan & Chiou, 2006).

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Griffiths (2003b) argues that the online environment changes the situational and structural characteristics of an activity. For example, issues such as ease of access, affordability and anonymity might make online pornography and other online sexual pursuits more attractive for some people. The characteristics of an activity that make it more absorbing and susceptible to excessive use include emotional or mental escape, immersion, and interactivity (Griffiths, 2003b). Woods, Griffiths, Chappell, and Davies (2004) add skill development to these characteristics. Woods et al. (2004) imply therefore that tasks with high flow characteristics are positively related to PIU.

Hypothesis 3: Online activities that are more immersive, interactive, and which foster mental or emotional escape, or skill development will have higher levels of PIU and flow on the Internet.

2. Methods

2.1. Sample

While access to the Internet has grown by approximately 113% in South Africa in the last 6 years, the Internet penetration rate is still rather modest compared to developed countries at approximately 10% of the total population (Internet World Stats, 2006). For example, the Internet penetration rates in Sweden (75%), United Kingdom (63%), Japan (67%), and the United States (69%) are significantly higher (Internet World Stats, 2006). However, in certain sectors in South Africa the Internet penetration rate is much higher, particularly in the employed, skilled, urban population (Wolmarans, 2004). The majority of studies that have identified groups "at risk" of problematic Internet use have focused on students (Davis et al., 2002; LaRose et al., 2003; Niemz et al., 2005; Simkova & Cincera, 2004; Suhail & Barges, 2006) or high school children (Nalwa & Anand, 2003; Tsai & Lin, 2001; Wan & Chiou, 2006; Yang & Tung, 2007). A smaller proportion of more recent studies have used a general working population (Meerkerk et al., 2006; Whang et al., 2003; Widyanto & McMurran, 2004). Within the context of low Internet penetration rates, people with access to computer technology and online facilities are more vulnerable to problematic Internet use than those with little access. It is for this reason that this study investigates a technologically literate working population accessed from an online information technology magazine.

A total of 1399 usable responses were obtained. This sample included 1065 males and 334 females, most likely in the age groups 24–29 years old ($N = 378$) and 30–35 years old ($N = 314$), with a Diploma ($N = 403$) or Bachelor's degree ($N = 259$). The majority of the respondents had access to the Internet from work ($N = 1311$) and/or home ($N = 1039$), usually with access from both locations. Most respondents had been using the Internet for longer than 5 years ($N = 1196$) and usually connected to the Internet in sessions of fewer than 2 h ($N = 703$) or between 2 and 5 h ($N = 393$) at a time per day. Respondents accessed the Internet 7 days a week ($N = 566$) with a large number of respondents only accessing the Internet 5 days a week, every work day ($N = 495$). Nearly all respondents used the Internet for email ($N = 1325$) although a large proportion of respondents also used other online communication facilities such as online

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chatting ($N = 239$), Instant Messaging ($N = 593$), and Online telephony ($N = 597$). A total of 633 respondents identified themselves as working in the information technology sector and 737 respondents worked in other sectors such as healthcare, retail, marketing, and banking or finance. *t*-Test comparisons between respondents in the information technology section and respondents working in other sectors produced no statistically significant differences for the three primary variables of PIU ($t = .01$, NS), Internet procrastination ($t = 1.17$, NS), and flow on the Internet ($t = 1.21$, NS). The ~~two~~ information sector~~s~~ and other sectors were therefore treated as a single group for the analyses. This lack of significance between sectors might be an artefact of the sample. The sample was obtained from an information technology magazine website. It is therefore highly likely that all respondents have (at least) some interest in information technology issues even if they were not formally employed in that sector. A respondent might be employed in another sector, but may be involved in information technology or may even be involved with work on the Internet (e.g. a Web developer for an insurance company). Alternatively, just because a respondent is employed in the information technology sector, does not necessarily mean that they use the Internet as an integral part of their job.

