



**AN EVALUATION OF THREE SEARCH ENGINES (GOOGLE, YAHOO,
BING) BASED ON ARABIC USER PERCEPTION**

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AN EVALUATION OF THREE SEARCH ENGINES (GOOGLE, YAHOO, BING)
BASED ON ARABIC USER PERCEPTION

A THESIS SUBMITTED TO
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SUAD SHATTI AZEEZ

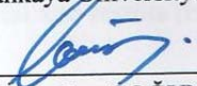
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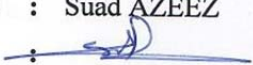




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ABSTRACT

AN EVALUATION OF THREE SEARCH ENGINES (GOOGLE, YAHOO, BING) BASED ON ARABIC USER PRECEPTION

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With the rapid increase of Arabic users around the world, a need of understanding the preferences of this wide Stratum of society is important. To do so we designed a questionnaire to evaluate three search engines (Google, Yahoo, and Bing) to reveal the Arabic user's perception of these three search engines. Each engine has its own features and it is own search methods to achieve the main purpose of search engines which is retrieving relevant results. This study exposes the pros and cons of the three tested search engines which give the opportunities to search engine developers to enhance their products. The results showed that Google performs very well comparing with Yahoo and Bing in some kind of data (text and video search) whereas image and advertisements Yahoo seems to be more accurate, Bing captivated many participants with its attractive homepage and useful features except supporting Arabic language in Bing map. Our results will help engineers and designers to improve their search engines in term of the design of homepages and result, improving their search engines algorithms for Arabic queries.

ÖZ

ARAP KULANICILARININ ALGILAMASINA DAYALI ÜÇ ARAMA MOTORUNUN DEĞERLENDİRİLMESİ (GOOGLE, YAHOO, BING)

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Dünyadaki Arap kullanıcılarının hızla artmasıyla birlikte, bu geniş toplumsal tabakanın tercihlerini anlama ihtiyacı da en önemli hale gelmiştir. Arapça kullanıcıların tercihlerini ve algılarını ortaya çıkarmak için üç arama motorunu da kapsayan ve değerlendirme imkanı veren bir anket tasarladık (Google, Yahoo, ve Bing). İlgili aramaları gerçekleştirmek için her motorun kendine özgü özellikleri ve kendine ait arama metotları bulunmaktadır. Bu çalışma, arama motoru geliştiricilerinin ürünlerini iyileştirmeleri için arama imkânı veren üç arama motoru test edilmiş ve arama motorunun artılarını ve eksilerini turtisilmistir. Sonuçlar, Google'ın Yahoo ve Bing ile karşılaştırıldığında bir takım veri türünde (metin ve video arama) alanlarında çok daha iyi olduğunu ortaya çıkarmıştır. Öte yandan resim ve reklam aramalarında Yahoo ile daha doğru sonuçlar elde edilmiştir. Ve en son Bing, Bing haritasında Arapça dili destekleme haricinde çekici ana sayfaları ve kullanışlı özellikleriyle birçok katılımcıyı büyülemiştir. Sonuçlarımız, mühendislerin ve tasarımcıların, Arapça sorgulamalar için bu üç arama motorunun (Google, Yahoo, ve Bing) algoritmalarını daha iyi hale getirerek daha iyi anasayfalar tasarlama ve sonuçlar elde etmelerine olanak sağlayacaktır.

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LIST OF ABBREVIATIONS

BMP	Windows Bitmap
CEO	Chief Executive Officer
GB	Giga Byte
HTML	Hypertext Markup Language
IBM	International Business Machines Corporation
IR	Information Retrieval
JPEG	Joint Photographic Experts Group
MSN	Microsoft Network
OCR	Optical Character Recognition
PC	Personal Computer
PDF	Portable Document Format
RSS	Rich Site Summary
URL	Uniform Resource Locator
XML	Extensible Markup Language



CHAPTER ONE

INTRODUCTION

Search engines are the tools that help the general population to discover online data accessible on the web. Access to various types of information is necessary these days [1]. Search engine presents such a function by allowing users to access a vast range of information type. Search engines assume a noteworthy part to search pictures, sounds, illustrations and other sort of records. Search engines are listed among the most accessed sites [2] with their own particular capacities, qualities, seeking conduct and elements. The users can search for information in multimedia formats such as text, audio, still images, and moving images [3]. Searching for data on the Web is, for the vast majority, a day by day action. Both search and communication are by a long shot the most mainstream employments of the PC. As anyone might expect, numerous individuals in organizations and colleges are attempting to enhance search by coming up with simpler and quicker approaches to locate the correct data. The individuals, regardless of whether they call themselves PC researchers, programming engineers, data researchers, or something else, are working in the field of information retrieval. Search engines have been around for numerous years. For instance, Medline, the online restorative writing search system, begun in the 1970s. The expression "search engine" was initially used to allude to particular hardware for text search. Since 1985-1984 ahead, be that as it may, it step by step came to be utilized as a part of inclination to "information retrieval systems" as the name for the product framework that looks at questions to reports and creates positioned result arrangements of archives. Search engines have different configurations that mirror the applications they are intended for. Search engines, for example, Google and Yahoo must have the capacity to hold numerous terabytes of information and after that give sub-second reaction times to a large number of queries presented each day from around all the world. Enterprise search engines for instance, Autonomy must have

