# Study of Human Anxiety on the Internet

Santosh Kumar Kalwar and Kari Heikkinen

Lappeenranata University of Technology,
Department of Information Technology, Lappeenranata, Finland
S.K.Kalwar@gmail.com, Kari.Heikkinen@lut.fi

**Abstract.** In this paper a conceptualization of human anxiety on the Internet is introduced; it is built on the understanding of human behavior with regard to technology. The objective of this paper is to conceptualize the human anxiety. An integral part of understanding is an inter-disciplinary (psychology science, cognitive science, behavioral science and communication technology) literature review, of which and overall summary is presented. The understanding is conceptualized by designing, implementing and evaluating through a developed user study model. In this paper the preliminary result of utilizing the developed user study found seven particular anxiety areas which need further studies.

**Keywords:** Human, study, anxiety, internet.

## 1 Introduction

Twenty-seven years ago, Internet was like a small dog at the bottom of the application pile, fighting for recognition, today, vast numbers of people are using Web Services through the Internet.

One of the fascinating things about the Internet is that it comes with outstanding tools for usage in regards to recreation, education, society and much more. Current estimated statistics have shown that more than 63 million humans use the Internet in homes and the importance of the Internet in daily activities is growing. There is little which cannot be accomplished from the comfort zone of home; paying bills, research work, buying, selling, updating, uploading, downloading, shopping and, most importantly, communicating with your family and friends half way across the world. Since the establishment of the WWW, the number of Internet users has grown from an estimated 16 million in 1995 to more than 500 million in 2002 – explosive growth to say the least [1]. The rather recent but enormous and rapidly progressing emergence of the Internet has not gone unnoticed by scholars working in many different fields of research [1]. The Internet has become both an object of study and a tool of research. A basic definition of the term host in the case of a computer network is a computer connected to the Internet. The number of hosts connected to the Internet has grown rapidly. In 1983, when the Transmission Control Protocol/Internet Protocol (TCP/IP) standard was first adopted there were only about 250 hosts connected to the Internet. By late 1993, figure had grown to two million. During 2005, the number of hosts on the Internet had increased to 317.6 million. In recent years, the number has

skyrocketed to 541 million [2]. The fact and digital data from various sources confirms that number of humans accessing the Internet is growing at a rapid pace. As the Internet evolves in terms of number of human online, it feels as if it is evolving as social community. Worldwide, the Internet population is growing at a rapid pace. The number of people getting access to information, learning, and going online is booming like never before. It should be remembered that as late 1988, only a few countries were connected to the Internet. According to the 2004 CIA World Fact book, over 50 countries have at least one million humans using the Internet [3].

Humans once found it difficult and expensive to communicate during the times of voice telephones but with the rapid technological development communication has improved drastically. The distance has been shortened from family, friends and from seeking information which can be seen as the replacement of very important daily interactions. Boundaries of time, distance and identity are broken by the transfer of simple applications like e-mail to the complex world of virtual communities. Together with the positive growth, its negative effects are growing too. According to the U.S. Department of Justice, the Internet is an anonymous and effective way for many predators to find and groom children for illegal activities [4]. The fear of using the internet is further amplified by social disintegration, psychological and cognitive implications.

## 1.1  Objective and Scope

The main research question is, "how can we address the challenges such as Internet addiction, psychology and human computer interaction it is currently facing now?" To understand the objectives, some of the questions were researched in details.

The paper aims to find answers to the following hypotheses:

- Do users shows increased or reduced anxiety level when using the Internet?
- What kinds of behaviors are shown when using the Internet?
- What is the role of the content?
- Finding types of the anxiety behaviors?
- How human process information at the internet interface?

The scope of the work includes design, implement and evaluate methods used in understanding the behavior of humans using the Internet technology. It has wide range of scope from the field of psychological perspective to cognitive science, behavioral science and communication technology. The scope is complex. However, To study human and their tasks and how to relate information to design style, human behavior theories, standards, procedures or guidelines in order to build an appropriate model of interaction with the help of some existing methods is investigated.

## 1.2  Internet Anxiety

A lot has been written in past about the negative use of the Internet anxiety, Internet addiction and full dependence on the internet is welling up [5] [6] [7]. The service disruption because of network faults, software bugs, administrator mistakes and version upgrade could seem less tolerable. Millions of human around the world use Internet to search, inform, find, communicate, work and play. Internet should not be

only viewed as negative such as addiction and pathological nor should it be vilified. One must be aware of negative consequences of overuse of the Internet by understanding the behavior of themselves and from others.

