

Search Engine Behavior and Satisfaction of Arab Students from a User Perspective

Annegret M. Gross
German-Jordanian University (GJU)
Amman, Jordan
annegret.gross@ymail.com



ABSTRACT: *With the birth of the internet in the 1990's, society grew used to turn to the internet as first port of information. Search engines play a major role in finding the desired information among the billions of websites available and are one of the most used services online. The effectiveness of search engines has already been evaluated in numerous studies and under many different aspects. However, only few studies touch upon search engine evaluation from a user perspective, and even less studies from a user perspective of speakers of a specific language. This study aims at shedding more light on search engine usage from the perspective of Arab users. A survey made among 70 Arab students in Jordan reveals new aspects of search behavior and user satisfaction. The study assesses the frequency of search engine usage, preferred search engines, and user priorities for search engine selection. It investigates language preferences such as search language and search engine language interface, and user opinion on the quality of English search results versus Arabic search results. User satisfaction with search engine results, contentment with first page search results as well as the perceived necessity for several searches and query paraphrasing are being discussed. Some of these aspects are being examined in this study for the first time. Where possible, the study draws parallels to comparable international research as well as to the few available studies on Arab users.*

Keywords: Arabic, Search Engine Behavior, Satisfaction, User Perspective

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1. Introduction

1.1 The Arabic Language on the Internet

Arabic is the fifth most widely spoken language in the world. Its 293 million native speakers form about 4.23% of the world's population (Nationalencyklopedin, 2010). This demographic status also has its bearing on the World Wide Web. Over the past decade, Arabic has become the fastest growing language on the internet with the Middle Eastern and the North African countries experiencing a tremendous growth rate of over 2,500%. From 2000 to 2011, the number of Arabic-speaking internet users increased from 2 million to more than 65 million users (Rotaru, 2011). Internet penetration in the Arabic countries, however, is still quite low at 40.2% (Internet World Stats, 2012). This leaves much potential for further growth in the future.

2. Search Engine Market Overview

The birth of the World Wide Web in the 1990's and the exponentially increasing amount of web pages called for automated

information retrieval (IR) systems that allow users to find the information they need among the billions of web pages floating around in cyberspace. Crawler-based web search engines are best for this job as they are able to index any term on the internet. Directory-based search engines, in contrast, have access to a limited base of documents only, which must have been registered in their directory. The first crawler-based search engine was WebCrawler, launched in 1994. Then followed Lycos and Infoseek (1994), Excite, AltaVista and Yahoo (1995), and Inktomi (1996). Last came Google in 1997, which today is the most popular web search engine with more than five billion searches carried out every day (Google Official History, Comscore, 2014).

This number of search queries entered every day into Google illustrates the importance that search engines have nowadays. Web search and email are indeed the two most popular services on the Web. A 2011 survey among US-Americans found that 92% of adults use search engines to find information on the Web, and 59% use them daily. For comparison, the same percentage of adults use email, and 61% use it on a daily basis. The majority of search engine users (96%) are young twens between age 18 and 29; but the elder age group of age 65+ still makes up 87% of search engine users. Young adults, college-educated and higher income adults are generally more likely to use search engines on an average day (Purcell, 2011).

The search engines mentioned at the beginning of this section had been developed in the United States and therefore tailored to English-language search queries. However, it soon turned out that they did not perform as efficiently when it came to retrieving information in languages other than English. In consequence, search engines specifically designed to handle the particularities of other languages were brought on the market. As for Arabic, Ayna was the first Arabic search engine to be launched in 1997. ArabVista followed in 2000 and was later on replaced by Al-Bahhar. Al-Hoodhood was launched in 2005 and Araby, the first crawler-based Arabic search engine, introduced in 2006.

All these Arabic-language search engines have disappeared by now and five international, multilingual search engines are dominating the market: Google is the most-used search engine worldwide (eBizMBA, 2014). In the US alone, it has a market share of 67%. After that come Bing with 17.9% and Yahoo with 11.3%. The last places are occupied by Ask with 2.7% and AOL with 1.2% (comScore, Inc., 2013). Google is available in Arabic user interfaces under specific web domains for altogether 15 Arabic-speaking countries. At the time of this paper, the only three Arab countries with no separate Google domain yet were Algeria, Syria, and Yemen. American internet corporation Yahoo! Inc. acquired Jordanian computer company Maktoob Inc. along with their search engine Araby in 2009. Yahoo's Arabic search site is now called *Yahoo Maktoob* and targets the whole of the Arabic-speaking countries. Bing, on its part, offers users the possibility to select the user interface language and can also be displayed in Arabic. As yet, Ask and AOL do not provide any Arabic-language option.

3. Particularities of the Arabic Language

The Arabic language is a diglossic language, which consists of Modern Standard Arabic (MSA), a form of the so-called *Fusha* language, and local dialects, the *Amiah* languages. Modern Standard Arabic is a literary language mainly used for books, newspapers, magazines, official documents and the like. It may also be used by Arab speakers from different countries, who otherwise would not be able to communicate with each other because their individual dialects are so divergent. Unlike Latin languages, the Semitic language of Arabic is written from right to left. The alphabet comprises 28 letters; only consonants and long vowels are written. Short vowels are usually only written in those cases where an ambiguity with an identically spelled word needs to be avoided. Arabic grammar knows two genders (masculine and feminine), three numbers (singular, plural, and dual), and three cases (nominative, accusative, and genitive) (Al-Harbi, Almuhareb, Al-Thubaity, Khorsheed, & Al-Rajeh, 2008).

