

Statistical Analysis and Implications of SNS Search in Under-Developed Countries

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ABSTRACT

Using Social Network Sites (SNS) as an information source has drawn the attention of the researchers for a while now. There have been many works that analyzed the types and topics of questions people ask in these networks and why. Topics like what motivate people to answer such queries, how to integrate the traditional search engines and SNS together are also well investigated. In this paper, we focus on a relevant but novel issue - how SNS search varies in developed and developing regions of the world and why. Analyzing 880 status messages collected from a widely used SNS, we have observed that, unavailability and inadequacy of information on web in developing countries play a significant role to motivate users using SNS for information retrieval. With established statistics of Internet usage, e-Governance, and our experimental data analysis, we have tried to emphasize the differences between social search and traditional web-search and provided insight that one might require to consider while developing any application for SNS based searching.

Author Keywords

Social network sites, search engine, query, developing countries.

ACM Classification Keywords

H.3.3. Information Search and Retrieval

INTRODUCTION

Being able to think and ask questions has been an integral part of the human race for supremacy, and for a long part of our history, helping one another in this quest was the only way. Then we learnt to preserve, convey, and spread our knowledge through written and printed medium. The digital revolution over the past three decades has provided us with new power to store and maintain large collection of data in a tiny amount of space. Especially the inception of search engines (SE) has enabled us to look into tremendous amount of information within seconds, a feat that our ancestors could hardly imagine about. These achievements lead many of us to believe that we are at the pinnacle of information search and retrieval, but

that is hardly the truth. As the past decade has seen the emergence of Social Networking Sites (SNS), many researchers are now wondering if history is repeating itself to bring us back to human intervention in information retrieval. We are somewhat back to the state when *everyone knows something* and when connected, *together knows everything*.

In this paper, we will use Facebook as an example SNS, without losing any generality. With one billion monthly active users and more than half a billion daily active users [7], currently (as of 30th June, 2013) it is the number two site in the world considering Internet traffic, according to Alexa ranking [1]. On an average, the users spend 10.5 billion minutes per day on it, make 421 million status message posts, 3.2 billion likes and comments, and have 140.3 friends in their Facebook network [2]. In this triumph of SNS, we are more connected with people around the world than ever before. Nowadays, it is no longer a source of entertainment and social connectivity only, it has paved a new way for information searching [11]. Apart from using the search engines that can merely use the already available information in the public sites crawled in its memory and some algorithm to search and index the results without much personalization, we can simply ask the members of our social network and get personalized and useful information that the researchers found quick, useful, and in many cases, more robust.

In this paper, we emphasize this phenomenon with special focus to developing regions of the world and see how SNS search has made significant changes in way people access information here. We discuss about seminal works in this area in the next section. The problem of ‘digital divide’ is explained then along with the concept of less biased SNS world. Our experimental data along with methodology, interviews, analysis, and findings are explained under the heading of ‘Experimental Data’. Finally we conclude after discussing and analyzing the implications of our survey data.

RELATED WORKS

Lampe *et. al.* [11] analyzed how the use of Facebook has changed over time, using three consecutive years of survey data and thorough interviews with a few of the survey people. They reported that though the uses of the site remain relatively constant over time, but the perceived audience for user profiles and attitudes about the site showed differences over the study period. They find that patterns of use, perception, and attitude somewhat changed over the time. Their study, consistent with others, found that the number of friends and time spent on Facebook increased at first and then leveled off, which from interviews, suggested that new users spend time

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adding people as friends and getting used to the site. After a while, this behavior lessens as time is spent more seeing what is happening to friends instead of expanding their friend-base. Also, new users are more likely to use Facebook to “find people to date” or “meet new people” than long-term users.

One of the important studies in SNS based information search is done by Efron *et. al.* [6], who identified that micro-blogging services like *www.twitter.com* are gradually becoming a popular venue for informal information interaction. They showed that question asking in micro-blogs is strongly tied to peoples’ naturalistic interactions, which helped them to offer a taxonomy of questions in micro-blogs. They also showed that the act of asking questions in Twitter is not analogous to information seeking in more traditional information retrieval environments, which contextualize these articulations through analysis of a large body of tweets.

Teevan *et. al.* [19] discussed the types of information people used twitter to find, for example, breaking news, real-time content, popular trends, etc. This paper presented the systematic overview of search behavior on Twitter and differences with web search using questionnaire data along with analysis on query logs. They found that Twitter results included more social content and events, while web results contained more facts and navigation. Based on their study, they recommended that search engines could use trending Twitter queries to discover additional queries that have strong temporal components.

Lampe *et. al.* investigated the Facebook user characteristics based on a survey of 614 people who used it to ask something [12]. They identified the perception of the relationships within network members as significant predictors of information seeking approach. They did not show any comparison between SNS and SE regarding obtaining any particular type of information. This question is addressed by Morris *et. al.* [13], where they explored the pros and cons of using SNS as information source and compared user interaction when they search anything either on SNS or SE, involving 12 participants on their study. They find that 53% of the users received quick responses from SNS and 83% received responses eventually as well.

The effects of community size and contact rate was studied for synchronous social Q&A involving 402 Microsoft employees by White *et. al.* [20]. The study analyzed the effects of these variables in terms of objective and subjective measures, and from the standpoint of askers, answers, and all members’ general perceptions of utility. Every metric showed improvement with increased community size, including increased fraction of questions answered, asking effectiveness, answer quality, and answer ratings, along with a corresponding decrease in the time to receive an answer, number of users who were bothered by incoming questions, and fraction of the community that was interrupted.

