

**DETERMINING THE INFLUENCE OF COGNITIVE STYLE ON  
INFORMATION SEEKING BEHAVIOR FOR PROPOSING USER PROFILE**

MARYAM SALARIAN

A dissertation submitted in partial fulfillment of the  
requirements for the award of the degree of  
Master of Science (Information Technology Management)

Faculty of Computer Science and Information Systems  
Universiti Teknologi Malaysia

AUGUST 2012

I dedicated this thesis to my beloved "**Kourosh**" and my dear mother and father for their endless support and encouragement.

## ACKNOWLEDGEMENT

First and foremost, I would like to express heartfelt gratitude to my supervisor **Dr. Roliana Ibrahim** for her constant support during my study at UTM. She inspired me greatly to work in this project. I have learned a lot from her and I am fortunate to have her as my mentor and supervisor

Secondly, I would like to thank **Dr. Hamid Kashefi** for his kind assistance in conducting my work in this project.

## ABSTRACT

An important issue that absorbs many attentions is studying the users' required information and their pattern of dynamic interaction with online search. According to different needs of users in internet environments such as Digital Libraries, information services are prepared for them. For this propose, personalized digital libraries providing a way for different users to express their preferences clearly. Users may not attention to their preferences and cannot have an acceptable research. To address these problems, this thesis investigates an approach that gains user preferences based on cognitive style and recognizes relevant characteristics for information seeking and then to examine the influence of cognitive character on information seeking. More specifically, this thesis aim to study cognitive style can identify user preferences and explain how Current Web Personalization systems use different kinds of techniques. In order to use specific characteristics of the users to create a profile that is used as the primary filtering element for the adaptation and personalization of the Web content. This study proposes a user comprehensive profile that consists of cognitive processing factors in information space. This paper specifically focuses on the use of the Internet by postgraduate engineering students. The sample of this study consists of 53 postgraduate engineering students from the Faculty of Computer Science and Information System in Universiti Teknologi Malaysia. The findings of this study revealed influence of users' cognitive styles on information seeking and then present framework of user profile based cognitive style characters.

## **ABSTRAK**

Suatu isu penting yang menarik ramai perhatian adalah membaca permintaan maklumat oleh pengguna dan corak dinamik interasi dalam pencarian atas rangkaian. Dengan mengikuti pelbagai keperluan yang berlainan dalam rangkaian seperti perpustakaan digital dan perkhidmatan informasi telah disediakan. Untuk tujuan tersebut, perpustakaan digital peribadi membekalkan satu cara untuk pengguna supaya menunjukkan kesukaan mereka dengan jelas. Pengguna yang mungkin tidak menumpu perhatian kepada kesukaan mereka akan gagal mendapatkan pengajian yang sesuai. Untuk mengaji masalah-masalah tersebut, tesis ini menyelidiki satu cara yang dapat memperolehi kesukaan pengguna dengan mengikuti bentuk kognitif dan mengecam ciri-ciri yang berkaitan untuk pencarian maklumat dan untuk memeriksa pengaruh sifat kognitif dalam pencarian maklumat. Untuk lebih spesifik, tesis ini bertujuan untuk mengaji ciri-ciri kognitif yang dapat mengenal kesukaan pengguna and menjelaskan bagaimana system Pelayar Individual Semasa menggunakan pelbagai teknik. Untuk mendapatkan ciri-ciri yang ditetapkan oleh pengguna untuk mewujudkan profil yang digunakan sebagai penapisan butiran yang utama bagi penyesuaian and peribadian dalam kandungan pelayar. Kajian ini mencadangkan satu profil pengguna yang lengkap dengan mengandungi faktor proses kognitif dalam ruang maklumat. Tesis ini terutamanya menumpu atas kegunaan rangkaian oleh pelajar kejuruteraan lepasan ijazah. Sampel yang diperolehi terdiri daripada 53 orang

pelajar kejuteraan lepasan ijazah dari Fakulti Komputer Sains dan Sistem Maklumat di Universiti Teknologi Malaysia. Perolehan dalam pengajian ini menunjukkan pengaruh ciri kognitif pengguna atas pencarian information dan rangka bagi profil pengguna dengan mengikuti ciri bentuk kognitif ditunjukkan.