The morphological and semantic structure of the Arabic language is highly challenging to IR systems for different reasons, which in return may affect user search engine behavior and user satisfaction with the obtained search results. The diglossia alone presents a semantic difficulty when seeking information. Furthermore, Arabic words are derived from mostly tri-radical roots and formed according to specific patterns. Arabic is estimated to have about 5 million words, which are derived from approximately 11,300 roots. This leads to the fact that the redundancy in Arabic is much greater than in English. For comparison, English has a total of about 1.3 million words with a number of 250,000 distinct words (Al-Maimani, Naamany, & Bakar, 2011). The same circumstance also leads to a high amount of polysemy with a ratio of ambiguity that is found to be larger than in other languages (Abdelali, 2006). Equally high and similarly problematic in information retrieval is the synonymy. Depending on the search term entered, redundancy, polysemy and synonymy are all factors which may lead to a search engine returning many ambiguous results that are not relevant for the user. The by far hardest challenge in information retrieval is, however, the

complex morphology of the Arabic language. Many affixes are agglutinated to the noun they refer to either as a prefix or as an affix. Definite articles, certain prepositions as well as the conjunction 'and' ('*ʿ*') are agglutinated as prefixes. Regular plural and dual endings as well as possessive pronouns are agglutinated as suffixes. As such, an individual Arabic noun can contain up to three prefixes and up to two suffixes. Another difficulty for IR systems is that many Arabic nouns form their plural irregularly, they have so-called *broken plurals*. Broken plurals are hard to handle for search engines because the noun modifies within the word and an irregular plural often hardly resembles its singular form. There is a multitude of more than 70 possible broken plural formation patterns (McCarthy and Prince, 1990). However, even in case of regular plurals, duals, and agglutinated affixes the matter is not that easy for web search engines: simply stripping off regular plurals, duals, and suffixes without any verification rules may lead to erroneous results because in some cases, these morphemes are a part of the word itself.

4. Literature Review

Given the importance of web search engines in today's world, it is surprising how low the number of studies is which evaluate search engines from a user perspective. Even lower is the number of studies which evaluate search engines from a user perspective of specific language speakers. Many studies have assessed the quality of search engines based on information retrieval effectiveness tests but have not taken into account user behavior and opinion. Effectiveness tests for the Arabic language on multilingual and Arabic search engines have been made, among others, by Moukdad (1999, 2004, 2006); Xu, Fraser and Weischedel (2002); Bushnaq (2003); Boualem and Abbes (2008); Al-Rawi and Al-Khateeb (2009); and Tawileh, Mandl and Griesbaum (2010).

The personal perception of search engine users is critical to rate a search engine from a holistic perspective. The user's personal opinion and degree of satisfaction are responsible for selection of a search engine and frequency of usage. These factors also decide upon success or failure of a search engine on the market. For web search providers, in reverse, it is vital to be aware of how users actually see the performance of their search engines. This allows them to better estimate the market potential for a specific region or language community and to identify needs for improvement in order to gain a larger market share.

However, not many studies have yet touched on Arabic users' attitudes towards search engines, search behavior and user satisfaction. To the author's knowledge, there are only two similar studies in this field so far. A study by ALDayel and Ykhlef, which was done in the Kingdom of Saudi Arabia in 2013, mainly focuses on the need for query paraphrasing when searching for Arabic content. 463 users were polled in an online questionnaire, which also contained questions about search engine frequency, language, and personal evaluation of search results and search engine support tools as well as criteria for search engine selection (ALDayel & Ykhlef, 2013). Al-Maskari, Sanderson and Clough (2007) evaluated the satisfaction of Arabic-speaking users with Google. In their study, 26 Arabic speakers were given the task to choose four Arabic search queries out of 104 given queries from the areas of religion, art, health, and politics. They were then asked to enter the queries into the search engine and rate the results (Al-Maskari, Sanderson & Clough, 2007). Apart from that, comparable international studies are available, e.g. on search engine usage frequency by Purcell (2011), on student information retrieval behavior by, among others, Silverstein, Henzinger, Marais and Moricz (1999), Griffiths and Brophy (2002), Lucas and Topi (2002), on user satisfaction by Sullivan (2000) and Fallows (2005), and on students' self-assessment of search skills by Becker (2003). These studies mainly focus on US-American as well as European internet users. This paper will make reference to relevant Arabic-specific and international studies where applicable.

5. Purpose of this Paper and Test Design

This paper aims at contributing more information about search engine usage behavior and satisfaction of Arabic users from a user perspective. The results of this study are intended to provide a closer insight into Arabic users' information seeking behavior, search engine and language preferences, satisfaction with the search results as well as personal criteria for search engine selection. The study will connect and compare the findings to the mentioned Arab user-related studies as well as the international research in an attempt to identify universal factors which may apply in particular to Arabic-speaking search engine users. It will point out similarities and differences as found comparing to the Arabic and international research.

At the study outset, a questionnaire was handed out to 70 Arab students. Students were chosen as target group because studies have identified the college-educated age group between 18 and 29 years to form the majority of search engine users

(Purcell, 2011). The participating students were enrolled in different Bachelor and Master study programs at two universities in Jordan. The distribution between male and female students was relatively even with 33 male and 37 female respondents. The participants answered the questionnaire anonymously. The questionnaire consisted of altogether 10 questions relating to search engine usage frequency, preferred search engine/s, language preferences, satisfaction with the results, and search behavior under different aspects, which all shall be explicated in more detail in the following sections. The question type was either multiple choice, which could be answered with one or multiple answers, or required the respondents to choose from a Likert five-point scale (LFPS).

6. Results

6.1 Frequency of Search Engine Usage

Search engines are one of the most popular services on the Web today. Therefore, the first survey question aimed at finding out how often the students made use of a search engine in general and was to be answered by a Likert five-point scale from ‘*very frequently*’ to ‘*never*’. The results are shown below in Table 1.

Usage frequency	Very frequently	Frequently	Sometimes
Percentage of users	71%	20%	9%

Table 1. Search engine usage frequency of Arab users

The large majority of respondents (71%) said they were using a search engine very frequently. 20% described their search engine usage as frequent and only 9% of the participants were using a search engine sometimes. None of the respondents said they were using a search engine seldom or never.