The type of questions and answers in SNS are investigated by Morris *et. al.* [14] using a study of 624 people about their Facebook usage experience. They also explored the relationships between answer speed and quality, properties of partici-

pants (age, gender, and social network usage habits) and their questions (type, topic, and phrasing). Their study complies with the findings of many other researchers that while traditional SE is good for objective queries, SNS shows better results and interactions for subjective queries. There are many motivations for asking questions in SNS - among them the most important reason was the believe that people in our social network knows our *context* better, therefore may provide more relevant answers. Often people turn to SNS regarding objective questions if knowing the answer is not urgent, in the hope that some other friend in his network already knows the answer and will share his knowledge with him in due time.

Panovich *et. al.* [16] evaluated the role of *tie strength* in question-response behavior as an indication of how close the relationship is – close friends are strong ties, while acquaintances are weak ties. In their study, they asked 19 participants to ask some technological recommendation questions through status messages. After the participants rated the received answers’ quality, they compared that with a tie strength metric, and found that stronger tie provides better answers than weaker ties, in general. Also, they find that friends who have expertise in the question topic provide more trustworthy answer irrespective of strong or weak ties.

Farnham *et. al.* [8] studied the suitability of *So.cl*: a web application that combines web browsing, search, and social networking, designed for the purposes of sharing and learning around topics of interest by taking feedback from 32 college students. Their findings present the importance of social media for inspiring learning around new topics through social connections. They found the easy, lightweight integration of sharing around search in *So.cl* effectively fostered serendipitous and informal learning online.

Naaman *et. al.* [15] examined 350 users’ messages and some system data to understand the individual’s activity using their own developed content-based categorization. Their analysis showed two common types of user behavior in terms of the content of the posted messages, and exposed differences between users in respect to these activities. But they did not address the relationship between social network structure and social influence to the type of content posted by users.

A controlled study conducted on 282 persons by Teevan *et. al.* [18] analyzed effect of the factors: punctuation in status messages, scoping of audience, and precision on the response time, quantity and quantity of response. Their key findings are that a higher portion of questions with a question mark received responses (88.1% vs. 76.3%, $p < .01$) and two-sentence questions received fewer and slower responses. They also noted that explicitly scoped questions resulted in better response.

Hecht *et. al.* tried to combine the benefits of SE and SNS searching in their system named *SearchBuddies* [9], a system that responds to Facebook status message questions with algorithmic search results. They proposed two agents - Investigator (search on SE), that connects people with information, and Social Butterfly (Search on SNS), that connects people with other people who may have the desired information. Af-

ter deploying their ‘Socially Embedded Search Engine’ on 122 users for three months, they believed that it provides highly relevant information in a social context. Horowitz *et al.* [10] presented *Aardvark*, a social search engine by which users can ask through email, message, voice, etc. Then *Aardvark* forwards that question to find the answer from someone expert and within asker’s network, depending on the intimacy between them.

None of these researches investigate the difference in question-answer behavior in different parts of the world. Yang *et al.* [21] addressed this issue and identified some key differences between SNS search in the Western and Eastern cultural hemisphere. Their survey included people from US and UK representing the Western culture and people from China and India representing the Eastern culture. They concluded that people in the Eastern culture are somewhat more likely to use SNS for getting objective information than their counterpart and use it more often for the purpose. They explained this phenomenon using existing and established knowledge from sociology study that Western cultures are associated with an analytic and low-context cognitive pattern, along with individualism, while Asian cultures are associated with a holistic, high-context cognitive pattern, along with interdependence and collectivist social orientation. Our initial findings match with them, except they did not include another possible explanation of this behavior - the existing web infrastructure deficit in the developing and undeveloped countries, commonly known as the *Digital Divide*. In our work, we will elaborate on this explanation.

THE DIVIDED WORLD

The term ‘Digital Divide’ indicates the difference in technological advancement between the developed and underdeveloped/undeveloped parts of the world. Computers and other computing devices are essential commodities for the people in the developed region for the past two/three decades and their web presence is ubiquitous nowadays. Recent explosion in the smart-phone usage has enabled virtually everyone to remain connected to Internet round the clock. Nearly all the governmental and business services have their information published and updated in the web. Traditional search engines in that respect are very effective in capturing the required information as it is already there in the Internet.

The scenario is quite opposite in the other parts of the world where the web culture has not flourished yet. If we focus on the South-East Asia region as an example of the developing part of the world, we can see from UN survey 2010 [5] that the average e-Governance ranking of the 8 countries in this region is 134, way beyond the developed regions. According to [4], about 8–10 percent people in this region have access to Internet. Even that is after the growth of Internet users in recent years, and the overall web presence is not good yet. Many important governmental and non-governmental institutions do not have their information in the web and often do not update their information regularly, if there is any.

The problem is twofold. First, people in this developing region cannot find the required information from the web using traditional search engines as it is beyond its capacity to show

any result that is not already in the web. Second, as the Internet culture has not flourished yet, many people are not used to search information in the web, or do not know how to find the right information if there is a lot of different search results. Though the Governments in these countries are trying to eradicate this digital divide, it is proved as not that easy. The world remains *divided* and probably will remain so for a long time from now.