the capacity to prepare the expansive assortment of data sources in an organization and utilize organization particular learning as a component of search and related assignments, for example, data mining. Data mining alludes to the programmed disclosure of interesting structure in both data and techniques for example, clustering. Desktop web search tools must have the capacity to quickly incorporate new web pages, email as the individual makes or takes a gander at them, and additionally give an instinctive interface for searching this extremely heterogeneous blend of data. Yandex is a leading Internet portal and search engine in Russia with over 6 million unique visitors per day. The company is focused on the Russian-speaking audience. Its in-depth local knowledge of Russia gives it a clear competitive edge in the Russian Internet market. Open source search engines consider essential type of systems that have fairly extraordinary plan objectives than the regular search engines [4]. There are a number of these search engines gives connections to large portions of them. The "enormous issues" in the architecture of search engines incorporate the ones recognized for information retrieval: successful ranking algorithms, assessment, and user collaboration. There are some of extra basic elements of search engines that outcome from their arrangement in huge scale, operational situations. The first important feature of search engine is the performance, which means the reaction time, query throughput, and ordering speed of a search engine. We stated the definition of these concepts as below [5]:

1. Reaction time: can be defined as the delay between presenting a query and getting the outcome list.
2. Throughput measures: the quantity of queries that can be prepared in a given time.
3. Ordering speed is the rate at which content records can be changed into contents for searching.
4. Index: this concept can be defined as a data structure that improves the speed of search.

All these concepts and more (will you see it in next chapters) are important factors to determine the efficiency of search engine.

1.1 Significance of the Study

According to many sites as in [6] and [7]. The number of Arabic users increased rapidly to reach 197 million users which cannot be neglected. Due to this rapid increase of Arabic users, we should expect that the available search engines nowadays serve the Arabic queries efficiently to meet Arabic user's needs. Although there are some studies highlighted on Arabic queries and made some comparisons and trade-off such as the study in [8], but none of the previous studies made a survey to find out how Arabic users think about these commercial engines to our knowledge. We designed a survey to reveal the preferences of Arabic users when using (Google, Yahoo and Bing). This study should help the engines engineers to know what the Arabic user perceptions, and how they can improve their search engines to be more usable for Arabic users. These improvements will make number of Arabic user increase.

1.2 Big Data

Big data can be defined as the capability of managing a huge volume of data within the right time and proper speed [9]. Big data may be defined as very huge and complex collections of datasets which can be accessed by smart algorithms that utilized to search for user query. New data are generated every day from different sources including pictures, social media, videos, etc. Due to this rapid growth of data, and the rapid increase of number of users will make the process more difficult for search engineers to present efficient algorithms that retrieve relevant results. Three characteristics to describe big data are as follows:

- Volume: The quantity of data stored and generated.
- Velocity: How fast that data is generated and processed.
- Variety: The nature and various types of data.

One of the solutions that have been proposed to overcome the fast growth of data has been applying better hardware; however, this approach has not been sufficient as the hardware enhancement reached a point where the growth of data volume outpaces computer resources [10]. Now, big data comes in three forms:

1. Structured data: The term structured data refers to the fact that the format of the data and the length are known. Examples of structured data include emails, phone

numbers, IDs, names, addresses, etc. There are two sources that provide structured data: data generated by human intervention such as gaming data and input data. The second source is the data generated by machines such as sensor data, web log data and financial data.

2. Unstructured data: The data that do not have specific formats or known lengths. These are found everywhere and are used widely. The sources of these unstructured data are human-generated data such as website content, mobile data and social media. The data generated by machines are the second source of unstructured data, which can be found as radar data, sonar data and satellite data.
3. Semi structured data: This kind of data combines structured and unstructured data. Dealing with this degree of data complexity is not so easy. Tall data and wide records lead to long running queries; therefore, new methods need to appear in order to overcome this challenge and manage huge data.