2.2. Questionnaire

The questionnaire consisted of five different sections. The first section consisted of nine biographical questions, including gender, age, education, marital status, and job sector. The second section consisted of six questions about participants' use of the Internet, including questions around where participants' connect to the Internet, the amount of time spent online, and the types of activities that they engage with online. The third section consisted of Thatcher and Goolam's (2005) Problematic Internet Use Questionnaire (PIUQ). The PIUQ consists of 20 items, based on Young's (1996) criteria for Internet addiction, on a five-point Likert-type scale from Rarely or Not applicable (1) to Always (5). The PIUQ was shown to have sound internal reliability ($\alpha = 90$) and validity in the validation study (Thatcher & Goolam, 2005). The fourth section consisted of the distraction subscale of Davis et al.'s (2002) Online Cognition Scale, used to assess procrastination. The distraction subscale consists of seven items on a seven-point Likert-type scale from Strongly Disagree (1) to Strongly Agree (7) with a high score indicating a strong propensity to be distracted (procrastinate) while using the Internet. Davis et al. (2002) found good internal reliability ($\alpha = 81$) for the distraction subscale. The final section consisted of an adaptation to Webster's et al.'s (1993) Flow scale. The Flow scale consists of 12 items adapted from Webster et al.'s (1993) original scale by replacing the words "Lotus 1-2-3" with "the Internet". The Flow scale is measured on a seven-point Likert-type scale from Strongly Disagree (1) to Strongly Agree (7) with a high score indicating strong flow experiences. Webster et al. (1993) reported adequate internal reliability for the original Flow scale ($\alpha = .72$). The PIUQ ($\alpha = .92$), distraction subscale ($\alpha = .89$), and the adapted Flow scale ($\alpha = .74$) each demonstrated satisfactory internal reliability and appropriate factorial validity for this sample. While the internal reliability for the Flow scale was not high it fell ~~within~~ the acceptable limit~~s~~ of .70 for survey research (Anastasi, 1988; Murphy & Davidshofer, 2005) and the factor analysis suggested a single factor solution (of flow) rather than a solution that supported Webster et al. (1993) individual flow dimensions.

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342 ### 2.3. Procedure

343 The questionnaire was placed on the website of a prominent South African information
344 technology magazine, with two different links from the homepage (one link in the "Sur-
345 veys" menu and another link from the lead story). While the website had a particular
346 South African information technology focus it is not possible to state categorically that
347 only people resident in South Africa responded to the questionnaire, given the nature of
348 the World-Wide Wide. A summary of the lead story was also included in the weekly email
349 sent to all subscribers to the online magazine. The links directed potential respondents to a
350 Q2 brief explanation of the research (see Appendix). Completion of the survey was voluntary
351 and respondents were able to complete the questionnaire at their own pace. Once respon-
352 dents had completed the survey they were directed to a webpage that provided information
353 on the symptoms of problematic Internet use. Contact details of a free counselling service
354 were provided on this webpage for follow-up consultations if a respondent felt they
355 required additional assistance. The questionnaire was made available on the website for
356 12 days. Thereafter, the links were removed from the website, the data was converted into
357 a spreadsheet and emailed to the researchers after removing any potentially identifying
358 indicators.