THE UNIFIED SNS WORLD

In this section we will investigate the interaction of people from these undeveloped countries in the Internet. We consider ‘Bangladesh’ as representative country from the South East-Asia to provide some data on this. Bangladesh is ranked 3rd among the 8 countries of this region in the e-Government ranking. Despite the efforts of the Government to provide e-services to its citizens, the web presence of different Government and non-Government institutions is quite low. Internet access is available to only 5 percent of her citizens and many of those who have access to Internet use it seldom. But if we consider the SNS presence of the people in Bangladesh, they are not far behind [3, 4].

There has been dispute regarding the total number of Internet users in Bangladesh. But despite the dissimilarity about the total number of Internet users from different online sources, it is noticeable that the ratio of the total number of Facebook users to Internet users from all the sources are close and roughly 43% of the Internet users in Bangladesh use Facebook. If we compare this ratio with other countries in the world (Table 1), we can see that the ratio is good enough. A significant part of her Internet users are SNS user too.

This connectivity among the users has paved a new way for information gathering and sharing for the people of developing countries like Bangladesh. SE cannot give them the data that is not there in the web, but through SNS, their query can reach hundreds of the people of their acquaintance, and as Yang *et al.* [21] has already mentioned, they are traditionally encouraged to share their query with others. Through SNS, we can obtain information that others already know, and clarify information that we can find in the vast amount of data in the web. This is a unique opportunity for the people in these regions, which was never there before. Though it is not the end of ‘digital divide’ mentioned earlier, but we are getting a bit closer to unify the world in terms of information searching and retrieval capacity.

EXPERIMENTAL DATA

Our data collection process had three phases. In the first part, we made a proposal for volunteers through our research group, from which we selected 10 enthusiastic participants from two universities. All our participants had more than 150 friends in their Facebook profile (average 270) and uses Facebook regularly in their day-to-day life. They were instructed about the data collecting process. They monitored the data stream in their Facebook home pages *passively* for questions asked through status posts and recorded those status posts with responses at three phases - after about one hour, after about 5 hours, and after a couple of days of making that

Table 2. Question types and response analysis

Question Type	Average First Response	Average Total Response	Appropriate Answer	Time Required to Search through SE
Recommendation	8.5 min.	6.2	Seemed somewhat appropriate	About 30 minutes searching to obtain reasonable information
Opinion	4.7 min.	9.5	No defined answer	No defined answer
Factual Knowledge	7 min.	6.9	Accurate in the 91.3 percent cases, the rest are unanswered	No information for 56.5 percent queries, about 5 min. for others.
Rhetorical	5 min.	12	Not applicable	Not applicable
Invitation	4.2 min.	15.5	Each got min. 1 positive reply	Not applicable
Favor	5.1 min.	7.1	Each got min. 1 positive reply	Not applicable
Social Connection	5 min.	15	Yes	SE were not suitable
Offer	4.3 min.	8.2	Yes	Not applicable

Table 1. Internet and Facebook usage analysis (All figures are in millions or percentage)

Country	Population	Internet User	%	Facebook User	% of Internet User
Australia	22.8	17.9	78.3	11.7	65.7
USA	314.8	243.8	77.4	168.6	69.2
UK	62.3	51.2	82.2	33.8	66.0
Nepal	26.6	2.7	10.3	1.9	69.2
India	1210.2	125.0	10.3	60.6	48.5
Pakistan	181.3	15.9	8.8	7.6	47.7
Srilanka	20.3	3.2	15.6	1.5	46.2
Bangladesh	152.5	7.5	4.9	3.2	42.6

post. We collected data for about 8 weeks and received 880 of such queries. Then we analyzed those questions according to the categories mentioned by Morris *et. al.* [14]. We tried to search answers for those questions using traditional search engines and compared them with the answers obtained from Facebook. We are still gathering more data, so the explanation provided in this section are not claimed as complete. But it should give some indication, emphasize our logic, and provide future directions for work.

We analyzed each of our 880 data sheets and summarized it into a table, which was then imported to a DBMS. We applied different sql techniques to compute the statistical mean, variance, *z*-score, *p*-value, and chi square tests. We will present these data along with their implications in this section. We compared our results with that obtained by Morris *et. al.* [14]. The survey participant in [14] were all employees at Microsoft, 72.8% full-time and the remaining were university students working as summer interns. Male female ratio was 3:1, 68.1% of their respondents were aged between 18 to 35 years.

In our second phase, we choose 10 participants using our already collected data. Five of them have asked at least one question in the past one month while the rest have responded to at least one query made in Facebook during that period. We tried to investigate the motivation behind using social network as an information source and the inspiration that worked behind answering in it. Our interview data strongly supported

Table 3. Comparison in question types analysis with [14]

Question Type	Percentage in [14]	Percentage in Our Data	<i>z</i> -score
Recommendation	29	7	-0.663
Opinion	22	20	0.914
Factual Knowledge	17	25	1.561
Rhetorical	14	12	-0.042
Invitation	9	3	-1.128
Favor	4	18	0.605
Social Connection	3	13	0.036
Offer	1	2	-1.284

Table 4. Comparison in question topic analysis with [14]

Question Topic	Percentage in [14]	Percentage in Our Data	<i>z</i> -score
Technology	29	24	1.675
Entertainment	17	24	1.624
Home & Family	12	13	0.363
Professional	11	11	0.105
Places	8	5	-0.641
Restaurants	6	0	-1.182
Current events	5	11	0.105
Shopping	5	2	-1.001
Ethics & Philosophy	2	6	-0.383
Miscellaneous	-	4	-0.666

our previous findings and also supported the findings made by Morris *et. al.* [14]. In the third phase, we conducted a structured survey with students of some private and public universities in Bangladesh and analyzed those data.