This outcome clearly reflects the high degree of importance and popularity that web search services have among Arab users. Interestingly, this percentage of very frequent search engine usage by Arab university students is above the value in the United States, where a comparable 61% of college students were found to use Web search on an average day (Purcell, 2011). The number is also in agreement with the findings by ALDayel and Ykhlef from their 2013 survey in Saudi Arabia, which estimated the number of daily search engines usage at 73% (ALDayel and Ykhlef, 2013:37). The findings allow the conclusion that Arab students tend use search engines more frequently than the average American student. Hence, search engines take on a more important role in the Arab world and the Arab market can be assumed to offer a greater potential for search engine providers than other language markets.

6.2 Mostly Used Search Engines

In a further question, the survey participants were asked to name the web domain (URL) of the search engine or the search engines they mostly use when searching for *Arabic* information on the Web. This question allowed multiple answers, which are depicted in Table 2 below.

Search engine URL	Percentage of users naming it as one of their preferred search engines
google.com	82.9%
yahoo.com	28.6%
bing.com	14.3%
google.jo	12.9%
google.de	5.7%
msn.com	4.3%
yamli.com / yamli.org	2.9%
ask.com	2.9%
maktoob.yahoo.com	1.4%

Table 2. Mostly used search engines by Arab users (multiple answers possible)

The result of the majority of 82.9% of Arab students naming Google.com as their search engine of choice did not come as a surprise. After all, Google is the most popular search engine on the Web (eBizMBA, 2014) and many previous studies, which tested the information retrieval effectiveness of search engines under different aspects, found Google to be the best performing search engine for retrieving information in Arabic (Bushnaq, 2003; Moukdad, 2004; Al-Rawi and Al-Khateeb, 2009; Tawileh, Mandl and Griesbaum, 2010). Other studies of student information retrieval behavior have also identified Google to be the “*first port of call*” for finding information in cyberspace (Griffiths & Brophy, 2002). Arab student users seem to rate Google Search to be best performing from their personal user perspective, too. Quite far behind percentage-wise follow two other international search engines. On second place is the third largest market leader in the search engine business, Yahoo.com, with 28.6%. Again, we see the international version of a search engine being preferred by Arab users to the Arabic search engine version. In fact, only 1.4% of the respondents said to use the actual URL of Yahoo Maktoob to access the search engine. This corresponds to one person out of 70 participants and places Yahoo Maktoob on the last rank. Despite Yahoo Maktoob’s special focus on targeting the Arabic-speaking market, it proves to be rather unpopular among the questionnaire respondents.

Bing.com is with 14.3% on third place. Bing is the second largest search engine after Google, slightly topping Yahoo with a market share of 17.9% in the United States. However, the questioned Arab users tend to prefer Yahoo over Bing. On fourth place is another Google domain, Google.jo, with 12.9%. The reason why the Jordanian Google web domain comes here is to be attributed to the fact that the survey was done in the country of Jordan. Had the survey been carried out in another Arab country, it is very likely that the corresponding Google country domain would appear here.

This leads us to the one-digit percentage range with the German Google site succeeding Google Jordan on fifth place with 5.7%. The fact that Google.de is ranked here may be due to a number of survey participants being enrolled in German as a foreign language programs. On sixth place, another international search engine: MSN.com with 4.3%. MSN (Microsoft Network) is a web portal that offers different information and internet services. The MSN network was first introduced in 1995. Four years later, MSN Search was launched. Today, MSN Search is powered by Bing, also a Microsoft company.

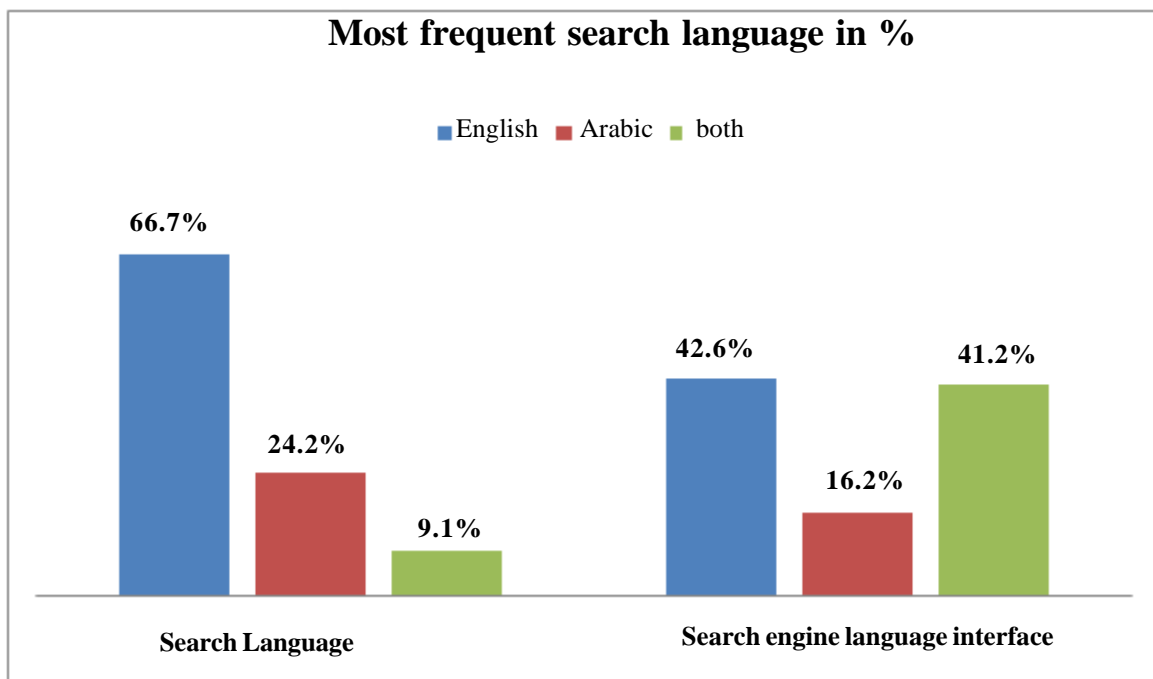


Figure 1. Most frequent search language and search engine language interface

Eventually on seventh place is the first Arabic search engine with 2.9% of the students listing Yamli (yamli.com or yamli.org) as their search tool of choice. Yamli, meaning in Arabic ‘*he dictates*’ (‘*īfāāī*’), was founded in 2007 by Lebanese company Language Analytics LLC. Beside the Web search, Yamli offers a real-time transliteration technology, where a search term entered in Latin characters is converted to its closest Arabic equivalent. Yamli Arabic Search, however, forwards its search queries to Google; the final search results are actually results from Google.com. As the retrieval process is entirely done by Google, users might opt for Yamli because of its transliteration function or because they find the initial Arabic search mask appealing. With an identical

2.9% on eighth place is Ask.com. Ask.com is, as already said before, an international multilingual search engine, which holds the fourth largest share in the US search engine market – a position it obviously cannot defend in present survey among Arab users.