1.3 Related Work

Many papers were published to investigate the evaluation of search engines, in this field we will exhibit some of these studies. The authors in [11] presented an evaluation of three search engines (Google, Yahoo, and Bing) based on the popularity of these three engines. The authors used a set of measurements for the purpose of search engines evaluation for instance they used a query “information systems” to compare between the three engines in 2012 and the retrieved results were as shown in the table below:

Table 1 Retrieved results [11]

Workload	Retrieved URL	Query Type
Google	762,000,000	Double Word
Yahoo	325,000,000	Double Word
Bing	21,100,000	Double Word

The authors also compared between the features of these three engines in term of the basic features as shown in the table below:

Table 2 Features available in the Three Selected Search Engines [11]

Features	Google	Yahoo	Bing
Website	www.Google.com	www.search. yahoo.com	www.bing.com
Search Operator	AND, OR, NOT	AND, OR	AND, OR, NOT
Search Web	Yes	Yes	Yes
Search Images	Yes	Yes	Yes
Search Videos	Yes	Yes	Yes
Search News	Yes	Yes	Yes
Search Maps	Yes	No	Yes
Search Books	Yes	No	No
Advance Search	Yes	Yes	Yes
Change Background	Yes	No	Yes
Change Search Settings	Yes	Yes	Yes
Display No. of Results	Yes	Yes	Yes
Shopping	No	Yes	Yes
Translation Services	Yes	No	Yes
Multi-Language Support	Yes	No	No
Questions/Answers	No	Yes	No
Directory	Yes	Yes	No
Advertising Programs	Yes	Yes	No
Business Solution/Services	Yes	No	No
Themes	No	No	Yes
Case Sensitive	No	No	No

Finance	Yes	Yes	No
Safe Search	Yes	Yes	Yes
Search Pad	No	Yes	No
Careers	No	Yes	No
Preferences	Yes	Yes	Yes

Authors in this study also designed 5 different English queries in order to cover all the types of queries. These types are listed below:

- Single word search / communication.
- Double word search / development communication.
- Boolean search / performance and evaluation.
- Phrase search / school of information technology.
- Phrase search / no knowledge are lost.

They collected the retrieved 10 results from each page. They assumed majority of users look at the first 10 results. After collecting and analyzing data the results they got are illustrated in the figure below:

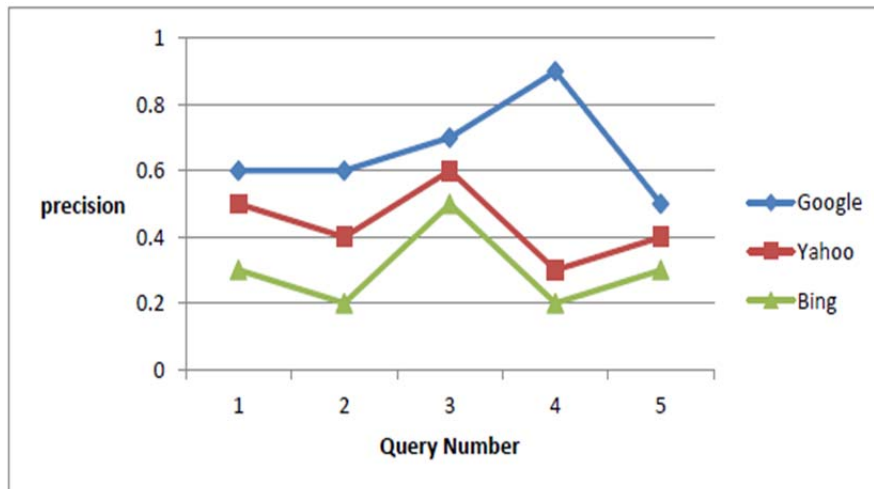


Figure 1 Precision values for the three search engines [11]

The authors used precision to compare the performance of engines in term of the relevant retrieved results. They concluded that Google retrieved more relevant results than the other two engines (Yahoo and Bing) in the first seven results. Yahoo took second place whereas Bing came in the last place, while considering more than seven results, the contrasts amongst Google and Yahoo are unimportant. Authors also tested the stability of these three engines over 5 weeks' period. They concluded that Google remained stable along this period with highest retrieved results. In study [12] authors test three search engines (Google, Yahoo, and Bing) using three different languages (Arabic, English, and Turkish) in six different disciplines, these disciplines are ("business", "culture", "health", "sports", "technology", and "travel") using five queries for each discipline. The first 10 results were classified into relevant or non-relevant results. The authors calculated the ratio of precision for each search in each language. The authors concluded that the highest number of relevant retrieved results were by Bing in "health" discipline using English language. On the other hand, the lowest number of relevant retrieved results was presented by Yahoo using Turkish language in "business" discipline. In "health" discipline, both Google and Yahoo showed their best performances in English and Arabic, whereas Bing demonstrated its best execution just in English. In "travel" discipline using Turkish language, Google reflect best performance whereas both Bing and Yahoo demonstrated their best performance in English. In whatever remains of the classifications, every one of the three web search tools demonstrated their best exhibitions in English language. In general, for all the six disciplines, all the three engines performed better with English rather than Arabic and Turkish.