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	<b>DECLARATION</b>	ii
	<b>DEDICATION</b>	iii
	<b>ACKNOWLEDGMENT</b>	iv
	<b>ABSTRACT</b>	v
	<b>ABSTRAK</b>	vi
	<b>TABLE OF CONTENTS</b>	vii
	<b>LIST OF TABLES</b>	xi
	<b>LIST OF FIGURES</b>	xii
	<b>LIST OF APPENDIX</b>	xiii
<b>1</b>	<b>INTRODUCTION</b>	
	1.1 Introduction	1
	1.2 Background of the Study	2
	1.3 Problem Background	3
	1.4 Research Question	4
	1.5 Research Hypothesis	4
	1.6 Research Objective	4
	1.7 Research Scope	5
	1.8 Thesis Organization	5
<b>2</b>	<b>LITERATURE REVIEW</b>	
	2.1 Introduction	6
	2.2 Models of information behavior	7
	2.2.1 Wilson's model of information behavior	8
	2.2.2 A model of internet-based information system	9

	use in organizations	
2.2.3	A nested model of the information behavior	11
2.2.4	Wilson second Models of information seeking behavior	13
2.2.5	Ellis's Model of Information Seeking	14
2.2.6	Kuhlthau's Model	16
2.2.7	Information Searching Model	18
2.2.8	Summary of the Information Behavior Models	20
2.3	Information Seeking Behavior	22
2.3.1	Qualitative Web User Information Seeking Studies	22
2.3.1.1	Web Experience	23
2.3.1.2	Cognitive Elements and Information Seeking on the Web	24
2.3.1.3	The Social Perspective of Information Seeking	28
2.4	Correlation and Regression	28
2.4.1	Correlation	29
2.4.2	Multiple Regression Analysis	30
2.4.2.1	Multiple Linear Regression Analysis	31
2.5	User Model	31
2.6	User Profile	32
2.6.1	Personalization	32
2.6.2	Personalization and Recommendation	33
2.6.3	Collecting Information about Users	35
2.6.3.1	Methods for user information collection	36
2.7	User Profile Construction	37
2.8	Chapter Summary	41
<b>3</b>	<b>METHODOLOGY</b>	
3.1	Introduction	42
3.2	This Research Proposed Methodology	42
3.2.1	Project Initiation and Planning	44
3.2.2	Conduct Literature Review	44



3.2.3	Pilot study and Reliability Testing	44
3.2.4	Data Collection	45
3.2.4.1	Research Instrument	45
3.2.5	Data Analysis	47
3.2.5.1	Testing on the Assumption of Normality	48
3.2.5.2	Multiple Linear Regression Analysis	48
3.2.6	User Profile Framework Based Cognitive Elements	49
3.3	Conceptual Framework	50
3.3.1	User Activity	51
3.3.1.1	User Context	51
3.3.1.2	Information Behaviour	52
3.3.2	User Model	53
3.4	Conclusion	55
<b>4</b>	<b>EXPERIMENTAL RESULTS AND ANALYSIS</b>	
4.1	Introduction	57
4.2	Data collection	57
4.3	Pilot study and Reliability Testing	58
4.4	Multiple Linear Regression Analysis	59
4.4.1	Testing on the Assumption of Normality	59
4.4.2	Correlation Analysis	62
4.4.3	Result of Multiple Linear Regression Analysis	64
4.4.3.1	Hypothesis	64
4.5	Discussion on the Results	67
4.6	User profile frame work	68
4.7	Summary	72
<b>5</b>	<b>CONCLUSION</b>	
5.1	Introduction	73
5.2	Achievement of the Study	73
5.3	Limitations of the Study and Recommendations for Further Research	74