Summarizing, the results show that the utmost part of the Arabic students turn to international, multilingual search engines as their first source for seeking information, first and foremost Google.com. Further behind follow Google's two largest international competitors: Yahoo.com and Bing.com. In terms of search engines preferred by Arab users, there is as of to date only one study to draw a parallel: ALDayel and Ykhlef (2013) came to similar results. Their survey in Saudi Arabia also revealed that a majority of 88% of the users rather use a multilingual search engine to search for Arabic content than an Arabic-specific one (ALDayel & Ykhlef, 2013:38). The search engine web domains were not specified in that study.

6.3 Most Frequent Search Language and Search Engine Language Interface

The present study also questioned the users about their preferred search language as well as their preferred search engine language interface. When being accessed from an Arabic country, the three major multilingual search engines Google, Bing and Yahoo offer users the option to select between English or Arabic as interface language. Hence, the survey let the respondents choose between the following answers: Arabic, English or *'it varies'*. Figure 1 below shows the results of what language users prefer to search in and what language interface they prefer to have their search engine displayed in.

When being questioned about their preferred search language, the majority of the respondents named English as their language of choice with a vast percentage of 66.7%. Only about a quarter (24.2%) said they usually entered search terms in Arabic language, and 9.1% said they used both languages to search the Web. This large preference of using search queries in English language rather than in Arabic may explain why a majority of Arab users tend to use a multilingual search engine. In this respect, we can note a discrepancy to the Saudi-Arabian survey where 55% of the respondents said to mainly seek Arabic content, and 40% said to look for both Arabic and English information. Only 2% were looking for information in English language (ALDayel & Ykhlef, 2013:38).

In addition to that, the survey participants were also inquired about the language they prefer to have the search engine displayed in. It turned out that slightly less than half of the users (42.6%) favor an English search engine user interface, while only a minority of 16.2% tends to use an Arabic interface. However, a similar percentage of 41.2% of the users like to see their search engine in both Arabic and English language. This stands in contrast to the language students mostly use to look up information in the Web. Whereas most of the survey respondents tend to use the search engine in English as well as search queries in English, the results for Arabic and both English and Arabic as search language and search engine language interface are not so homogeneous. While only 9.1% responded to use both English and Arabic as search language, 41.2% have their search engine user interface displayed in both languages. This may indicate that a substantial number of users seem to search in English language while their search engine interface is set to Arabic. This is an interesting revelation which deserves more research attention.

6.4 Satisfaction with Search Engine Results

The users' satisfaction with search engine results is evidently a very subjective perception. Studies found that users are generally satisfied with the performance of search engines. According to a number of surveys on user search engine evaluation in the US, more than 80% of the users consider their searches to be successful most of the time (Sullivan, 2000; Fallows, 2005). Most users feel comfortable when using a search engine and state that *"they are happy with the results they find"* (Fallows, 2005:i). *"87% of searchers say they have successful search experiences most of the time, including some 17% of users who say they always find the information for which they are looking"* (Fallows, 2005:i). Fallows (2005) also reports that almost the whole of search engine users are confident about their searching skills (92%), and over half of them (52%) say to be *"very confident"*. Other studies also report that students' self-assessment of search skills is usually high (Becker, 2003; Thompson, 2003; Buschman & Warner, 2005). However, the same studies as well as a number of further researches look at user search behavior very critically and bemoan the generally superficial search strategies. Becker (2003) points out that although the students are aware of information literacy skills, they do not apply them effectively in practice. Other studies add that search engine users fail to apply sophisticated search techniques, avoid complex searches, are reluctant to plan and structure a search, and only view a small number of results (Silverstein, Henzinger, Marais & Moricz, 1999; Jansen & Pooch, 2001; Lucas & Topi, 2002; White, Jose & Ruthven, 2002; Tompson, 2003; Spink & Jansen, 2004; Jansen & Spink, 2005). Many studies make reference to the finding that young search engine users are basically well adept in the technology but that information literacy is the actual concern. Graham and Metaxas (2003) stress that technically versed users still fall victim to the erroneous belief that all

needed information can be retrieved easily through a search engine. In consequence, they consider the first results as authoritative and definitive information.

As the present study did not evaluate the quality of the information retrieval process applied by the students, it assesses the user satisfaction levels from a merely subjective user perspective. The present section deals with the satisfaction with search engine results and shows the survey responses in Figure 2 below; other points such as satisfaction with first page search results, modification of search terms in form of query paraphrasing, and the necessity for multiple searches in order to find the desired information will be dealt with in more detail in later sections in this paper.