Table 2 shows some analysis of our obtained data. The data has good similarities with the data obtained by others. Specially, like Yang *et. al.* [21], our data also indicates that people in the eastern culture asks less subjective queries than people in the western countries. However, unlike many other works, our study shown later finds that significant part of the queries is related to finding factual information. When we analyzed the queries of such kind, we could understand the

reason. Though these questions are objective and have definite answers, the users could not find the information in the web, and thus turning to SNS was the only option, aside contacting specific persons for it. As indicated by Morris *et. al.* [13], people often do a Google search before asking anything through SNS, probably this was the case with our queries too. But the ratio of such queries is quite high in this region and considering the fact that web culture here has not expanded that much, it was somewhat expected.

When we analyze and compare our question types with that in [14] in Table 3, we can understand the validity of our claim. The queries asking about factual information comprises of the highest portion in our collected data, also supported by its high z -value (1.561). We can also see that there are significant differences in the ratio at which people seek information regarding recommendation, invitation, favor, and social connection - supporting the arguments presented by Yang *et. al.* [21]. A chi-square test value of 32.8 for $\alpha = 0.05$, which is far above the expected value of 14.067 also supports that our hypothesis is correct.

The question topics shows more similarity when we compare it with [14] indicating that people here face similar sort of queries in their daily life like their western counterparts. From Table 4 we can see that in most categories, our data shows considerable similarity with the data gathered by Morris *et. al.* [14]. This observation is also supported by the chi-square test value of 14.4, which is less than 15.507 (from chi-square table) for $\alpha = 0.05$.

Then we have analyzed our data to identify if the factual queries posted by the people around us can actually be answered by searching in traditional search engines. We found that answers to 79.57 percent of such queries cannot be found through SE where as 69.79 percent of them got satisfactory answer through Facebook. Our analysis shows that 90.43 percent queries got at least one answer and 20.64 percent gets answer which might not be adequate or are unsatisfactory.

There are many queries on different topics that we could not find specific answer in the web. Some examples were like “When is the next performance by Shironamhin/James?” (two popular bands in Bangladesh). In the developed countries, we can expect that the music providers keep record of their future events and update it frequently. But here in Bangladesh, we could not find any specific site maintained by them. But when people asked it in Facebook, they got the information almost instantly (within 5 minutes).

Another of the interesting queries and responses was about the traffic situation in a particular day. A person was on a very tight schedule to attend a workshop in Dhaka, Bangladesh. He was supposed to land in Dhaka Airport at 8 AM, and his speech was scheduled at 10 AM in front of the Governmental dignitaries. So he was asking people in this locality about possible real life traffic scenario during that time, describing the challenge he has to face. This kind of traffic information for Bangladesh is not available through Google map or any other service. But his friends could make valuable comments (Fig. 1), including an effective suggestion to get a front row



Figure 1. Example of question-answer in Facebook.

seat while taking boarding pass so that the queue in front of him in the immigration remains small. During interview, he pointed that this is one of the reason he prefers to ask such questions in Facebook as it may show unorthodox but unexpectedly useful solutions.

Another interesting query we find was about “Does xx University publish any journal?”. Using Internet, we were able to find 3 journals published from that university. But in Facebook, the comments contained information about 6 journals. We contacted the relevant departments to verify that the information from those Facebook comments were accurate indeed. Those journals being local hard-copy only had no online presence, and thus quite hard to find using search engines.

Local information is another kind of information that people seemed to seek through SNS. Queries like “Has there been any accident in xx Road?”, “Do we have class test tomorrow?”, “What movies are now showing in xx cinema hall?”, etc. are such examples. These queries are answered promptly by friends in the SNS, but we could not find answers to them through searching the web.

We also analyzed the response time of queries asked through SNS. We analyzed the queries and responses to record the time required for first response and for obtaining sufficient or satisfactory response. Both of these two data showed similar pattern. More than 40 percent of the queries got some response before 20 minutes and about 70 percent got the first response before 100 minutes had elapsed (Fig. 4). It also shows that queries that had not got the response by 10 hours have



Figure 2. Another example of question-answer in Facebook.

very low chance of getting it later. The analysis data for reasonable response time shows similar pattern too (Fig. 5) with majority of the queries getting expected response by 2 hours.

When we asked our participants about why they have chosen Facebook to ask the questions, all of them agreed to the fact that many of their queries are not satisfied by traditional search engines. While dealing with objective questions, they usually go through Google first. When they cannot find the information there, or are uncertain about the validity of it, they turn to Facebook to get the answer. However, there are some other cases too.

A person made a query about the location of the service centre of a particular mobile operator. He got prompt reply from his friends. That information was available in the web and could be found easily. In fact, his friends have searched it for him and gave him the answer. When we asked him about it, he agreed that this information was not urgent for him, and as he passes a lot of time using Facebook, he just made a post in the hope that someone may know it personally. He did not expect that this information is already available in the web and can be searched for. This shows that there is a gap in understanding the flourish of web technology in this region and often people are not aware what have changed around them in the past decade.