5.4	Research Contribution	74
5.5	Summary	75
	<b>REFERENCES</b>	76

## LIST OF TABLES

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Some of the Critical Research about Information Seeking	27
2.2	A User Profile Upper Level Classes	39
2.3	Properties of User Profile Context	40
3.1	Demographic User Profile and its Transition into User Profile Classes	54
3.2	An Instance of User Profile Upper Level Classes Based on Data Collection in this Research	55
4.1	Variables and Item in Data Set	58
4.2	The Instruments and Cronbach's Alpha	59
4.3	Normality Test for information Seeking	60
4.4	Relationship Between Information Seeking and Cognitive Style Element	63
4.5	Simultaneously Test (F-Test) Output	65
4.6	Partial Test (T-Test)	65
4.7	User Profile Ontology Upper Level Classes	70
4.8	Ability Hierarchy that is Modeled With the User Profile Ontology	70
4.9	User Profile Based Items of Internal Knowledge	71
4.10	User Profile Based Items of Uncertainty	71
4.11	User Profile Based Items of Change	72

## LIST OF FIGURE

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Wilson’s model of information behaviour	8
2.2	Model of information Environment	10
2.3	A nested model of the information searching, information seeking, and research areas	12
2.4	Wilson model of information seeking behaviour	14
2.5	A stage process version of Ellis’s behavioural framework	15
2.6	A comparison of Figure 3 with Kuhlthau’s stage process	17
2.7	Ingwersen’s model of the IR process	19
2.8	The Scatter Plot of Correlation	30
2.9	Overview of personalization on a user-profile- base	35
2.10	Ontological User Profile as the Context Model	37
3.1	Research Operation Framework	43
3.2	A conceptual Framework According to the Study	50
4.1	The scatter plot of CGPA	61
4.2	The histogram of information seeking	62
4.3	User profile frame work based cognitive character	69

**LIST OF APPENDIX**

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	Appendix A	82
B	Appendix B	90

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The web has maintained a continuous growth rate in the last decade. This fact makes the web an important information resource accessible to a great number of people who continuously use it. Offering widespread access to data and exchange of new ideas on a wide range of topics and interests, the web is a powerful vehicle of communication that breaks through geographical, cultural and political boundaries. It integrates diverse audiences on a national and international level. The widespread use of the available Web Information Retrieval Systems has subjected the nature of information seeking to a significant transformation. As the number of search engines and their use increase, knowledge and understanding of users' information seeking and their patterns of dynamic interaction with online Information Retrieval Systems is getting increasingly significant. Information seeking behaviour is vital for improving the quality of systems designed to retrieve information by modifying their design in relation to the needs and expectations of the user.

In order to be able to utilize the web or make adequate use of it, people need to be learned in order to create a mental image, picture, or representation of a system or service. This mental picture, image, or representation can be referred to as a reflection of the experiences of the past, expectations, belief system, knowledge structure, etc. System users or service users who use the internet are seeking some information which will be used for identifying unfamiliar entity using things that are

more common or easily adopted with existing cognitive structure (Bruce and Policy, 1999). With the exponential growth of the World Wide Web in the past decades and its development into an enormous and heterogeneous collection of information resources, people have come to deal with new techniques and methods for accessing information. The internet is now an important channel of communication and is used for information distribution and gathering, "it is using power for the evolution and improvement of information seeking" (Nahl, 1998).

## **1.2 Background of the Study**

The ability of users in creating, interacting, or manipulating digital content that are on different platform in the information and digital era have made users so dependent on digital technology (Wilson, 2000a). In today's world, the information that an individual would need at a given time may be available in different sources which can be accessed via different information channels. Most research students look for a wide range of resources and they continually use these resources for their school work like assignments, projects, etc. (Ford, 1999). However, identifying the most useful information can be quite difficult (Chowdhury, 2006).