359 ### 2.4. Analyses

360 As an initial first step, principal components factor analyses were run on each of the
361 three scales; PIUQ scale, Distraction subscale, and the Flow scale. Using Kaiser (1974)
362 criterion for unity and the slope of the scree plot, each of the scales were indicative of
363 single-factor solutions with the first factor explaining 42% (PIUQ scale), 61% (Distraction
364 subscale), and 35% (Flow scale) of the variance, respectively. There are essentially three
365 options in calculating scale totals. Firstly, one can sum each of the items that make up
366 the scales as designed. However, since two of the scales have been amended from the ori-
367 ginal scales there may be problems with respect to reliability and validity in this sample
368 and many of the items may not really contribute equally to the scale total. Secondly,
369 one could use the mean scores for each item to get a scale total, but this again would
370 assume that each item contributes equally to the scale total. Finally, one could use
371 weighted scores (based on the orthogonal rotation factor analysis). This option answers
372 the weaknesses inherent in the first two options as the weightings reflect the relative
373 "importance" of each item in the scale. The scale totals used in these analyses were based
374 on the weighted contribution from the factor analysis loadings of the first factor after vari-
375 max rotation. The relationships between the key variables and potential scale overlaps
376 were examined using Pearson's correlation coefficients and partial correlation coefficients.
377 The partial correlations enable one to determine any possible moderating influences
378 between the three key variables in the study. The impact of different types of uses of
379 the Internet was examined in two ways. First, *t*-test comparisons were made between
380 the use and non-use of a particular Internet activity for each of the three key study vari-
381 ables. Second, Extended Automatic Interaction Detection (XAID) procedure (Hawkins &
382 Kass, 1982) was used to determine which Internet activities were the best predictors of
383 each of the three key study variables. XAID is one of a family of regression-type data anal-
384 ysis methods where the predictors are all categorical variables and the single dependent
385 variable is interval in nature. The XAID is best represented as a tree structure with the best

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predictor "splits" occurring higher in the tree. In order to further examine the relative contributions of flow on the Internet and Internet procrastination towards predicting PIU, a forwards stepwise multiple linear regression was computed. Due to the large sample size, the .01 and .001 levels of significance were chosen for the analyses (except for the XAID analyses where the .01 and .05 levels of significance were chosen due to the rigour of the XAID analysis).

3. Results

3.1. Means and standard deviations of the weighted scales

An examination of the means and standard deviations of the PIUQ and the Internet distraction scales indicates that they are skewed towards the lower end of the scale. This implies that the majority of the sample scored low on PIU and Internet procrastination. In contrast, an examination of the mean and standard deviation of the Flow on the Internet scale indicates that this scale is slightly skewed towards higher scores implying that experiences of flow on the Internet are relatively common Table 1.

3.2. Results of the overlaps between PIU, Internet procrastination, and flow on the Internet

The results of the correlations between the three constructs for the total sample are presented in Table 2. Each of the correlations was positively statistically significant at $p < .001$ with medium (between .40 and .60) to large (>.60) effect sizes. The correlation between PIU and Internet procrastination was equivalent at .58 after partialling-out (all partial correlations are also shown in Table 2) the effect of flow on the Internet. This would suggest that the strong positive relationship between PIU and procrastination is unaffected by their relationships with flow. The correlation between PIU and flow on the Internet was reduced to .28 after partialling-out the effect of Internet procrastination. This would suggest that procrastination may be a connector between PIU and flow. Finally, the correlation between flow on the Internet and Internet procrastination was reduced to .18 after partialling-out the effect of PIU. This would suggest that PIU is a connector between procrastination and flow.

3.3. Multiple regression results with PIU as the dependent variable

Assuming that PIU is the dependent variable in these relationships (i.e. PIU is a result of Internet procrastination and flow on the Internet) a multiple stepwise linear regression was computed. The multiple stepwise linear regression indicated that four variables explained a significant proportion of the variance (see Table 3). The variables of Internet

Table 1
Means and standard deviations of the weighted scales

	Mean	Standard deviation	Max.	Min.
PIUQ	24.61	8.63	63.88	12.78
Internet distraction	16.41	7.59	37.95	5.42
Flow on the Internet	26.75	6.50	41.37	5.27

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Table 2
Correlations and partial correlations (after partialling-out the third variable in parentheses) between PIU, Internet procrastination and flow on the Internet

	Internet procrastination	Flow on the Internet
PIU	.67** (.58)	.48** (.28)
Internet procrastination	–	.44** (.18)

** Significant at $p < .001$.

Table 3
Multiple stepwise linear regression onto PIU

	R^2	ΔR^2	F
Internet procrastination	.45	–	849.40**
Time spent online	.50	.05	529.99**
Flow on the Internet	.54	.04	406.04**
Number of days per week online	.55	.01	318.81**