Four types of Internet anxiety was identified by Presno. C,, using qualitative study method [8]. These are: *Internet terminology anxiety*: anxiety produced by an introduction to a host of new vocabulary words and acronyms. *Net search anxiety*: anxiety produced by searching for information in a maze-like cyberspace. *Internet time delay anxiety*: anxiety produced by busy signals, time delays, and more and more people clogging the Internet. *General fear of Internet failure*: a generalized anxiety produced by fear that one will be unable to negotiate the Internet, or complete required work on the Internet. Additional three areas of the Internet anxiety from the qualitative study were found in this research. *Experience anxiety*: an anxiety produced by lack of concentration or focus. *Usage anxiety*: a generalized anxiety produced by excessive usage of the Internet. *Environment and attraction anxiety*: anxiety produced by content on the Internet. For example: interactive game, pornography and larger number of colorful applications.

**Table 1.** Types of Anxiety recorded for Subject I and Subject II

| Types of anxiety | p1 | p2 | p3 | p4 | p5 | p1 | p2 | p3 | p4 | p5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Terminology | x | | x | | x | x | x | | x | x |
| Search | | x | x | x | | | x | x | x | x |
| Time delay | x | x | x | x | | x | | x | x | |
| General fear | | x | x | | | | x | x | | x |
| Experience | x | | x | | x | x | | x | | x |
| Usage | x | x | | | x | x | x | | | x |
| Environment & attraction | x | x | x | x | x | x | x | | x | |

## 2   Inter-disciplinary Literature Review

Sociability is important as well as usability of applications in the Internet. While usability is concerned with making sure that the application, software and system is consistent, predictable, and easy and satisfying to use, sociability and the social aspect of building and maintaining an online community focuses on processes and styles of social aspect in interaction that support human behavior on the internet to some extent. Research has shown certain social groups to be under-represented on the Internet [9] [10] not simply because of a lack of access, but more because of cognitive, motivational and affective factors [11]. Psychology therefore has an important role in advancing the understanding of why humans choose to use or not to choose the usage of the Internet [12]. There will always be an argument to model psychology with technology or technology with psychology however; combining psychology with technology will give rise to new technology called psycho technology. To understand the Internet technology in broader ways, interaction between human and the technology through the Human Computer Interaction becomes essential. Brain Computer

Interface techniques are only studied in this research work, no practical implementation was carried out due to the limitation of resources.

In BCI, skill developed by a human involves proper control of electro physiological signals which are easily adapted and modulated by the brain for better feedback. In understanding human anxiety, BCI techniques could be used for testing and analyzing different activities on the Internet. The ethnographic study of the Internet can be divided into two categories. First, user-based and second, content based. User-based analysis is about the investigation, examination and the study of humans using the Internet. Whereas, content based analysis is mainly focused on text. Humans are capable of providing reasons to support their points of view if asked a question such as "What color is my shirt?" and are capable of knowing without explicit Deduction or reasoning answers to questions like, "If I were you, I would hate myself", whereas computers cannot function without specific programming instructions.

## 3   Methods, Design and Implementation

The user study model used both qualitative and quantitative research methods. The qualitative research was conducted using interviews and observational analysis. The quantitative research was conducted in three iterations by using questionnaires and surveys.

The Questions were analyzed with the help of different types of questionnaires being constructed. Intentionally, Participants were given very general types of question to answer. Two types of Questionnaires were used: Using the Internet and Using the Pen and Paper method. Task calculation was carried out by dividing the task into subtask. Two types of subject were categorized based on skill level (novice, intermediate and expert human): Subject I and Subject II. Usability Test recording form was used for each participant. This form was used to record both the verbal and non-verbal behaviors of humans using the Internet. The task was chosen which was based on the
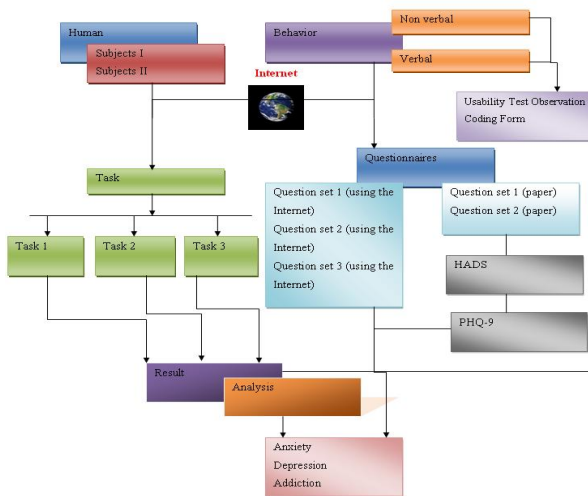


**Fig. 1.** The user study model implemented to test behavior of humans using the Internet

Internet. The task contained three modules which were divided into task 1, task 2 and task 3 based on the level of difficulties. It was found from the task analysis that humans using the Internet took less than a second to complete all of these tasks.