The authors in [13] evaluated five search engines in Arabic language these engines are Araby, Ayna, Google, MSN and Yahoo. The used Arabic queries in this study were collected randomly from the most used queries in Araby engine which is an Arabic search engine. The results showed that Google performed better than others, Yahoo and Msn came in the second and third place but sometimes they switched their positions. Araby came in penultimate place. Ayna showed very weak performance and many problems with indexing, search algorithms, the authors recommended that Ayna needs

serious improvements. In [14] authors introduced a study that revealed how users interact with search engines by answering a survey which was designed by authors. The questionnaire consists of several questions. These questions were answered by two groups, the first group composed of 37 faculty members, the second group composed of 226 undergraduate students. The results showed that 57% of the respondents use two times or more the search engines whereas only 27% uses search engines only once a day and 14% of respondents uses internet one time per week and finally 2% never used internet. The authors concluded that about 84% uses internet daily. The figure below shows these ratios.

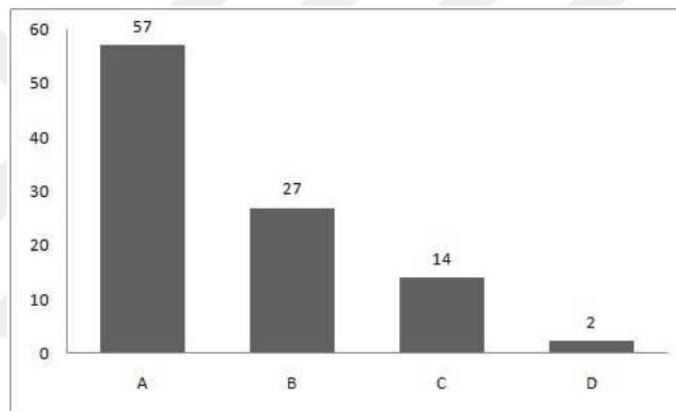


Figure 2 Use of internet [14]

For the second question, which was about if the respondents have heard about these engines (Google, Yahoo, AltaVista, ask and Bing) the results showed that Google is the most famous engine where 100% of respondents heard about it, 70% heard about yahoo, for Ask engine only 51% heard about it, AltaVista came in last position where 21% only heard about it. And finally, 48% heard about Bing.

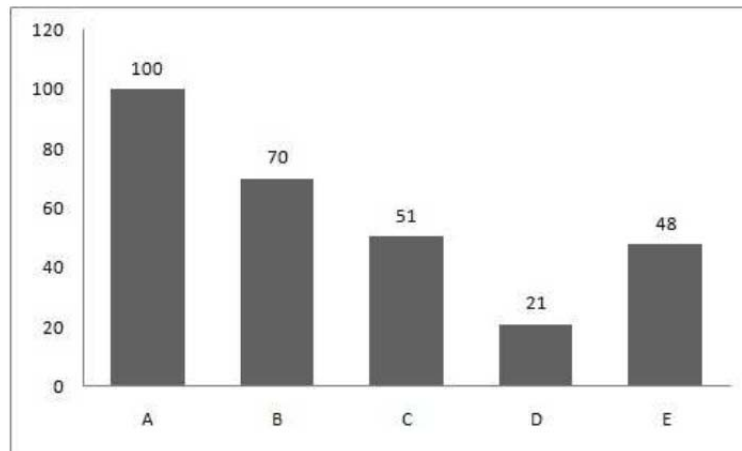


Figure 3 Famousness of search engines [14]

In term of high use of search engines Google is the most used engine about 98% of respondents uses this engine. In addition, the about 92% respondents see that the most ease use of search engine is Google. About 72% use internet for education purpose, 44% for fun, and 15% for sport purpose 5% for different things such as news, products, and lifestyle. The authors concluded based on the respondent's perspective that Google is the most widely used search engine due to its ease of use, better interference, and features as well. Another study was proposed in search engine evaluation filed in [15]. Three search engines were tested, which are (Google, Yahoo, and Bing). The test was performed in two phases, the first phase was done to assess the IR systems in these three multilingual engines between (2004- 2014) and the indexing and stemming. The results showed that Google had a best performance, Bing came in the second place while Yahoo came last. The second testing phase was performed by choosing several queries to evaluate how these search engines Google, Yahoo Maktoob and Bing deal with search queries of suitable names that were transliterated into Arabic with different spelling variants, search queries that include common spelling mistakes. The author concluded that Google is best multilingual search engine that has well prepared search results for Arabic queries. In addition, Google showed best stemming and indexing. In [16] Li. (2001) analyzed and assessed five web search tools which are (Google, solicit, AltaVista, yippee, Bing) by following two methods, the first one he compared the features of those five search engines, the second way was performed according to user's

point of view by designing a survey for this purpose. 263 respondents took place in this survey, according to their response, Google was the winner according to user's point of view. Author in [17] presented a study which was performed in Taiwan, he surveyed 758 people to see whether users use always the same search engine or sometimes users change their search engines. He found that over 95% of surveyed people between 18-30 years old, about 75% of respondents have been using internet for more than 5 years, about 95% are using internet at least one hour per day.