** Significant at $p < .001$.

procrastination ($R^2 = .45$, $p < .001$), length of time online in a session ($\Delta R^2 = .05$, $p < .001$), flow on the Internet ($\Delta R^2 = .04$, $p < .001$), and number of days per week online ($\Delta R^2 = .01$, $p < .001$) were found to be the most important variables in explaining the greatest proportion of the variance in problematic Internet use within this sample. The correlation between days per week online and length of time online in a session was statistically significant, but weak ($r = .16$) suggesting that possibility of multicollinearity was low. Also, these two variables are theoretically distinct (i.e. one person may spend a moderate amount of time online every day of the week while another person might spend a large amount of time online one day a week and yet both may experience problematic Internet use) which would suggest the inclusion of both variables in the model. While the regression model was statistically significant ($p < .05$) with the addition of 10 other variables, these variables explained less than 1% additional variance each which was deemed a negligible amount. It was likely that statistical significance in a number of these instances might be an artefact of the large sample size.

3.4. Comparisons of PIU, Internet procrastination, and flow on the Internet by Internet activity

For the PIU variable the *t*-tests showed that with the exception of using the Internet for email and general web browsing, the use of all other activities was significant at the $p < .001$ level. For the flow on the Internet variable, the *t*-tests showed that the use of all 11 Internet activities produced a significantly higher level of flow at the $p < .001$ level. The *t*-test results for the Internet procrastination variable showed that using the Internet for email, general web browsing, file transfer protocols, and telnet were non-significant. The use of news websites was significant at $p < .01$ and all other activities were significant at $p < .001$ (online chatting, instant messaging, online games, peer-to-peer file sharing, and blogging. Due to the more nuanced results for the Internet procrastination variable, only these means and *t*-test results are shown in Table 4.

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Table 4
T-tests for Internet procrastination and Internet activities

Internet procrastination	Non-use mean	Use mean	*t*-Statistic
File transfer protocols (FTP)	16.40	16.43	−.08
Email	15.97	16.44	−.51
General web browsing	13.79	16.48	−2.07
Telnet	16.25	17.59	−2.17
News websites	16.05	17.32	−2.83*
Online telephony	15.96	17.65	−3.67**
Peer-to-Peer file transfers (P2P)	15.95	17.90	−4.08**
Instant messaging	15.46	17.71	−5.48**
Blogging	15.86	19.71	−6.66**
Online games	15.83	20.45	−7.66**
Online chat	15.57	20.47	−9.27**

* Significant at $p < .01$.
** Significant at $p < .001$.

The XAID analyses produced some interesting patterns of association with the dependent variables. For the flow on the Internet variable, the best predictor was the use of online chat. If a respondent did not use online chat the next best predictor was using blogging. For the PIU variable a similar patter emerged except that two more variables were considered significant in the model. If a respondent did not use blogging then the use of online gaming was the next best predictor. If a respondent used online chat, the next best predictor was using online telephony. For the Internet procrastination variable the predictive abilities of the blogging and online gaming activities were reversed, with online gaming

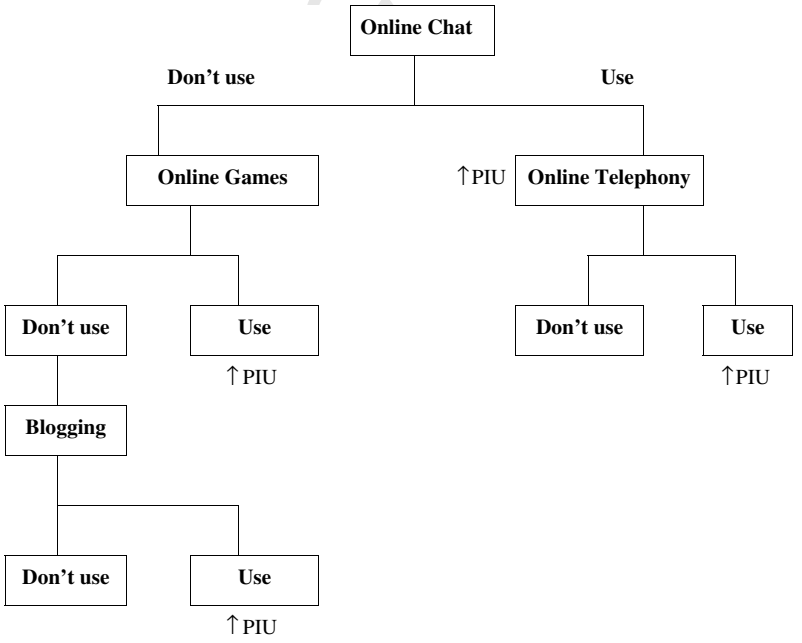


Fig. 1. XAID tree diagram for online activity predictors of PIU.