There is a division of the participant's overt behavior into two major general categories: verbal and nonverbal. Verbal behavior includes anything a participant says and Nonverbal behaviors include various activities that the participants actually do. In non verbal behavior mostly facial expression such as smiling, looks of surprise, furrowing brow or showing body gestures such as leaning close to the screen, rubbing the head is shown by the participants these are facial expression, eye-tracking, pupil diameter, skin conductance among others.

## 4 Results and Discussion

The goal of the study was to determine "how can we address the challenges such as Internet addiction, psychology and human computer interaction it is currently facing now?" In order to evaluate the main research question, the main research question was broken down into hypothesis. There were five different hypothesis formulated in the beginning of the research. Now, Let us try to discuss these hypotheses to see our method, design, evaluation and analysis of the research was supported (fully supported, partially supported and not supported) or not.

H1: *Do users shows increased or reduced anxiety level when using the Internet?*
Hypothesis 1 was fully supported. Human shows the sign of increased level of anxiety when using the Internet. It appears that, with any given task on the Internet number of anxiety increase in human. More number of participants said "yes" to five or more items from the QS 2, which indicates problematic Internet Usage. Using HADS and PHQ-9 it was observed that, one participant seemed to have a Case of higher depression scale. Therefore, in this particular case users showed increased anxiety level when using the Internet.

H2: *What kinds of behaviors are shown when using the Internet?*
Hypothesis 2 was fully supported. Literature review revealed that there are two types of behavior shown by human using the Internet: Verbal and Non verbal. During Observation of behavior for the participants, Most of the times humans were laughing, smiling, drumming their fingers on the table and looking aimlessly around. These behaviors pattern was verbal and non-verbal. These types of the behavior patterns were observed among narrowly selected group of the participants.

H3: *What is the role of the content?*
Hypothesis 3 was partially supported. Role of content could determine the predicted or unpredicted human behavior on the Internet. Such as addiction, anxiety and stress of using the Internet, since humans were successfully able to complete the task with ease, it could be predicted that-any sort of given task for humans is very easy to do on the Internet. Therefore, the role of content has principal impact on how human behaves on the Internet.

**H4:** *Finding types of the anxiety behaviors?*
Hypothesis 4 was fully supported. It was found that in this particular case there are seven main area of anxiety in the humans: Internet terminology anxiety, Internet search anxiety, Internet time delay anxiety, general fear of Internet failure anxiety, experience anxiety, usage anxiety, and environment and attraction anxiety. Using Observation methodology and Comparing two types of subjects: Subject I and Subject II, it concludes that- all the participants showed these above cited anxiety.

**H5:** *How human process information at the internet interface?*
Hypothesis 5 was partially supported. When human interacts with the internet interface, it appears that, everything that human senses such as sight, hearing, touch, smell and taste are processed as the information in the mind. This information could result in behavior such as verbal and non-verbal. Even if behavior initially disappears, it may partially return as undamaged parts of the brain reorganize their linkages. The human behavior in totality of processing information includes internal cognitive processes which can result in observable behavior. Processing of the information at the internet interface has the realistic approach such as thinking of mental processes as several railroad lines that all feed to same terminal.

   Two schools of thought have emerged which confirms with the hypothesis that, there are two types of the behavior while using the Internet: Verbal and Non-Verbal behavior. In more general terms human using the Internet can use the content available on the Internet in two different ways: Positive or Negative. The gestures or types of human behavior shown could lead to anxiety.

   Seven major types of anxiety were studied and validated: Internet terminology anxiety, Internet search anxiety, Internet time delay anxiety, and general fear of Internet failure anxiety, experience anxiety, usage anxiety, and environment and attraction anxiety. Two types of behavior (verbal and non-verbal) were formulated from relevant literature study, empirical analysis and evaluation. The study of Brain Computer Interface concludes that signal could be send in human brain physically to control and observe behavior of humans, however the BCI techniques were not used in the study and without using BCI techniques, the study conducted discovered sample of humans showing increased level of anxiety when using the Internet. The task completion behaviors of humans were calculated.