Our face-to-face interview session was focused on two things - why do we ask in Facebook and why do we care to answer those queries. Answer of the first topic could strongly support our primary hypothesis of living in a digitally backward region, while the second one shows significant co-relation with other researchers' findings about motivation in replying.

Strong ties like close friends, work peers, neighbors are more



Figure 3. Another example of question-answer in Facebook (The question was asked in Bangla, written using English alphabets in phonetic form. It asked about the price and availability of micro SIM cutter in a local market.

encouraged to reply to queries in Facebook, supporting the earlier research works. Another important motivation for replying is to make a positive introduction of oneself to the asker. People are often more motivated to answer the queries made by their seniors, or someone with which they want a more positive relation with. And of course people often do it selflessly for a friend, or to show others about his expertise in the relevant topic. It is in the nature of human beings to help others, and that will remain as the driving force behind the success of SNS search.

SURVEY ON SNS Q/A USAGE

We have also conducted a structured survey on students from different private and public universities in Bangladesh to understand the use of SNS in getting information. These people constitute a significant portion of the populace that use social networks and other technological tools. The results show interesting opinions about SNS Q/A behavior. We have conducted both online and offline survey using the same questionnaire in English, which can be found in [17].

We have collected 328 responses in total, all of which are undergraduate level students. 93 percent of our participants are from the age group of 18–24 years. The male-female ratio was not equal, 78 percent being male. This is the common and expected ratio of male and female students in the undergraduate level in Bangladesh. 98 percent of our survey participants were unmarried. We will see if these demographic properties have any impact on their Facebook usage pattern in later parts of this paper.

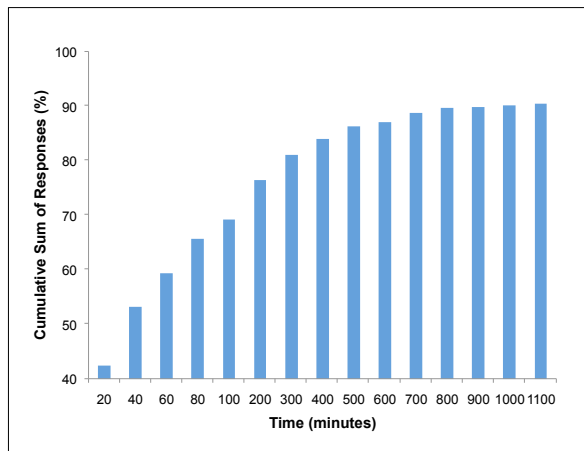


Figure 4. Cumulative first response time vs. time.

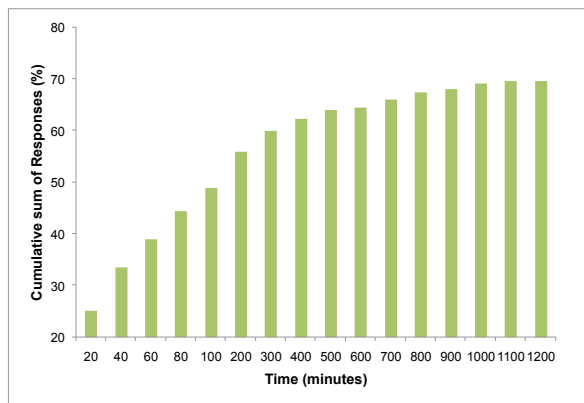


Figure 5. Cumulative reasonable response time vs. time.

Almost all of our participants (99.1%) have their own Facebook account and majority of them are using it for more than two years (Fig. 6). Majority of them have about 201–500 friends in Facebook (Fig. 7). When asked about how frequently they update their Facebook status (Fig. 8), most of them said they hardly update their status (64%) or less than 3 times per week (22%). 73.8 percent of our participants have asked some question or opinion through Facebook, 23.5 percent have never user Facebook for the purpose and 2.7 percent of the participants did not reply to that question.

It appears from Fig. 9 that posting queries through Facebook is not a part of its day to day usage for the participants as majority of them (52%) hardly post any question through Facebook and 25% of them post less than three questions per week. However, the response time for queries posted in Facebook is quite good, as emphasized in Fig. 10 and Fig. 11. This phenomenon is elaborated in more details in later parts of our survey. We can see that more than 50% of the participants expect to get the first response for their query by 10 minutes only. When asked about the amount of time to obtain a satisfactory response, majority of the responses (28%) were that ‘I do not remember’ and about 45% of them get satisfied with the responses obtained within 30 minutes of making their query.

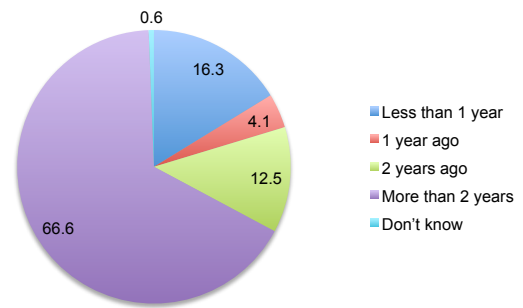


Figure 6. Percentage of Facebook usage period.

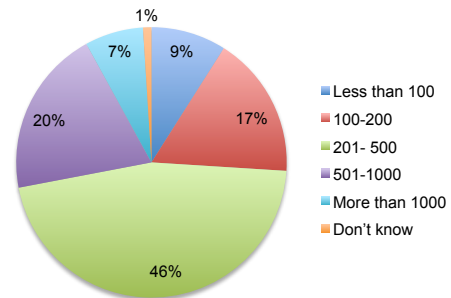


Figure 7. Number of Facebook friends.