We should mention the reason stand behind choosing these three search engines which is simply because these three search engines are common and famous within Arabic in addition, these three search engines were used in [11,12]. In fact we met many people and asked them about which search engines they usually use, we found that the most used search engines are those three engines. Even though there are several other search engines such as Yandex.

Research Question

The most Significant question that we should answer in this research is:

RQ: What are the perceptions of Arabic users about the three search engines (Google, Yahoo, and Bing) in term of their merits?

CHAPTER TWO

BACKGROUND

In this chapter, we presented details about the main idea stands behind the way that most search engine work on. In addition, an overview of the past and current trends regarding the three search engines (Google, Yahoo, and Bing) in details. We also stated the most significant features for each engine.

2.1 How Do Search Engines Work?

Search engines can be described as an answer machines, users look for their queries using search engines, these engines in turn respond for the requested queries. Millions of requests per a second, days and nights are requested and all this giant number of users are expecting to retrieve the most relevant results. Search engine jobs characterized in two tasks:

- Retrieving the most relevant results to the query.
- Based on the popularity of the web sites, engines rank the retrieved results.

For search engines relevance has meaning furthermore than finding correct words within pages. When the era of search engines started, search engines were built on a very simple idea which is finding right words in pages, now with the giant increase of number of data on the web this simple idea will not work anymore. The complexity of search engines increased over the years, since many factors effect on the relevancy.

Engineers started to think in the popularity of sites, page, documents, the more popular sites, documents, or pages means the more valuable information within them. This way worked very well and efficiently in term of user's satisfaction degree. In order to determine the popularity, engineers developed many algorithms for this purpose instead of manual determination which is impossible to perform due to the giant number of sites,

documents etc. on the web. These algorithms rely on hundreds of factors to make their decision whether this site is popular or not.

2.2 Google History

Larry Page and Sergey Brin are software engineering students who Established Google in 1998 furthermore, began as another web search tool, today, Google is an example of American partnership. Google is one of the world market pioneers in Internet innovation and promoting administrations. These days, Google Search engine considers as the world's biggest internet searcher and the verb "to Google" has turned into a generally utilized equivalent word for seeking on the Internet. Google is a very huge foundation, about 24000 employers distributed over the world. The Analysts of Datamonitor (2011) arrive at the conclusion that "Google is one of the premier internet brands in the world." once more, the organization was positioned as the most significant brand on the planet. Comparing with other brands such as Microsoft, Coca-Cola and IBM, Google comes in the first place. Google deals with a huge number of searches, about 3 billion each day [18]. According to [19], in 2016 Google considered as the most used search engine where the market share ratio was about 64%. The idea of designing Google based on retrieving relevant results on response of a user's query. Google provides several types of searches as below:

1. Search web: information search from web.
2. Search for maps: Google maps were designed by Lars and Jens Eilstrup Rasmussen using C++ language. The company was detonated by Google. In 2005 Google maps service was lunched [20]. There are two types of view in Google maps, "top-down" view and "bird-eye" view. Google maps offer a tremendous number of locations, organizations, in all the countries around the world. Google maps search allows searching for maps for countries, cities, roads within these cities and in some locations, it supports 3D images for chosen locations. The majority of the imageries are from satellites, whereas the high-resolution imagery is an aerial photography, which were taken by the help of an aircraft.

3. Book search: Google provide this search to look for the scanned books (over 25,000 million title of book), and magazines which were scanned by Google using OCR (optical character recognition) techniques then storing it in Google database and ignoring other results such as videos, images, audios, etc. [21].
4. Search for images: this type of search preciously used for images searching. By typing a textual query as an input and retrieving images as results. Google teams are working on developing images search by entering images as inputs instead of text queries. Google images are organized in a way that user can click the thumbnail which in turn will be viewed in a box over the website that it came from. Additionally, Google groups images that are similar or almost similar to each other.
5. Video search: the results of this kind of search are only videos.
6. Search for news: Google enables users for searching news by citing from more than 4500 news sources across the world [22]. The results can be found in 35 different languages [23]. Google news service covers a huge number of publishers (over 25,000) [24]. Its front page gives generally the initial 200 characters of the article and a link to its bigger content. Google sort the results according to the date of publishing.
7. Advance search: user can specify his search to get more precious results.
8. Search operator: Google presents different options to enable users to get results that meet user's well. For instance, users can use logical operator such as or, and etc.

2.3 General Features of Google Engine

Google engine comes with many features that used which eases the use of users to this search tool in this section we presented the most important features for this search engine.