The identification of what users do is always related to the behavioural approach.(Wilson, 2000a). It can also be referred to as knowing how users search, what kind of errors do users make, what do users really consider as important or relevant, what feelings do users express, and how much of importance or value they (users) place on the outcome. To seek information is a kind of generic cognitive activity (Marchionini, 1995a, Berryman, 2006, Byström, 2005b). Cognitive processes determine the ways in which knowledge is assessed, filtered, stored, organised, and continually re-structured in individuals' mind.

A system (web site) that has to be personalized must be able to distinguish between groups of users and individual users. The above process can be called users profiling. The main aim or objective of the user profiling system is to be able to

create an information base that contains the characteristics, the activity of users and the preferences of users. These factors all need to gather and exploit some information about individuals in order to be effective (Kazunari Sugiyama 2004). This study is conducted to determine the information-seeking behaviour on academic website of post graduate students. It studies on the Faculty of computer science at the Universiti Teknologi Malaysia (UTM). It presents an outline of models of information seeking and cognitive style in the Web domain and surveys user's cognitive style for collecting information about users and finally using them to propose a user profile.

### **1.3 Problem Background**

In order to investigate the area of information seeking it is, firstly, important to study and critically review the most relevant and significant existing works in the field. Results achieved from information seeking study are used to support the notion of successive search of digital information environments over time by considering human progress via different phases or stages, adopting different strategies, and exhibiting several information behaviours at phases or stages of their information – seeking process (Ellis, 1989, Kuhlthau, 1993).

Current research of the characteristics of users in user system interaction shows that individuals are different in their abilities and the way they react to a system. Studying digital journals helped to take different approaches and objectives for the study. Kind of research has been conducted on the information behaviour of academicians in the websites. Students need to obtain information in the best way in order to reduce in searching time and achieve satisfaction in retrieval information. Identification of general knowledge system provides a proper coverage for users to search topics which can be incorporated into different models of user preferences.

Aspects of information seeking that are related to students are seriously subjective. Different users have different needs, values, and ways of seeking for



information. It is difficult to design a system on our web site to identify specific information needs for each researcher that could show the best results.

#### **1.4 Research Questions**

This research is conducted as an attempt to find the answers for following questions:

1. What are the existing models in information behaviour and users' cognitive style?
2. Does the cognitive style have any influence on information seeking behaviour?
3. How can the user profile be designed based on the cognitive style to achieve information needed from academic websites?

#### **1.5 Research Hypothesis**

The research hypothesis is related to the research questions 2:

$H_0$ : There is no significant influence of cognitive style on information seeking behaviour.

#### **1.6 Research Objective**

The objectives of this study are:

1. To study existing information behaviour models and cognitive style models.
2. To investigate the influence of cognitive style on information seeking behaviour.
3. To propose a framework of user profile based on the identified characters of cognitive style.

## **1.7 Research Scope**

1. This study is carried out on the research students (PhD and master course) of the faculty of computer science and information system of UTM.
2. The respondents are students who use the academic websites. They look for information based on their preferences, assignments, and other related work.
3. This study focuses on students' cognitive character towards the use of academic website to a successful search.

## **1.8 Thesis Organization**

The remaining parts of this proposal are arranged as follow. In Chapter 2 reviews the literature, fundamental concepts relative to this study and also theories regarding this research. Chapter 3 presents the research methodology of the present study, and it discusses the advantages and techniques used for designing user profile. Presenting the details of the data collection, analyzing data, and identifying more effective cognitive characters in order to propose the framework of user profile are discussed in Chapter 4. Chapter 5 presents the conclusions of the study.

