An Investigation into the Correlation between Willingness for Web Search Personalization and SNS Usage Patterns

Arjumand Younus[12], Colm O'Riordan[1], and Gabriella Pasi[2]

[1] Computational Intelligence Research Group, Information Technology,
National University of Ireland, Galway, Ireland
{arjumand.younus, colm.oriordan}@nuigalway.ie
[2] Information Retrieval Lab, Informatics, Systems and Communication,
University of Milan Bicocca, Milan, Italy
{arjumand.younus, pasi}@disco.unimib.it

Abstract. This paper presents a user survey-based analysis of the correlation between the users' willingness to personalize Web search and their social network usage patterns. The participants' responses to the survey questions enabled us to use a regression model for identifying the relationship between SNS variables and willingness to personalize Web search; the obtained results show that there is a strong relationship between willingness for personalized Web search and social network usage patterns. Finally, based on the findings of our survey we present some implications and directions for future work.

1 Introduction

For over a decade Web search personalization has been viewed as an effective solution for user-tailored information-seeking and its effectiveness depends on the quality of user-related information, which is generally implicitly gathered. The implicit collection of user information however often raises serious privacy concerns, and it represents one of the major barriers in deploying personalized search applications [6, 8]. The relationship between users' usage patterns of social networking services (SNS) and their willingness for Web search personalization is a promising direction that can help significantly towards the deployment of personalized search applications. Search engines could in this way select the category of users who could be targeted for personalized search applications.

To the aim of finding a characterisation of users who would prefer personalized search results more than non-personalized search results we conducted a user survey. We designed the user survey so that we can investigate the social network usage patterns of users along with their preferences to opt for personalized Web search. The collected data were then used in a regression model to analyse the correlation between SNS variables and willingness to personalize Web search. In doing this analysis we discovered a number of useful patterns and behaviours about users' openness to Web search personalization; these outcomes

can be of help in the future developments of personalized Web search and social search systems.

2 Related Work

For over a decade Web search personalization has been viewed as an effective solution for user-tailored information-seeking. A huge amount of research proposes the use of implicitly-gathered user information such as browser history, query and clickthrough history and desktop history to improve search results ranking on a per-user basis [4, 9, 11]. The collection of such implicit user information often raises serious privacy concerns which is one of the major barriers in deploying personalized search applications [6, 8]. The relationship between users' social network usage patterns and their willingness for Web search personalization is a promising direction that can help significantly towards the deployment of personalized search applications. The decision to investigate the correlation between social network usage patterns and willingness for Web search personalization was taken on account of many studies that have shown people to spend a considerable amount of time on social networks [3]. This high amount of social network usage by users in turn has also affected their information-seeking habits and specifically, the way they interact with search engines [7]. Hence, we argue in this contribution that it is necessary to revisit the notion of Web search personalization from this perspective.

The literature closest to our identified research questions addresses the use of social information in Web search [2, 5]. However, these efforts do not aim towards using social network activities for inferring users' willingness towards Web search personalization. Research by Morris et al. pursues a comparison of information-seeking using search engines and social networks and proposes the design of future search systems that can help direct users to social resources in some circumstances [7]. We propose a somewhat similar notion through an analysis of the correlation between user's willingness for Web search personalization and his/her social network usage patterns.

3 Survey Methodology

In order to understand how SNS usage patterns affect people's willingness to personalize Web search results, we designed a survey and dispatched it to a wide range of people in various countries (i.e. Ireland, Italy, Spain, France, United Kingdom, Finland, United States, Canada, Pakistan, India, South Korea). The survey comprised 16 close-ended questions with five questions of a general nature (collecting demographic information about the participants), four questions related to various aspects of Web search personalization[3] and ten questions related

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[3] Respondents were asked through a binary variable a "Yes" or "No" response whether or not they considered personalized search results to be of any benefit to them. 49.5% of the respondents considered personalized Web search as useful while 50.5% considered it as not useful.

to SNS usage[4]. The survey was completed by 380 people with 61.8% males and 38.2% females. Statistics about the use of various SNS tools are shown in Table 1 and Table 2. Participants were recruited via university distribution lists (both online and offline) and social networking sites (chiefly, Facebook and Twitter) and we recruited a diverse range of people; distribution lists were employed to avoid recruiting only those participants who have a social network presence and thereby avoiding high skew in the results.