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being a better predictor of Internet procrastination if online chat was not used. In each case, only online chat was significant at $p < .01$. Other variables in the model were significant at $p < .05$. The XAID tree model for PIU is given in Fig. 1.

4. Discussion

4.1. Overlaps between PIU and Internet procrastination and flow on the Internet

The strong positive correlation between PIU and Internet procrastination (Hypothesis 1) was as expected. Davis et al. (2002) have made a strong argument for including procrastination as a dimension of PIU despite the fact that they are distinct theoretical concepts. One of the possible reasons for the strong correlation was the choice of Internet procrastination scale. The distraction subscale of Davis et al. (2002) Online Cognition Scale (which Davis et al. (2002) used to assess PIU) was used to assess Internet procrastination in this study. This may have exaggerated the strength of the correlation between PIU and Internet procrastination. Despite this choice of scale, there is still good reason to believe the relationship between PIU and Internet procrastination is positive and strong. The Internet clearly has many distractive qualities (LaRose et al., 2003; Lavoie & Pychyl, 2001) since it is easy to learn to use, and it can provide appropriate challenges to those that require the additional challenge.

The moderate positive correlation between PIU and flow on the Internet (Hypothesis 2) was not as expected and is opposite to that obtained by Wan and Chiou (2006) who looked specifically at online gaming. Flow is generally considered to be a positive individual experience and PIU is considered to be a negative personal experience, therefore one might expect a negative correlation between flow experiences on the Internet and PIU. The result found in this study would imply that extended experiences of flow on the Internet might even result in PIU symptoms. In other words, flow experiences are the reason why someone would spend longer than intended engaged in an online activity. Since most respondents' experiences of flow on the Internet are moderately high and reported PIU is relatively low, this might mean that a marginal increase in flow experiences on the Internet would lead to small (non-diagnosable) increases in PIU symptoms. This would mean that individuals and employers might benefit from additional flow experiences and yet not suffer too badly from PIU symptoms. However, this correlation also implies that a person who has a very high PIU score is also likely to be in a high flow state and that person might therefore be experiencing time distortion and a loss of control over the amount of time spent on Internet tasks. Griffiths (2003b) provides an alternative explanation. The positive relationship between flow on the Internet and PIU could be because they share many of the same qualities (i.e. they are immersive, provide opportunities for perceived control, and are intrinsically motivating). These findings parallel the research investigating the negative effects of work dependence or "workaholism" (Scott, Moore, & Miceli, 1997; Spence & Robbins, 1992). The ambiguity inherent in the relationship between flow on the Internet and PIU might (in future) be explained by different types of PIU. For example, Scott et al. (1997) identified compulsive-dependent "workaholics" as more at risk to harmful psychological and physical problems as a result of their work behaviour than achievement-oriented "workaholics".

The results of the partial correlations also produce an interesting set of results. The relationship between PIU and Internet procrastination is independent of the impact of flow on