2.3.1 Google Home Page

Google home page represents the gate for users to access the internet. Google presented a modern design for its homepage, it contains Google logo which change according to

some historic events, inventions, born or death dates of scientists and other famous people. Under Google's log we can see the country name which appears according to the user location. Search box which is under Google's logo, where users can enter their queries in two different ways (text or speech). There is also a button for signing in with user accounts. If a user signs in, Google will analyze the user's interests and later on Google in turn will give useful suggestions for that user based on his searching behavior beside that, user can access his Gmail. Based on user location, Google view the spoken languages in that country, so user can change the language of the homepage according to his desire. Google also view shortcut for Google applications on its homepage, these applications were created for different purposes as stated below:

- My account: this shortcut link user to another page and give user fast access to options and other tools.
- Search: take user back to homepage.
- Maps: this shortcut to access Google maps.
- Gmail: take user into log in page of Gmail.
- Drive: Google foundation presents this service to make users able to store their files securely. Each user gets about 15 GB to store his data for free.
- Calendar
- Google plus: it is a social networking service.
- Google translate: it is a free multilingual service developed by Google to translate photos, text, sites, videos, and speech to 100 different languages.
- Google photos: user can upload, store and share his photo in an organized way.

At the bottom of homepage, there are some shortcuts which present to user different options, these are:

- Google advertises: Google offers paid advertising services for users, people from the world can advertise with Google.
- Business: users can show people their business in details, phone number, when they open and when the close, and even the locations on Google maps.

- About: it is an overview of Google Company, and what are the products created by Google.

Google also presents many other options and services to make life easy for users. For instance, users can change the out appearance of search engine such as backgrounds and themes. Users might also hide or show the number of fetched results, customize search settings. Google also supports safe search service which enables the users to filter out the results from adult contents.

2.3.2 Google Search Results

Google lists results in very organized way we will divide the search results page into four sections as shown the figure below

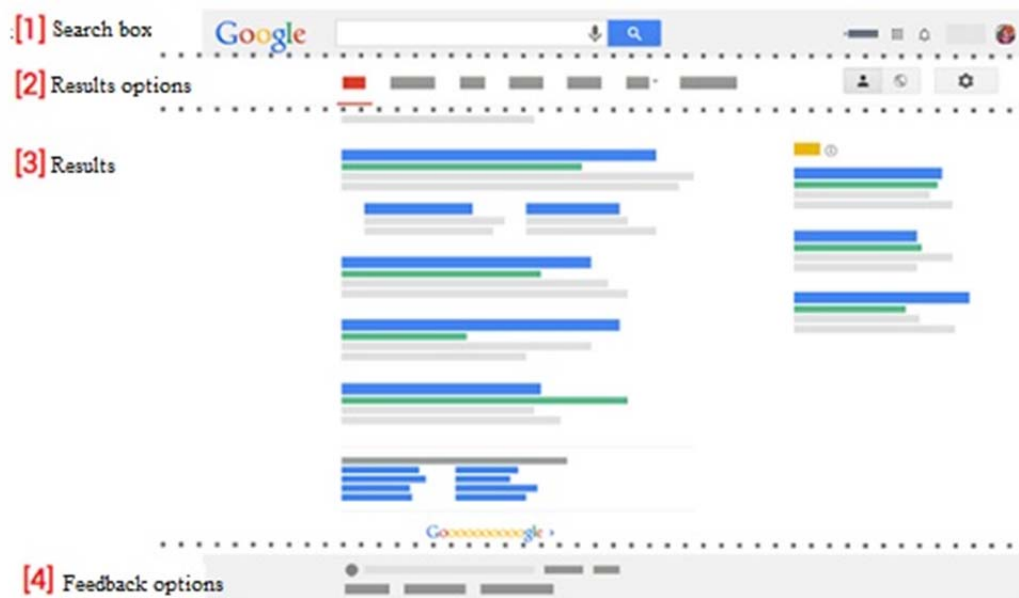


Figure 4 Google search results

1. Search box: the first section composed of search box and other shortcuts that we talked about previously.
2. Results options: the second section consists of results options, where user can change the retrieved results to one of these options (text, video, image, news, etc.). the default is showing all the types of information.

3. Results: the third section contains the retrieved results, each result can be divided to three parts as follow:
 - Title: the blue line of search tool represents the title of web page.
 - URL: represents the address of the web and appear in green color.
 - Snippet: located below the URL, it gives the user an idea whether it is relevant to the user's query or not.
4. Feedback options: section 4 we can see our current location, and users can also give Google team feedback about improving the search or the way that they view results or any other suggestions.

2.3.3 Google Search Behavior

Millions of searches performed every day, Google search engine in turn responses in very short time for these tremendous numbers of queries every second. Finding relevant items for a query among a giant number of documents is not easy thing, according to [25], there are three key processes to fetch the relevant results to the user as follow:

1. Crawling: is the procedure by which Googlebot (which is a program that dose results fetching also known as spider) search for the new and updated pages to be added to the index of Google. For this purpose, they used a big number of computers to crawl (fetch) a giant number of pages. Googlebot determines the sites to crawl, and the number of pages to crawl from each site.
2. Indexing: after crawling pages by Googlebot, these pages will be processed to compile assemble a monstrous index of the considerable number of words it sees and where these words located on each page. Although Googlebot programs process the information in key content, tags and even attributes but not all content sorts, during the indexing, the rest of unprocessed data will be processed.
3. Serving results: the search process starts when a user enters his query, Google machines will search for the most relevant pages and retrieve it based over 200 factors used to determine the relevancy [25]. Google used page ranking algorithm for ranking websites, this algorithm measures the importance of a website based on the number of links and the quality of these links.