## REFERENCES

- A. VIEJO, J. C.-R. 2010. Using social networks to distort users' profiles generated by web search engines *Computer Networks* 54, 1343-1355.
- AHU SIEG, B. M., ROBIN BURKE 2007. Ontological User Profiles for Personalized Web Search *American Association for Artificial Intelligence*.
- ALLEN, T. J. 1977. Managing the flow of technology: technology transfer and the dissemination of technological information within the R & D organization. *cambridge, MA: MIT Press*.
- BELKIN, N. J. E. A. 1995. Cases, scripts and information seeking strategies: on the design of interactive information retrieval systems. *Elsevier Ltd*, 379–395.
- BERRY, L. L. Year. "Relationship marketing", in Emerging perspectives on service marketing. *In: American Marketing Association*. 1983 Chicago, IL: American. 25-28.
- BERRYMAN, J. M. 2006. What defines 'enough' information? How policy workers make judgements and decisions during information seeking: preliminary. *results from an exploratory study Information Research*, 11.
- BORLUND, P. I., P. 1997. The development of a method for the evaluation of interactive information retrieval systems. *Documentation*, 53, 225–250.
- BRUCE, H. 1999. Perceptions of the Internet: what people think when they search the Internet for information. *Internet Research: Electronic Networking Applications and Policy*, 9, 187-199.
- BRUCE, H. I. R. E. N. A. A. & POLICY, 187-199 1999. Perceptions of the Internet: what people think when they search the Internet for information. *Electronic Networking Applications and Policy*, 9, 187-199.
- BYSTRÖM, K., HANSEN, P. 2005. Conceptual framework for tasks in information studies. *Journal of the American Society for Information Science and Technology*, 56, 1050-1061.

- CHOWDHURY, S., LANDONI, M. 2006. News aggregator services: User expectations and experience. *Online Information Review*, 30, 100-115.
- COOPER, D. R., SCHINDLER, P.S. Year. Business research method. *In: McGraw-Hill*, 2001 Singapore.
- CRABTREE, B., SOLTYSIAK 1998. Identifying and Tracking Changing Interests. *International Journal on Digital Libraries*, 2, 38-53.
- DETLOR, B. Year. Internet-based information systems use in organizations: an information studies perspective. *In: Michael G. DeGroot School of Business*, 2003 McMaster University, Hamilton, Ontario, Canada., 113–132.
- DOYLE, J. K., RADZICKI, MJ., ROSE, A. SCOTT TREES, W. 1997. Using cognitive styles typology to explain individual differences in dynamic decision making: much ado about nothing *Center for Quality of Management Journal*, 6, 5-51.
- ELLIS, D. 1989. A behavioural approach to information retrieval design. *Journal of Documentation*, 45, 171-212.
- ELLIS, D. H., M. 1997. Modelling the information-seeking patterns of engineers and research scientists in an industrial environment. *Documentation*, 53, 384-403.
- ENTWISTLE, N. J. Year. Styles of learning and reaching. London. *In*, 1981 london.
- EYSENCK, H. J., ARNOLD, W. MEILI, R. 1972. Encyclopaedia of psychology. *London: Search Press*.
- FELDMAN, M. J. 1993. Factors associated with one year retention in a community college. *Research in Higher Education*, 34, 503-512.
- FORD, N. 1999. IR and creativity: Towards support for the original thinker. *Journal of Documentation*, 55, 528-542.
- FORD, N., WOOD, F., & WALSH, C. 1994. Cognitive styles and searching. 18, 79-86.
- FORD, N. M., D. 1996. Gender differences in Internet perceptions and use. *Aslib Proceedings*, 48, 183-192.
- GODFREY, K. 1985. Simple linear regression. 1629-1636.
- GOLEMATI, M., KATIFORI, A., VASSILAKIS, C., LEPOURAS,G., HALATSIS, C. Year. Creating an Ontology for the User Profile: Method and Applications *In: Proceedings of the First IEEE International Conference on Research Challenges in Information Science (RCIS)*. 2007 Morocco.