   By the end of this discussion session, We can reach to the conclusion that, to reduce Internet anxiety, addiction and depression scale on the Internet, it is important to have many multicultural experiences, and control over own self behavior to accumulate successful experiences of behavior.

## 5   Conclusions and Future Work

Taking the results and discussion to the logical conclusion it appears to the authors knowledge that, "Internet has lulled humans with the sense of dependency to greater extent". Five types of hypothetical questions were answered in this study. These questions were: Do users shows increased or reduced anxiety level when using the Internet? What kinds of behaviors are shown when using the Internet? What is the role of the content? Finding types of the anxiety behaviors? , And How human process information at the internet interface? Seven major types of anxiety were studied

and validated: Internet terminology anxiety, Internet search anxiety, Internet time delay anxiety, and general fear of Internet failure anxiety, experience anxiety, usage anxiety, and environment and attraction anxiety. Two types of behavior (verbal and non-verbal) were formulated from relevant literature study, empirical analysis and evaluation. The study of Brain Computer Interface concludes that signal could be send in human brain physically to control and observe behavior of humans, however the BCI techniques were not used in the study and without using BCI techniques, the study conducted discovered sample of humans showing increased level of anxiety when using the Internet.

From the book by Sir Tony Hoare, The first passage in *Communicating Sequential Processes* reads, "Forget for a while about computers and computer programming, and think instead about objects in the world around us, which act and interact with us and with each other in accordance with some characteristic pattern of behavior". The same idea is followed in the study of human anxiety on the Internet.

- Large sample size, different demography structure and discovery of perfect user study model are needed, for larger impact and generalization.
- In contrast to several findings of negative effect in the Internet addiction, anxiety and depression group, some positive effects could be determined in future by building the framework for future learning through Imagination, Investigation and Innovation.
- In depth analysis and comparisons of the human brain and the network open System Interconnection (OSI) model could be performed.

Despite the above limitations, undoubtedly the Internet has provided a collection of applications that is having a profound effect on mankind. Like the wheel, the plow, and steam power before it, it is a proving a truly differentiating tool in our world, changing the very ways in which we interact with each other. Progress is relatively easy to recognize if we follow technology exploration. A more challenge is to find technology we want to change ourselves and for our civilization. Understanding the human factors for the design and development of the technology, system and services to ensure successful and perfect application environment is major concern.

The forms of anxiety identified suggest areas for future Internet development and research.

# References

1. ISOC.org (2008), `http://www.isoc.org/internet/history/brief.shtml`
2. ISC.org. Millions of host on the internet (2008), `https://www.isc.org/`
3. Central Intelligence Agency. The DigiWorld in the global economy. In: DigiWorld 2008 (2008),
   `https://www.cia.gov/library/publications/`
   `the-world-factbook/geos/xx.html;`
   `https://www.cia.gov/library/publications/`
   `the-world-factbook/fields/2184.html`
4. Golden, S.M.J.: Protecting children in the internet age (2008),
   `http://www.senate.state.ny.us/sws/`
   `Protecting%20Children%20in%20the%20Internet%20Age.pdf`

5. Kraut, R.E. (2008),
   `http://www.cs.cmu.edu/~kraut/RKraut.site.files/articles/`
   `Bessiere06-Internet-SocialResource-DepressionL.pdf`
6. Chou, C.: Incidence and correlates of internet anxiety among high school teachers in tai-wan. Computers in Human Behaviour 19, 731–749 (2003)
7. Skinner, B.F. (2008), `http://www.bfskinner.org/aboutfoundation.html`;
   `http://www.bfskinner.org/f/Science_and_Human_Behavior.pdf`
8. Presno, C.: Taking the byte out of internet anxiety: Instructional techniques that reduce computer/internet anxiety in the classroom. J. Educ. Comput. Res. 18, 147–161 (1998)
9. Jackson, L.A.: Social psychology and the digital divide. In: The 1999 Conference of the Society for Experimental Social (1999)
10. Sax, L.J., Ceja, M., Teranishi, R.T.: Technological preparedness among entering freshmen: the role of race, class and gender. Journal of Educational Computing Research 24, 363–383
11. Jackson, L.A., Ervin, K.S., Gardner, P.D., Schmitt, N.: Gender and the internet: Women communicating and men searching. Sex Roles 44(5), 363–379 (2001)
12. Jackson, L.A., Ervin, K.S., Gardner, P.D., Schmitt, N.: The racial digital divide:Motivational, affective and cognitive correlates of internet use. Journal of Applied Social Psychology 31, 2019–2046 (2001)