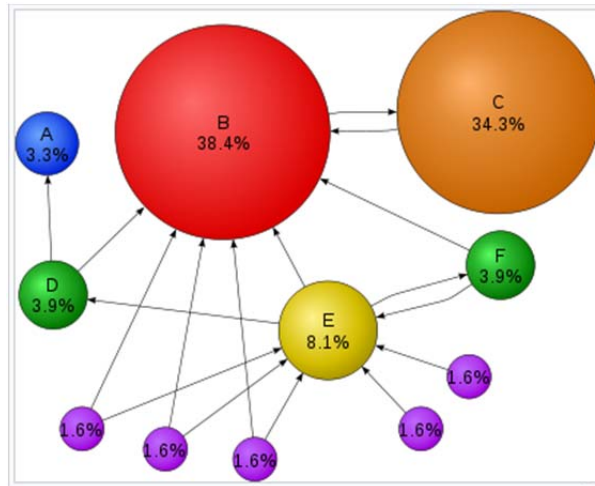


Figure 5 Page ranking in Google

To understand page ranking (PR), figure (5) shows the links between websites. Although Website (E) has number of links greater than website (C), but the PR of website(C) is higher than website (E) because the links to website(C) come from an important website which is website (B).

2.3.4 Google Privacy

Privacy is one of the big concerns of users, every search made by search engines can be traced. Google provide a service for users to avoid tracing. This sort of information help Google team to improve the performance of the search engine which in turn ease the use of Google. This collected information used to improve users experiment in different services for instance it will be used to fetch the most relevant results and advertising, help to present most related videos in YouTube, ease connecting with people. Google works very hard to keep this information away from hacker's attacks by encrypting this information. There are two kinds of information that Google collect [25] which are:

- Information presented by users to Google like personal information.
- Information collected during users use of Google search engine, for instance the highest frequently visited websites, the most watched video, interactions with specific types of advertisements and the most visited places and locations.

- Device information: such as the type that user used during his searching, operating system version. If the used device is a mobile, Google get information about mobile network.
- Log information: Google collect some information about when user use one of Google services such as details about the way of how users use services, device information such as hardware and software information, browsers languages and types, requests times and dates, and cookies.
- Location information.
- Unique application numbers: when users install or remove one of Google services.
- Local storage: collecting information about devices storages.

2.4 Yahoo History

Yahoo it is an American company established by Jerry Yang and David Filo in January 1994 and was joined on March 2, 1995[26]. Yahoo considers one of the most effective pioneers in internet era during 1990s. Yahoo search is one of the services created by Yahoo Company. In 2015 Yahoo considers the third used engine in US since the ratio of queries was 12.8% whereas 19.8% of queries were searched using Bing engine, and 64% of queries were searched using Google [27].

Initially, Yahoo search began as a web directory of different sites, composed in a hierarchy, instead of a searchable record of pages. In the late 1990s, Yahoo! developed into an undeniable entry with a search interface. In 2003, Yahoo! started purchasing services, for instance, they bought Overture Services, Inc., where AlltheWeb and AltaVista search engines were owned that time by Yahoo. At first, despite the fact that Yahoo! owned several search engines, they didn't utilize them on the principle Yahoo.com site, however, continued utilizing Google's internet searches for its results [28]. With the beginning of 2003, Yahoo search engine turned into its own particular web crawler-based. Yahoo search engine joined the capacities of all the search engine organizations they had gained, with its current research, and place them into a single search tool.

2.5 Yahoo Features

In this section, we exhibited the features of Yahoo search engine, since Yahoo like other search engine which has developed many features that used to support the search engine and increase the usability of this engine.

2.5.1 Search Types in Yahoo

In term of types of search Yahoo support several types of searches, these are:

1. Search web: Yahoo provide information search from web which is the main purpose from the existence of search engines.
2. Map search: Yahoo support map search, users can search for many information by using map search, such as getting the directions, locations, public places such as restaurants, hotels et. yahoo Maps presents interactive maps with zooming ability, traffic conditions in real time, Yahoo maps also provide users with reports in case of accidents occurrence along with driving directions.
3. Image search: users can specify their results for instance, users can determine the dimension of images (length, width), type of retrieved images (jpeg, bmp etc.).
4. Video search: user can switch between available options one of those options is the ability to search for videos.
5. Shopping: Yahoo presents a shopping service where users can shop online. Shopping page well designed, with many filtering options for search results.
6. Advance search: users can filter their retrieved results using the advanced search. Yahoo search can be customized using advance search with several options such as safe search where users can prevent the explicit contents, users can change the search engine languages according to their preferences, Yahoo also enables users to determine the number of retrieved results [29].
7. Questions and answers: it is a service where use can post his questions and get answers back from another user in all disciplines. Yahoo Answers is a group driven question-and-reply (Q&A) site or a learning market. Yahoo Answers clients with focuses for asking and noting questions, and Yahoo! Answers is a community-driven question-and-answer (Q&A) site or a knowledge market.