- GRUBER, T. R. 1993. Toward Principles for the design of Ontologies used for Knowledge Sharing. *International journal of Human-Computer Studies*, 43, 907-928.
- HILL, J. R. H., M. J. 1997. Cognitive strategies and learning from the World Wide Web. 45, 37-64.
- INGWERSEN, P. 1996. Cognitive perspectives of information retrieval interaction elements of a cognitive IR theory. *Journal of Documentation*, 52, 3-5-.
- J. TEEVAN, S. T. D., AND E. HORVITZ. Year. Personalizing Search via Automated Analysis of Interests and Activities. *In: SIGIR 2005*, ACM Press, 2005.
- JENKINS, C., CORRITORE, C. L., WIEDENBECK 2003. Patterns of information seeking on the Web: a qualitative study of domain expertise and Web expertise. *Information Technology and Society*, 1, 46-89.
- KARAMUFTUOGLU, M. 1998. Collaborative information retrieval: toward a social informatics view of IR interaction. *Journal of the American Society for Information Science*, 49, 1070-1080.
- KATZER, J. F., P.T. 1992. The information environment of managers. *In: Annual Review of Information Science and Technology*. 227–263.
- KAUWELL, D. A., LEVIN, J., LEE, Y. J. , YU, J. H. . Year. Knowledge construction with visual representations of distributed information [online]. *In: World Wide Web Conference (WWW9)*, The Web: the next generation, May 15-19 2000 2000 Amsterdam.
- KAZUNARI SUGIYAMA , K. H., MASATOSHI YOSHIKAWA. Year. Adaptive Web Search Based on User Profile Constructed without Any Effort from Users. *In: Proceedings of the 13th international conference on World Wide Web*, 2004 New York, NY, USA. 675 - 684.
- KELLY, D., TEEVAN, J. 2003. Implicit feedback for inferring user preference: a bibliography. *ACM SIGIR Forum*, 37.
- KELLY, G. A. 1993. A theory of personality: the psychology of personal constructs. *New York: Norton*.
- KIM, H., CHAN, P. Year. Learning implicit user interest hierarchy for context in personalization. *In: Miami, Florida, January 12-15 2003*. 101-108.
- KIM, K.-S. A., B. 2002a. Cognitive and task influences on Web searching behavior. *Journal of American*

- Society for Information Science and Technology*, 53, 109-119.
- KIM, K. S. Year. Individual differences and information retrieval: implications on Web design. *In: Proceedings of the 6th Conference on Content-Based Multimedia Information Access RIAO 2000 paris, France.* 885-893.
- KIM, K. S. A., B. 2002b. Cognitive and task influences on Web searching behavior. *American Society for Information Science and Technology*, 53.
- KOBSA, A. 1993. User Modelling: Recent work, prospects and hazards, *Adaptive User Interfaces. eds.*
- KUHLTHAU, C. C. 1991. Inside the search process: information seeking from the user's perspective. *Journal of the American Society for Information Science*, 42, 361-371
- KUHLTHAU, C. C. 1993. A principle of uncertainty for information seeking. *Journal of Documentation* 49, 339-355.
- KUHLTHAU, C. C. 1994. Seeking meaning: a process approach to library and information services. *Norwood, NJ: Ablex Publishing.*
- KULES, B. 2000. User Modeling for Adaptive and Adaptable Software Systems.
- LAZONDER, A. W., BIEMANS, J. A. AND WOPEREIS, I. G. 2000. Differences between novice and experienced users in searching information on the World Wide Web. *American Society for Information Science*, 51, 576-581.
- LIN, X. 1997. Map displays for information retrieval *Journal of the American Society for Information Science*, 48, 40-54.
- LIVONEN, M., WHITE, M. D. 2001. The choice of initial Web strategies: a comparison between Finnish and American searchers. *Journal of Documentation*, 57.
- MARCHIONINI, G. M. Year. Information seeking in electronic environments. *In: Cambridge University Press, 1995 Cambridge.*
- MILES, J. A. M. S. 2001. *Applying Regression and Correlation*, London.
- NAHL, D. 1998. Learning the Internet and the structure of information behaviour. *Journal of the American Society for Information Science*, 49, 1017-1023.