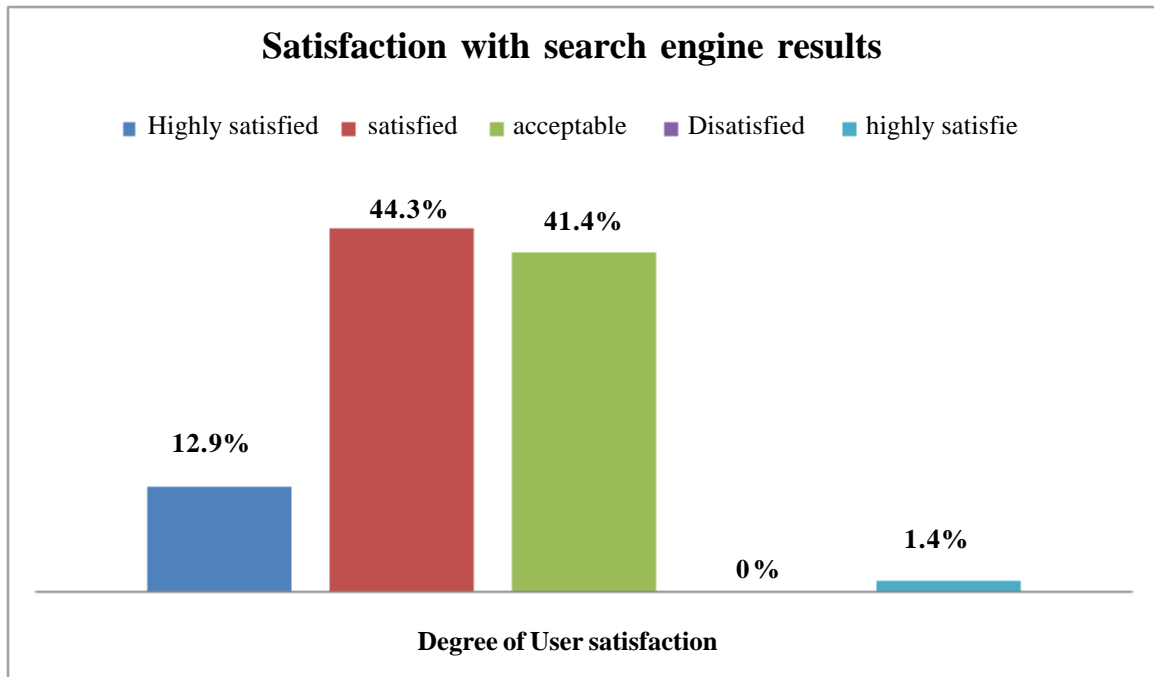


Figure 2. General satisfaction with search engine results from a user perspective

The results graphed in Figure 2 make it immediately evident that most of the responses are located in the upper average range of the scale. Most respondents describe their perceived level of satisfaction with the search results as satisfying (44.3%) and acceptable (41.4%). Only 12.9% find themselves *'highly satisfied'* with the search results. Surprisingly, none of the participants classified their search experience as unsatisfactory. However, 1.4% (which corresponds to one person out of 70 respondents) described their search experience as highly dissatisfactory.

This great percentage of users who classify their search experience as only satisfying and acceptable is in stark contrast to the above mentioned studies that identified a generally high – though superficial – satisfaction of search engine users with the search results. There is no identical study on Arab user satisfaction with search results to refer to at this point. However, ALDayel and Ykhlef (2013) asked their participants a similar question of whether the results of the search engine match for what they were looking for. The largest percentage of the responses of their survey also concentrate in the middle area with 59% saying they *'sometimes'* find what they are looking for and 39% saying they *'always'* do. Two percent answered *'never'* (ALDayel and Ykhlef, 2013:38). Al-Maskari, Sanderson and Clough (2007) gathered feedback from Arabic search engine users about their search experiences with Google relating to satisfaction with the coverage, accuracy and overall satisfaction with the results on a Likert five-point scale from 5 (highest) to 1 (lowest). As for coverage and accuracy, the majority indicated their satisfaction level with '4' and '3'. The overall satisfaction with the search engine was rated '3' by most users (34.62%) and '4' by another 30.77%. Only 15.38% were *'highly satisfied'* with the search results and 7.69% were *'not satisfied'*.

In this respect, the results of this study are in consistence with the two other studies on Arab information seekers: Arab user satisfaction ranges mainly in the middle average. These findings may lead to several assumptions to explain the difference to the international studies mentioned at the beginning of this section. The cited research was mainly carried out in the United States with American participants or foreign participants living in the US. The search language was English. First of all, one

could assume that Arab users may have a different attitude towards the retrieved search results; they may view the information more critically than other users. Secondly, despite that most users named English as their preferred search language (66.7%; cf. Section 6.3), users also may have had Arabic search queries in mind when answering that question. Multilingual search engines were found to work not as efficiently for languages other than English (Mujoo, Malviya, Moona & Prahakar, 2000; Sroka, 2000; Bar-Ilan and Gutman, 2003). Hence, a lower degree of satisfaction of Arab users may correlate with a lower performance of such search engines with regard to Arabic-language search queries. Thirdly, depending on the subject looked for, relevant Arabic topics may still be more scarcely available online than English information. Therefore, Arabic queries may not produce as relevant and numerous results as English queries. Fourthly, different users may use different information retrieval techniques (query formulation and search methods), whereof some are more effective than others. The survey results of users being questioned about their perception of the effectiveness of Arabic and English search queries as well as their felt necessity for query paraphrasing will follow in a subsequent section in this paper. Apart from that, these findings open up potential for further research: as yet, there are no studies that analyze the information seeking behavior of Arab users or the reasons of their average levels of satisfaction with the search engine results.