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the Internet on this relationship. Therefore, a person who is procrastinating is also likely to be displaying symptoms of PIU (or vice versa). If they are also in a state of flow while engaging in procrastinating activities this does not materially affect PIU. However, the relationship between PIU and flow on the Internet is affected by the removal of Internet procrastination as a variable. In other words, the relationship between PIU and flow on the Internet is significantly stronger when a person is using the Internet to procrastinate. Conversely, if a person is not using the Internet to procrastinate the relationship between flow on the Internet and PIU is weakened. Similarly, the relationship between Internet procrastination and flow on the Internet is affected by the removal of PIU as a variable. This means that the relationship between Internet procrastination and flow on the Internet is weaker when PIU symptoms are absent. If a person is in a state of flow while avoiding work-related tasks this is more likely to result in PIU. By implication, if a person is in a state of flow for work-related tasks, the relationship with procrastination would not exist and a person would be less likely to experience PIU. However, this is not to say (theoretically) that a person cannot be in a state of flow for work-related tasks and still experience PIU. After all, if a person spends long hours performing work-related tasks online while neglecting family and other social commitments it is likely that PIU symptoms would emerge over time.

These results provide a small degree of support for Belanger and Van Slyke (2002) contention that a small amount of play is important for preventing boredom (and possibly even encouraging creativity). The results also support the findings from Woods and Griffiths (in press) who found that some (procrastination) activities are perceived positively as a temporary escape from other life experiences. The results would suggest that too much play or procrastination would result in PIU, since the relationship between flow and playfulness is strongly implied in the definition of flow (Csikszentmihalyi, 1997). The results of the partial correlation between Internet procrastination and flow on the Internet would suggest that a small proportion of flow and procrastination is manageable by the individual without resulting in well-being detriments and the appearance of PIU symptoms would be dependent on the degree of control that a person has over the amount of time spent engaged in non-work tasks.

4.2. Regression analysis

The regression analyses provide some support for the correlation and partial correlation results. Internet procrastination explains the greatest proportion of the variance (45%) of any of the variables entered into the model. This result is entirely in line with the results of the correlations as supported by Davis et al. (2002) and LaRose et al. (2003). The variable explaining the next greatest amount of the variance (5%) entered into the model was the amount of time spent online in a session. This finding is consistent with LaRose et al. (2003), Lin and Tsai (2002), Morahan-Martin and Schumacher (2000), and Young (1996) but contradicts Widyanto and McMurran (2004) who found that time spent online was unrelated to PIU. It must be noted that Widyanto and McMurran (2004) sample was quite small in relation to the other studies. Flow on the Internet explained a further 4% of the variance in PIU and the number of days that a person spends online per week a further 1%. Given the intercorrelations between Internet procrastination and flow on the Internet, it is likely that much of the variance explained is shared. Likewise, there is likely to be some shared variance in the two variables related to time spent online (i.e.

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average time spent online per session and the number of days per week spent online). What is revealing from the regression model is that procrastination and the amount of time spent online are better predictors of PIU than flow experiences.

4.3. The impact of different online activities

The results give strong support for the contention that the online activities that are most interactive (i.e. online games, online chat, online telephony, and blogging) are the best predictors of PIU, flow on the Internet, and Internet procrastination. The results are similar to the majority of previous studies (Chen et al., 1999; Leung, 2004; Li & Chung, 2006; Meerkerk et al., 2006; Ng & Wiemer-Hastings, 2005; Whang et al., 2003). These online activities each have a number of qualities in common including high degrees of social interaction, perceived control, and they are intrinsically motivating, and absorbing. Interactive activities provide opportunities for skill development and therefore also have a high degree of perceived control (Griffiths, 2003b). These qualities are similar to those found in flow experiences hence providing theoretical support for the positive relationship between PIU and flow on the Internet. This provides support for Woods et al. (2004) contention that the structural and situational elements of different tasks provided a better explanation of excessive behaviour than trait-based explanations.

Since the study was conducted in South Africa, the question arises about the generalisability of these results to more industrialised countries. The information technology industry in South Africa is similar in nature to information technology sectors in many countries. In this industry, access to the Internet is ubiquitous, convenient, and fast. People working in this industry in South Africa are technologically-literate and evidence of their access and use of the Internet reported in this study parallels (or in most cases is higher than) that reported in studies from Canada (Davis et al., 2002), Taiwan (Lin & Tsai, 2002), The Netherlands (Meerkerk et al., 2006), the United Kingdom (Niemz et al., 2005; Widyanto & McMurran, 2004), and the United States (Morahan-Martin & Schumacher, 2000; Morgan & Cotton, 2003). However, to assess the true generalisability of these results further studies in different countries and different work sectors would be necessary.