We also asked about the topics they post questions about. Three major areas are technology, entertainment, and current events (Fig. 12). They are also the topics where they get quick answers from their friends, as depicted in Fig. 12 too. About 67% of the people provided opinion that they get satisfactory response to their queries from friends most of the times, if not always and 26% people get it ‘sometimes’ (Fig. 14). Again, majority of the participants (55%) rate the answer they get from their friends as *important* (Fig. 13). 52 percent of the participants said that they also have obtained valuable information *many times* from the questions other people posted, whereas 35 percent have said ‘a few times’ for the same.

When asked about the reason behind posting questions in Facebook, the most popular two reasons came out as ‘it gives faster response’ and ‘it is not available in websites’ (Fig. 15). Other popular options were that it is easier than searching and we can get more trustworthy answers from our friends.

Then we tried to compare the results people get from SNS and traditional search engines. Though 30% of the participants agreed that both of them provide similar results, 47% of them are not so sure about it and said that the results might differ and SNS can add some additional information or perspective to the problem at hand. Majority of the people (56%) will choose Google for information searching, but 40% said that they will decide either Facebook or Google depending on the query under consideration. In case they have limited time or bandwidth, 67% will use Google, 27% will decide depending on the query, and only 5% will use Facebook solely. If they do not get satisfactory information from Facebook, most of them (46%) will ask someone personally about it, almost a similar percentage of people will search using traditional

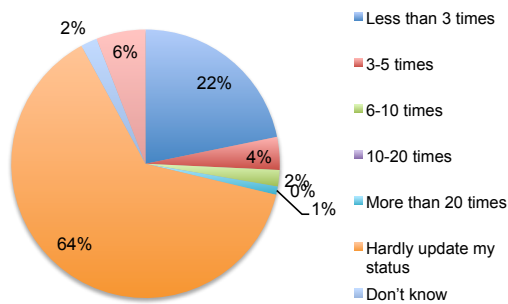


Figure 8. Facebook status update (per week) statistics.

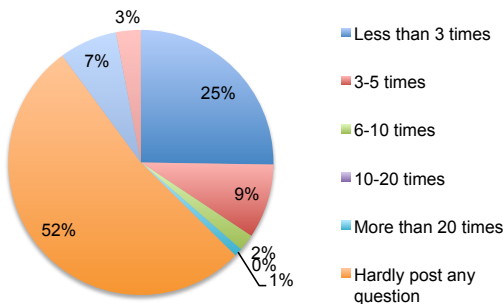


Figure 9. Frequency of posting query in Facebook.

search engines (42%) (Fig. 16).

To understand the advantage of SNS over SE, or vice versa, 27% people think that Google enjoys the advantage that it can crawl a vast amount of data that is far beyond the capacity of human being. But Facebook queries are more tailored to my needs as our friends understands the context of the question (35%) and through Facebook we can get the information that is available not in the web (34%) - both factors strengthening Facebook as an information source.

Most of the people response to a query they see, at least 'sometimes' (Fig. 17), The main motivation is being helpful to others (Fig. 18). To assist others in their friend list, 49% of the people often do a search themselves to provide an answer, while 24% said that they ask another friend personally to know the answer and let the asker know about it.

Then we used chi-square test of independence among different sample groups based on demographics and SNS usage pattern to identify if the question-response behavior depends on any of them. Out of our 91 such analysis, most of them showed independent behavior, for $p < 0.05$. When the test indicates significant dependence, at least one of the samples is different from the other samples. The test does not identify where the differences occur or how many differences actually occur, so we calculated the z -scores of different samples for that query to see the dependencies or anomalies among them.

Our analysis shows that though the gender ratio among the participants are not equal (78/22), their Facebook Q/A patterns, specially the first/reasonable response time are independent of their gender. And though the lifetime of the users' Facebook account has no co-relation with response time and

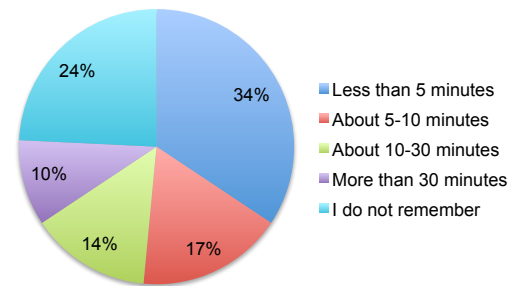


Figure 10. First response time for the queries.

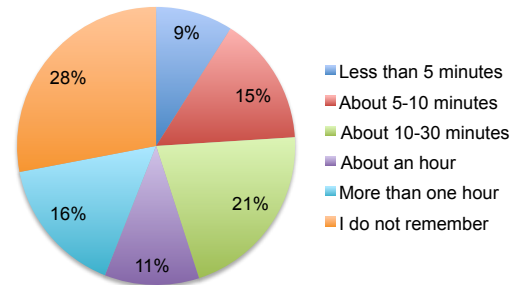


Figure 11. Satisfactory response time for the queries.

number of times they repost their queries, it is positively co-related with the information source they use for asking queries. People who have used Facebook for more than two years have considered to use 'both Facebook and Google, depending on the query' more than others.