6.5 Contentment with the First Page Search Results

Most international investigations come to the conclusion that search engine users only view the first ten or twenty results. They rarely view more than the results on the first page (Spink & Jansen, 2004; Pan, Hembrooke, Joachims, Lorigo, Gay & Granka, 2007), which usually consists of ten links to presumably relevant web pages, the so-called *ten blue links*. Further research has shown that the search engine users even tend to eye only those results on the first page which are visible without having to scroll down (Joachims, Granka, Pan, Hembrooke & Gay, 2005; Granka, Hembrooke & Gay, 2006; Cutrell & Guan, 2007; Pan, Hembrooke, Joachims, Lorigo, Gay & Granka, 2007). Additionally, users consult only about five Web page results (Spink & Jansen, 2004; Jansen & Spink, 2005). Figure 3 below illustrates the findings this study revealed about Arab users in this respect:

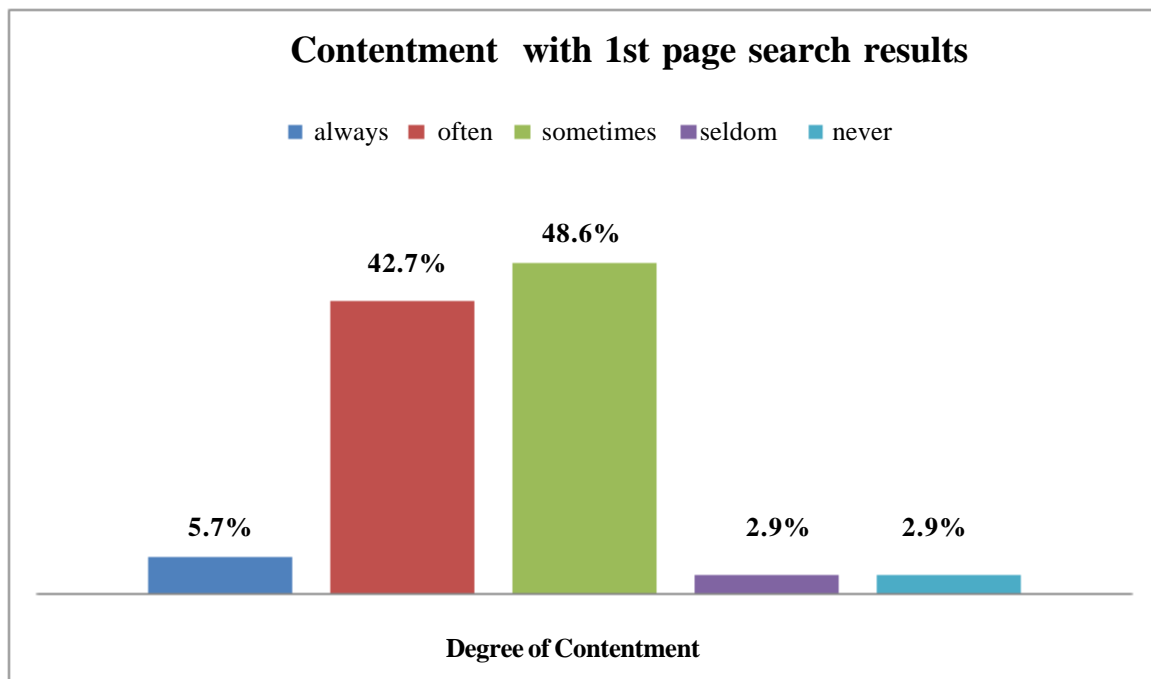


Figure 3. Contentment of Arabic users with the search results on the first page

As can be seen from Figure 3, the majority of the responding students find themselves only *'sometimes'* satisfied with the results on the first page (48.6%). A slightly lower percentage (42.9%) replied that they are *'often'* satisfied with the *"ten blue links"*. However, only a very low number of respondents, namely 5.7%, *'always'* feel that the first page results are sufficient. And a comparably low number of students of 2.9% each said they were *'seldom'* or *'never'* happy with the initial results.

To the author's knowledge, this is the first study examining Arabic users' satisfaction with the results on the first page of a search engine. Thus, there is no comparative study to juxtapose. As opposed to the above mentioned research, which was

done with US-American and European search engine users, one can note that a quite substantial percentage of the Arab users, approximately half of the respondents, do not consider the first ten results to satisfy their information needs. This leads to the conclusion that Arab users apparently tend to view more results pages than only the first one. The motives of this user behavior, which one can only speculate about in the frame of this study, may again stem from the reasons already mentioned above, such as a more critical evaluation of the Web content, the availability and relevancy of the Arabic content retrieved by a (multilingual) search engine, Arabic versus English search queries, or the methods used to seek information. Again, this is an area where further research may be needed.

6.6 Necessity for Several Searches and Query Paraphrasing

International studies found that search engine users rarely modify their search queries. After analyzing a large number of studies on information retrieval behavior between 1997 and 2003, Spink and Jansen (2004) report about a common use of short search queries, which are not being reformulated. They add that advanced searching is used seldom and if so, it is often used incorrectly. Search queries are typically short, without modification, and users often have difficulties formulating appropriate search terms (Lucas & Topi, 2002; White, Jose & Ruthven, 2002). Additionally, the used queries are extremely simple (Jansen & Spink, 2005), unstructured (Silverstein, Henzinger, Marais & Moricz, 1999), and users shy away from using advanced search options such as Boolean operators (Jansen & Pooch, 2000). Ray and Day (1998) therefore conclude that if users are generally content with their search queries, they may not see the need to refine their search terms. Figure 4 below juxtaposes the necessity for several searches and query paraphrasing as perceived by the Arab users participating in this study.