- NIGEL FORD, T. D. W., ALLEN FOSTER, DAVID ELLIS\* 2002. Information Seeking and Mediated Searching Part 4. Cognitive Styles in Information Seeking. 728–735, 53.
- PALMQUIST, R. A., KIM, K. S. 2000. Cognitive style and online database search experience as predictor of Web search performance. *Journal of the American Society for Information Science* 51, 558-566.
- PAPAZOGLU 2001. Agent-oriented technology in support of e-business. *Communications of the ACM*, 44, 71-77.
- POLLOCK, A., HOCKLEY, A. . 1997. *What's wrong with Internet Searching*. *D-Lib Magazine*. [online] [Online]. Available: <http://www.dlib.org/dlib/march97/bt/03pollock.html> [Accessed].
- RIDING, R. J. 1991. Cognitive styles analysis. *Birmingham: Learning and Training Technology*.
- ROSS, L. A. N., R. E 1991. The person and the situation: perspectives of social psychology. *New York, NY: McGraw-Hill*.
- SARACEVIC, T. 1996. Modeling interaction in information retrieval (IR): a review and proposal. *American society to information science*, 3-9.
- SEKARAN, U. 2009. *Research Methods for Business-A Skill-Building Approach*.
- SHAVLIK, J., CALCARI, S., ELIASSI-RAD, T., SOLOCK, J. Year. Adaptive Interface for Discovering and Monitoring Information on the World Wide Web. *In: Redondo Beach, California, january 5-8 1999 california*. 157-160.
- SINGH, A., AND NAKATA, K. 2005. Year. Hierarchical classification of web search results using personalized ontologies. *In: 3rd International Conference on Universal Access in Human-Computer Interaction, 2005*.
- SPINK, A., BATEMAN, J. AND JANSEN, B. J. 1999. Searching the Web: a survey of EXCITE users. *Internet Research. Electronic Networking Applications and Policy*, 9, 117-128.
- STADNYK, I., KASS, R. 1992. Modeling User's Interests in Information Filters. *Communications of the ACM*, 35, 49-50.
- SUSAN GAUCH1, M. S., ARAVIND CHANDRAMOULI1 AND ALESSANDRO MICARELLI2 2002. User Profiles for Personalized Information Access.
- TABACHNICK, B. G., & FIDELL, L. S. 2001. *Using Multivariate Statistics*. *Needham Heights*.

- TAYLOR, R. S. 1986. Value-Added Processes in Information Systems. *American society to information science*.
- TEITELBAUM-KRONISH, P. 1985. Relationship of selected cognitive aptitudes and personality characteristics of the online searcher to the quality of performance in online bibliographic retrieval. *Dissertation Abstracts International*, 46.
- WHITMIRE, E. 2003. Epistemological beliefs and the information-seeking behavior of undergraduates. *Library & Information Science Research*, 25, 127-142.
- WIDYANTORO, D. H., IOERGER, T.R., YEN 2001. Learning User Interest Dynamics with Three- Descriptor Representation. *Journal of the American Society of Information Science and Technology*, 52, 212-225.
- WILSON, T. D. 1981. On user studies and information needs. *Journal of Documentation*, 37, 13-15.
- WILSON, T. D. 1999. MODELS IN INFORMATION BEHAVIOUR RESEARCH. *Journal of Documentation*, 55.
- WILSON, T. D., ELLIS, D. FORD, N., FOSTER, A. . 2000. *Uncertainty in information seeking: A research project in the Department of Information Studies* [Online]. Available: <http://informationr.net/tdw/publ/unis/uncerty.html> [Accessed].