The length of Facebook usage or the number of friends has no impact on the topics of their posted questions. However, the more friends they have, the quicker the first response to their queries comes. But interestingly, the reasonable response time is independent of the number of Facebook friends. So, having more friends does not necessarily indicate that one could have quicker effective response. Also, according to our analysis, those who have more friends, prefer to use 'both Facebook and Google' as an information source more than the other sample groups.

The analysis data shows that there is no apparent relation between the frequency of normal status update with first/reasonable response time, preferred source of information search, or question topics. However, frequency of question posting has some dependency with the first response time and question topics - people who posts question frequently gets their first response quicker than others and people who seldom posts queries are more interested in 'current events'. We also found that topic of question has no impact on first/reasonable response time or preferred source of information. Those who responses to others' queries 'most of the times' and 'sometimes' choose 'both Facebook and Google based on the query' as their preferred information source.

DESIGN IMPLICATIONS

Combining the strength of SNS and SE is an ongoing research topic with yet any good usable solution to appear. Designing

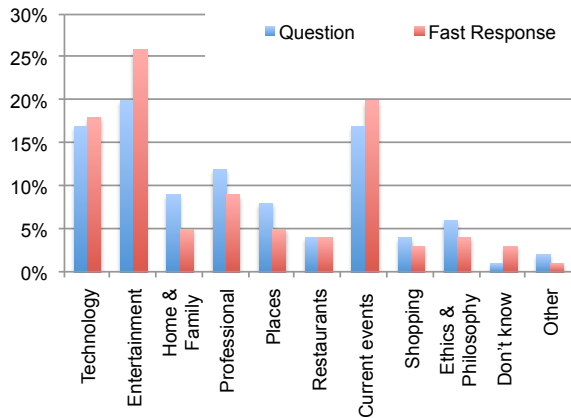


Figure 12. Question topic and response preference.

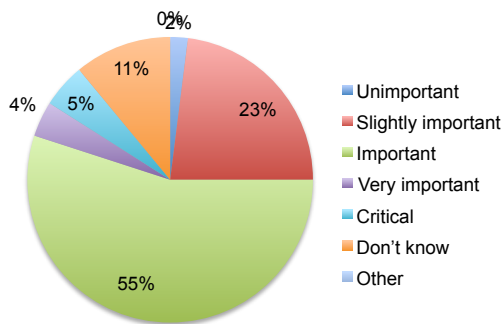


Figure 13. Rating of the responses received.

such a solution has many challenges and requires accurate understandings of the users' demands from these systems along with their responses to them. There has been very few works about cross-cultural studies on this topic, and our research emphasizes the importance of it before developing any successful platform to combine SE and SNS.

First of all, any such system needs to be aware of the cultural differences across the globe; it should not assume that one shoe fits all. Challenges of information validation in the underdeveloped regions will be of great importance due to lack of available information in the web. Depending on the friend base of a person also poses challenges, the issues of strong and weak ties need to be investigated and understood well. And the *Dunbar Number* phenomenon comes into consideration, as our study shows that having higher number of friends does not ensure quicker response. So randomly selecting from the friend list may not work as expected. The complex interpersonal relationship and ties need to be understood for making it a success.

One novel finding of our research is that question topics in different cultures and regions of the world do not vary much, indicating that people all over the world have similar queries in their day-to-day life and search for answers. However, question types vary significantly and anyone designing for SNS search applications may require keeping that in mind.

CONCLUSION

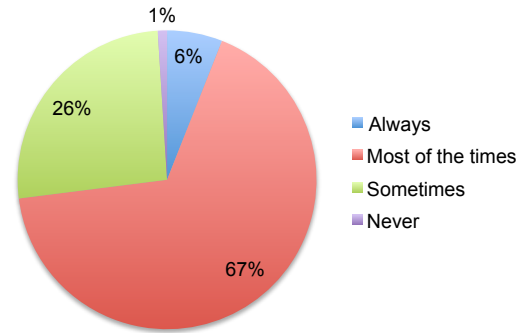


Figure 14. Ratio of satisfactory response.

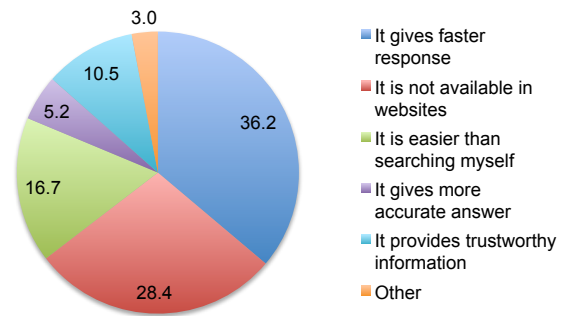


Figure 15. Reason behind using Q/A in Facebook.

In this work, we have focused on differences of the SNS searching habits in different regions of the world based on their economic context. We showed that the motivation for SNS search in developing regions could be quite different than in the developed parts. The lack of information availability has played a major role in peoples' turning to SNS to get answer than from traditional search engines. Whether other factors like culture, religion, etc. play a significant role alongside these factors remain as a major research challenge. We are now working on developing a Facebook app using this information that will assist the users to obtain real life information from Facebook in a better way than now.

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REFERENCES

1. Alexa Ranking of Facebook. <http://www.alexa.com/siteinfo/facebook.com>.
2. Facebook Usage Statistics. <http://www.thesocialskinny.com/100-social-media-statistics-for-2012/>.
3. Facebook User Statistics. <http://www.socialbakers.com/facebook-statistics/page-2/?interval=last-6-months>.
4. Internet User Statistics. <http://data.worldbank.org/indicator/IT.NET.USER/countries>.