4 Survey Results

Table 3 shows the results of logistic regressions with the binary outcome in the dependent variable reflecting user's trust in search personalization as a beneficial process (shown as *WP i.e., Willingness of Personalization* in Table 3)

SNS Tool Details	N (%)
Facebook Presence	356 (93.7%)
Twitter Presence	241 (63.4%)
Google+ Presence	239 (62.9%)
LinkedIn Presence	272 (71.6%)
Bookmarking Sites Presence	60 (15.8%)

Table 1: Statistics for SNS Accounts of Survey Respondents

SNS Usage Details	N (%)
Facebook As Most Used	325 (85.5%)
Twitter As Most Used	106 (27.9%)
Google+ As Most Used	30 (7.9%)
LinkedIn As Most Used	17 (4.5%)

Table 2: Statistics for Highly Used SNS Accounts by Survey Respondents

The results from Table 3 show that males are more likely to consider Web search personalization as beneficial. Furthermore, the presence of a user on Twitter and/or Google+ is a strong indicator that he/she will consider Web search personalization as beneficial and similar is the case for his/her high usage of Twitter and/or Google+ (row 7-8 corresponding to *WP* and row 12-13 corresponding to *WP*); the increase is more significant for user presence on Google+ and for high usage of Google+. Additionally, as expected an increase in posting frequency on Facebook increases the odds of willingness to personalize Web search and contrary to expectation, an increase in the number of users' friends on Facebook decreases the odds of willingness to personalize Web search (row 16 and row 18 corresponding to *WP*). Lastly, users who use SNS more frequently for Q & A activities are more likely to be willing to opt for Web search personalization in addition to users who frequently consider that responses coming from SNS as more reliable than responses from search engines (row 23-26 corresponding to *WP*).

5 Discussion

We will now discuss the theoretical and practical implications of our study. The correlations (and their results) investigated here may seem intuitively obvious

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[4] These were related to various SNS tools (more specifically Facebook, Twitter, LinkedIn etc.) as well as at the characteristics of SNS usage (such as frequency of SNS usage, frequency of posting SNS updates, number of friends on SNS, frequency of asking questions on SNS) that relate more closely to users' willingness for Web search personalization.

	WP
Male	1.635**
American	0.001
Asian	0.001
European	0.001
Age	1.069
Facebook Presence	0.982
Twitter Presence	1.544*
Google+ Presence	1.816***
LinkedIn Presence	0.940
Bookmarking Sites Presence	1.289
High Usage of Facebook	1.599
High Usage of Twitter	1.166*
High Usage of Google+	3.042***
High Usage of LinkedIn	1.193
Facebook Usage Frequency	0.898
Facebook Posting Frequency	1.637***
Facebook Liking Frequency	0.920
No. of Facebook Friends	0.873*
Twitter Mentions	1.000
Twitter Retweets	1.001
No. of Topics in Tweets	0.997
No. of Tweets	0.999
Prefers Q & A Activity on SNS	1.821***
Considers Q & A Activity on SNS as Useful	1.771***
Frequency of Q & A Activity on SNS	1.366**
Frequency of Considering Responses from SNS More Useful than Search Engines	1.374***

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

Table 3: Logit regression showing the odds of users' willingness towards Web search personalization

in terms of high engagement in social networks signifying a higher degree of readiness to accept the (at least partial) loss of privacy that is inevitably involved in search personalization. However, recent research indicates that this is not the case as users of SNS have shown growing privacy concerns [10]. Boyd and Hargittai [1] found that the majority of young adult users of Facebook have engaged with managing their privacy settings on the site at least to some extent and noted a rise in such privacy settings' engagement between 2009 and 2010, a year in which Facebook unveiled many controversial privacy changes that made more of information on the site public. In fact even as our data shows the percentage of survey respondents who do not consider Web search personalization as beneficial is higher than expected.

5.1 Implications

Users' privacy concerns have proven to be a significant challenge with respect to Web search personalization, and the issue of when to personalize and when not personalize assumes a relevant role, which has not been deeply investigated yet. We argue through the investigations in this paper that social network usage patterns of users can serve as a significant predictor for determination of when to personalize and when not to personalize. Understanding the target audience of personalized search systems is an important aspect for the development of

meaningful and well-accepted systems, and hence, this work serves as a first step in that dimension. This could aid towards removing the need for the user to state privacy requirements and to infer these settings through social network usage patterns.

6   Conclusion

In this paper, we utilized a survey methodology to investigate the correlations between users' social network usage patterns and their openness to opt for Web search personalization. We believe that the findings of our study may have significant implications for the design of future personalized search and social search applications. Proper exploitation of SNS data can lead to advancements in personalized Web search systems by providing a more acceptable method for derivation of user interests.

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