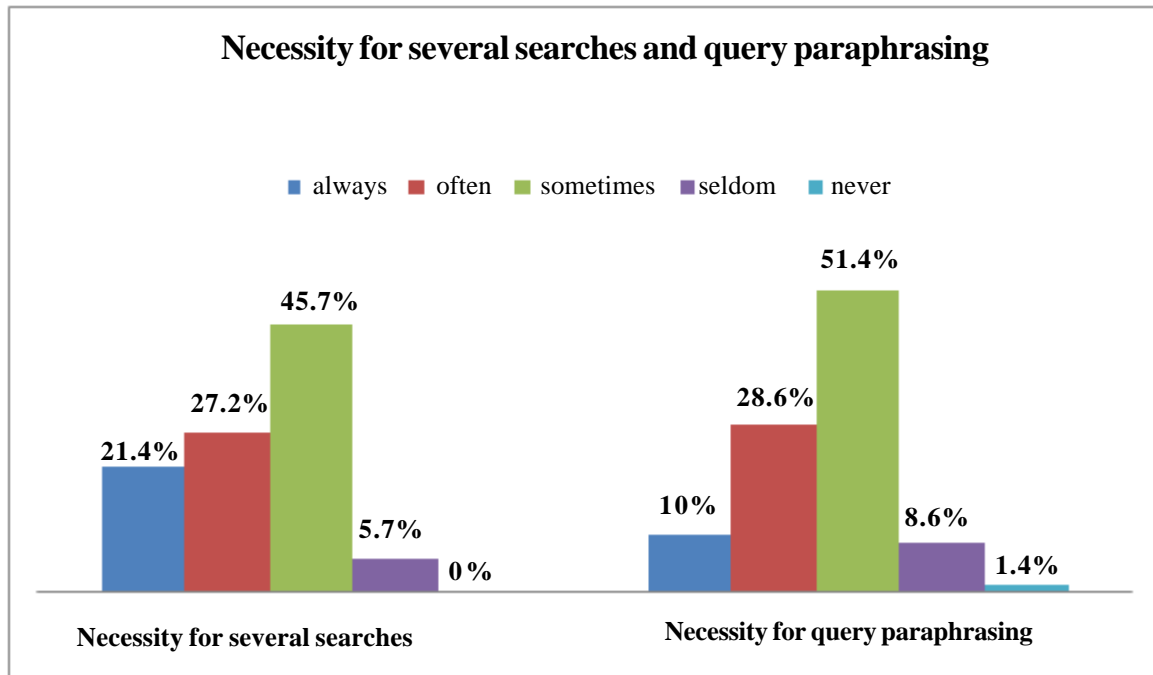


Figure 4. Necessity for several searches and query paraphrasing as perceived by Arab users

The results reveal that the majority of search engine users face the necessity for both several searches and query paraphrasing to obtain the information they seek: about half of the survey participants indicated there was a need for both actions. Concretely, 45.7% of the students find it necessary to repeat a search several times 'sometimes' and an even higher percentage of 51.4% do paraphrase queries during a search process 'sometimes'. 27.2% of the users rerun a search 'often' and a similar percentage of 28.6% use paraphrasing 'often'. Still 21.4% say that they 'always' have to perform several searches to find what they are looking for and 10% 'always' modify their search query. Only 5.7% reported to find themselves 'seldom' confronted with the necessity for several searches. 8.6% 'seldom' modify their initial search term and 1.4% 'never' do so.

The study by ALDayel and Ykhlef (2013) can again be used as a reference in this case: the authors questioned the survey takers about their behavior when the search did not return suitable results. 8% said they changed the search engine and another 8% would not do anything. However, an overwhelming 84% reported that they used query paraphrasing if the search results were not appropriate. The results of the present study as well as of the comparative study induce the assertion that

several searches and query modification are more often the order of the day among Arab search engine users than among English and European users as mentioned in the literature review at the beginning of this section. Redoing a search with a modified search query seems to be a method frequently employed by Arab user in case the previous search did not return the sought-for results.

6.7 Better Results with English Search Queries

In a further survey question, the students were prompted to indicate on a Likert five-point scale from 'always' to 'never' whether they feel to obtain better results with English-language search queries than with Arabic ones. The responses to this question are illustrated in Figure 5 below.

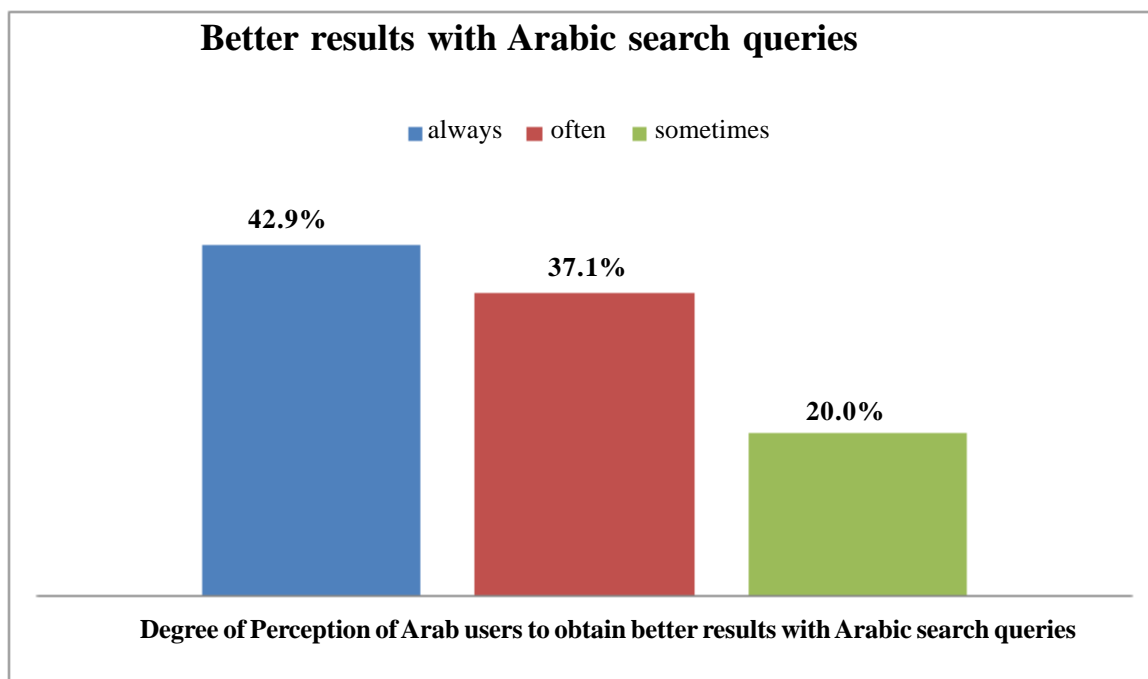


Figure 5. Perception of Arab users to obtain better results with Arabic search queries than with English search queries

As we can see, the majority, i.e. slightly less than half of the users (42.9%), felt that English-language search queries 'always' produced better results than Arabic terms. Closely behind followed 37.1% of the users saying they 'often' had the impression to obtain better results when searching in English. 20% of the respondents shared this impression 'sometimes'. Interestingly, none of the participants stated to 'never' or only 'sometimes' feel that English search queries are more efficient.