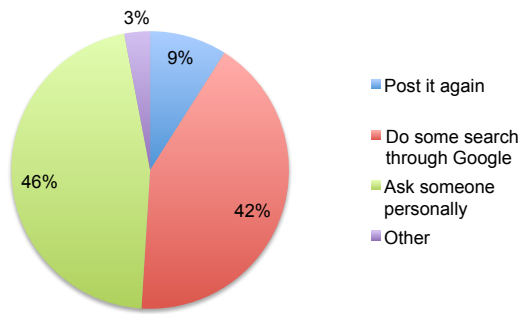


Figure 16. Actions when no satisfactory answer is obtained from SNS.

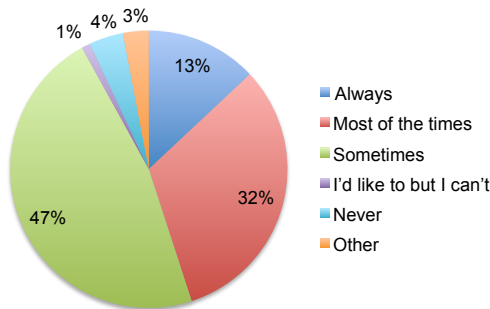


Figure 17. Response to others' queries.

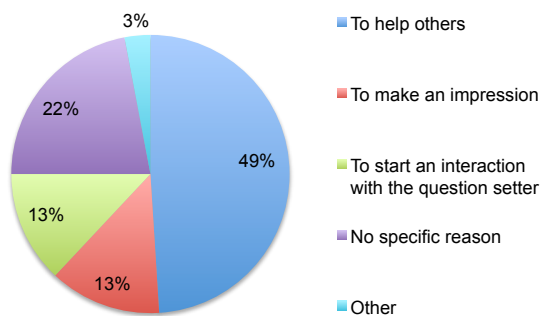


Figure 18. Motivation behind responding to others' queries.

5. United Nations E-Government Survey 2010. http://www2.unpan.org/egovkb/documents/2010/E_Gov_2010_Complete.pdf.
6. Efron, M., and Winget, M. Questions are content: a taxonomy of questions in a microblogging environment. In *Proceedings of the 73rd ASIS&T Annual Meeting on Navigating Streams in an Information Ecosystem - Volume 47*, ASIS&T (2010), 27:1–27:10.
7. Key Facts - Facebook Newsroom. <http://newsroom.fb.com/Key-Facts>.
8. Farnham, S., Lahav, M., Raskino, D., Cheng, L., and Laird-McConnell, T. So.ci: An interest network for informal learning. In *Proceedings of the International AAAI Conference on Weblogs and Social Media*, ICWSM (2012).
9. Hecht, B., Teevan, J., Morris, M. R., and Liebling, D. J. Searchbuddies: Bringing search engines into the conversation. In *Proceedings of the International AAAI Conference on Weblogs and Social Media*, ICWSM (2012).
10. Horowitz, D., and Kamvar, S. D. The anatomy of a large-scale social search engine. In *Proceedings of the 19th international conference on World wide web*, WWW (2010), 431–440.
11. Lampe, C., Ellison, N. B., and Steinfield, C. Changes in use and perception of facebook. In *Proceedings of the ACM conference on Computer supported cooperative work*, CSCW (2008), 721–730.
12. Lampe, C., Vitak, J., Gray, R., and Ellison, N. Perceptions of facebook's value as an information source. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI (2012).
13. Morris, M. R., Teevan, J., and Panovich, K. A comparison of information seeking using search engines and social networks. In *Proceedings of the International AAAI Conference on Weblogs and Social Media*, ICWSM (2010).
14. Morris, M. R., Teevan, J., and Panovich, K. What do people ask their social networks, and why?: a survey study of status message q&a behavior. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI (2010), 1739–1748.
15. Naaman, M., Boase, J., and hui Lai, C. Is it really about me? message content in social awareness streams. In *Proceedings of the ACM conference on Computer Supported Cooperative Work*, CSCW (2010).
16. Panovich, K., Miller, R., and Karger, D. Tie strength in question & answer on social network sites. In *Proceedings of the ACM conference on Computer Supported Cooperative Work*, CSCW (2012), 1057–1066.
17. Survey questionnaire on Q/A behavior in Facebook. <https://docs.google.com/forms/d/1Px8hXj9NEz1SuO9sKaBlmHKnUW9X13gkmHsrzXB4eQg/viewform?pli=1>.
18. Teevan, J., Morris, M. R., and Panovich, K. Factors affecting response quantity, quality, and speed for questions asked via social network status messages. In *Proceedings of the International AAAI Conference on Weblogs and Social Media*, ICWSM (2011).
19. Teevan, J., Ramage, D., and Morris, M. R. #twittersearch: a comparison of microblog search and web search. In *Proceedings of the fourth ACM international conference on Web search and data mining*, WSDM (2011).
20. White, R. W., Richardson, M., and Liu, Y. Effects of community size and contact rate in synchronous social q&a. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI (2011), 2837–2846.
21. Yang, J., Morris, M. R., Teevan, J., Adamic, L. A., and Ackerman, M. S. Culture matters: A survey study of social q&a behavior. In *Proceedings of the International AAAI Conference on Weblogs and Social Media*, ICWSM (2011).