4.4. Limitations of the study

Since it was not possible to determine the country of origin of respondents based on the questionnaire, it is difficult to determine the generalisability of the results. It is assumed that the vast majority of respondents were resident in South Africa given the nature of the data collection point (a South African information technology website), but it is also possible that this assumption is false. The use of Davis et al. (2002) distraction scale as a measure for Internet procrastination has already been acknowledged as potentially problematic given Davis et al. (2002) conceptualisation of PIU. Other studies should use a more independent measure of procrastination, although this would involve some modification of items since no other scale of Internet procrastination exists. One obvious limitation is the use of an Internet-based sample as this may lead to sampling bias. Since the sample was obtained from an Internet-based information technology magazine, this means that respondents would be biased towards the Internet as a useful technology and may even have been procrastinating by filling out the online survey instead of completing other work-related tasks.

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Webster et al. (1993) assessment of flow is incomplete measuring only four of the eight components of flow (i.e. control, concentration and focus, and autotelic components). This is problematic since it does not allow for a full examination of theoretical and practical overlaps in all the aspects of flow with PIU and procrastination. Furthermore, Hoffman and Novak (1996) have argued that the state of flow is dynamic. The measure of flow used in this study assessed flow over an indeterminate period and a range of different tasks. It is possible that flow is experienced for some online tasks some of the time, but not for other tasks. The measure of flow used in this study was not sensitive enough to assess these dynamic changes in flow states for different activities. Similar criticisms might be levelled at the sensitivity of the procrastination measure to different Internet activities. Eleven different Internet activities were examined in this study. This list of activities is by no means exhaustive (online sexual addiction and online gambling are not included, for example) or highly nuanced in terms of specific tasks (ordering a product online or reading a news report on a sporting event, for example). Future research might consider widening the list of Internet activities or limiting the area of investigation to a particular activity in order to adopt a more nuanced approach to different online tasks. Similarly, the measures of PIU, flow and procrastination should focus specifically on identifying Internet activities that are work- and non-work-related.

4.5. Conclusions and directions for future research

The results from this study have demonstrated that there is empirical evidence for an overlap between the concepts of flow on the Internet, Internet procrastination, and PIU. Following Belanger and Van Slyke (2002) the results of this study suggest that studies need to investigate the respective proportions of time spent socialising, playing, procrastinating, and working online. This would mean, following the situational approach to procrastination (Blunt and Pychyl, 2005), that one would need to investigate the qualities of the different online work tasks that lead to boredom or excessive challenge and whether play or procrastination might contribute to improved work performance. The difficulty with this line of inquiry from a flow perspective is that the Internet is a "multi-activity medium" (Chen et al., 1999, p. 590). This means that people might have matched skills and demands for some activities (e.g. online gambling or online gaming) but not for others (e.g. online literature searching). This implies that studies should probably operationalise flow, skill and challenge in terms of specific online activities. Mahatanankoon et al. (2004) Personal Web Usage (PWU) scale might prove useful in this regard. Additionally, there are many different applications of the Internet (Chen et al., 1999), some of which (downloading software or playing online games) may be potentially more conducive to PIU than other activities (Lin & Tsai, 2002; Morahan-Martin & Schumacher, 2000; Yang & Tung, 2007). Several studies (including this study) have suggested that PIU is more likely to occur when the Internet is used for social functions rather than work-related (instrumental) functions (Li & Chung, 2006; Yang & Tung, 2007). Further research is required to unravel this issue to determine whether PIU is a separate concept from excessive work within the information technology worker population. Lin and Tsai (2002) also found that Internet dependents were more likely to be sensation seekers which, in turn, might mean that they become bored with routine work more easily and hence use the Internet to procrastinate (leading to PIU). The relationship between sensation seeking, PIU and procrastination requires further investigation. Finally, there is some evidence to suggest that

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people should be made aware of the dangers of online activities that have high flow quotients.

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