The fact that users believe to obtain better search results when using English queries explains why such a large number of users (74.3%) prefer to search in English and may also be the explanation for why many of them (48.6%) use their search engine in the English language interface as this study already revealed in previous Section 6.3. The findings of this research also support previous studies rating multilingual search engines not to be as performing for languages other than English (Mujoo, Malviya, Moona & Prahakar, 2000; Sroka, 2000; Bar-Ilan and Gutman, 2003). As Section 6.2 showed, Arab users mostly turn to the international version of Google.com to retrieve information. The way Arab users personally perceive Google's performance apparently supports the research findings about Google not being as effective when Arabic search queries are entered.

6.8 Priorities for Search Engine Selection

The reasons why users opt for a certain search engine are surely of great interest when studying search engine behavior from a user perspective. Following up on the evaluation by ALDayel and Ykhlef (2013), this questionnaire asked the participating students in Jordan to rate their priorities for search engine selection according to the same criteria. The aim was to juxtapose the responses given by students in Jordan with the responses obtained from participants in Saudi Arabia and identify differences or similarities, which may apply for Arab users in general. The survey suggested four criteria for search engine

selection: precision of results, large number of retrieved documents, availability of search support tools, and fame and reputation of the search engine. The students were asked to rate these criteria according to their personal priorities from 1 ('very important') to 4 ('not so important').

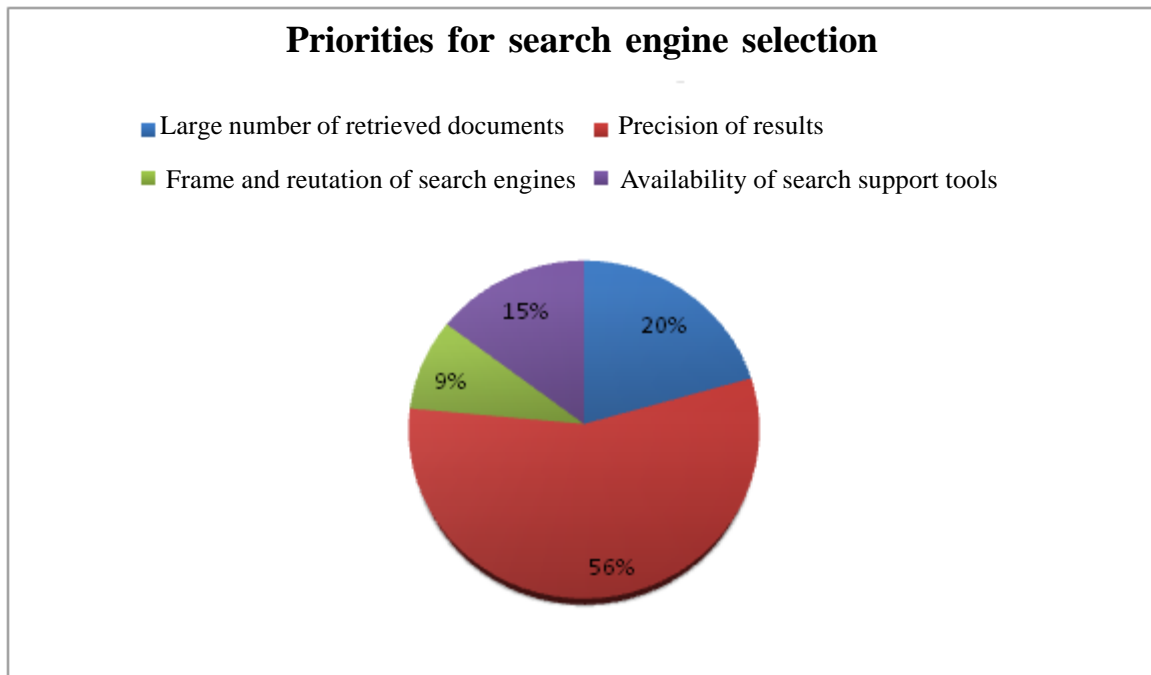


Figure 6. Arab users' priorities for search engine selection

Figure 6 above depicts that the large majority of more than half of the respondents (56%) mostly appreciate the precision of the results when using a search engine. One fifth (20%) of the students consider a large number of results as their priority for selecting a search engine. 15% name the availability of search support tools, and the smallest percentage of users (9%) selects a search engine for its fame and reputation.

Comparing the outcome of this study with the results obtained by ALDayel and Ykhlef (2013) does not allow us to establish similar criteria according to which Arab users tend to select a search engine. The criteria named by Saudi Arabian users considerably differ from what students in Jordan listed as their priorities. ALDayel and Ykhlef (2013) found in their survey that about 58% of the respondents see a large number of retrieved documents as their number one criterion for search engine selection. 45% named the precision of the results and another 43% the fame and reputation of the search engine as their main selection criteria. 32% said the availability of search support tools made them opt for a specific search engine.

7. Conclusion

This small-scale study with 70 students from two universities in Jordan aimed at shedding more light at the still very little researched topic of search engine behavior of Arab users from a user perspective. The study revealed that the percentage of very frequent search engine usage among Arab students is very high and even lies above the value found in the United States. The mostly used search engines are indeed the three large international engines, first of all Google.com, then Yahoo.com and Bing.com. Specific Arabic search engines are not popular among students in Jordan. Precision of the results was named as number one priority to select a search engine. The most frequent search language is English; only one quarter of the respondents usually seek information in Arabic language. About 40% also prefer an English search engine interface, but a similar percentage use the interface in variably both English and Arabic. User satisfaction with the search engine results in general and contentment with the first page search engine results both range in the middle average. Most of the users find it *sometimes* to *often* necessary to run several searches and paraphrase their query in order to find what they are looking for. Interestingly, the majority of users feel to obtain better search results when using English search queries.

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