Yahoo! Answers award users with points for asking and answering questions and enables them for deleting a question or answer.

8. News search: Yahoo supports searching for news over the web, where users can look for news headlines, details.

2.5.2 Yahoo Home Page

Yahoo homepage at Yahoo.com gives clients access to find, expand and draw in with the news, substance, and video in the same place. Yahoo grouped several disciplines in Yahoo homepage in order to ease user access to these disciplines. Yahoo operated as a portal that provides the latest news, entertainment, and sports information for the user. The portal also gave each user access to other Yahoo services such as Yahoo! Search, Yahoo Mail, Yahoo Maps, Yahoo Finance, Yahoo Groups and Yahoo Messenger. Yahoo homepage has modern design and attractive colors. We gave an overview of the shortcuts on the home page and the mains sections with details.



Figure 6 Yahoo home page

Shortcuts direct users into the selected shortcut page for instance, home direct the user to the home page of Yahoo, mail to Yahoo mail, finance and so on as listed below

- Mail: this is links that take user into his Yahoo mail and not to other emails.
- News: news page presents daily news.
- Sports: this page gives users information associated with sports, stars news, schedules of matches, daily fantasy where Yahoo presents fantasy sports which contains extremely large user base due to offering traditional fantasy sports.

- Finance: By using Yahoo Finance users optimize their investment which requires tracking and researching.
- Celebrity: page gives news and information about stars.
- Style: Yahoo Style which is about style and fashion section and their news.
- Movies: presents information and videos about movies.

2.5.3 Yahoo Trending

Yahoo presents a leading search engine with a vast variety of Web-based services. The top 10 results of Yahoo search of the day are shown in the "Trending Now" section of Yahoo!'s homepage. This helps users by giving them a quick overview of the, most frequently searched topic of the day. All the 10 results are listed on the right of the home page.

2.5.4 Yahoo Results

We divided search results page into four sections as shown in figure below

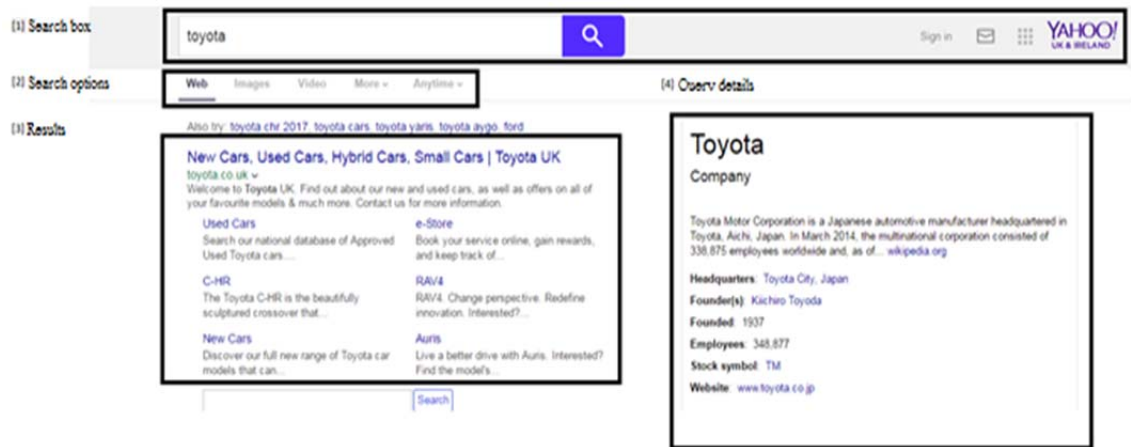


Figure 7 Yahoo results

1. Search box: section one contains the search box, where users can insert their queries.
2. Search options: section two gives extra options for the viewed results where users can insert the query and select the type of the viewed results as video, images, news etc.

3. Results: section three represents the results, where the titles are in purple color, URL can be found in below titles with green color, Yahoo also presents snappiest for the results.
4. Query details: Yahoo gives some details about the query as shown in section four in addition, yahoo also view advertisement related to the user's query.

In addition, Yahoo also shows the number of results at the bottom of the pages. Suggestions are listed also at the bottom of the pages.

2.5.5 Yahoo Search Behavior

Yahoo is one of the pioneers' Search Engine on the web when users need to discover pertinent reports. Yahoo in the beginning stages was only a directory of sites. Many of the most used HTML page formats, in addition many of the more popular file-types for instance, PDF, Excel spreadsheets, PowerPoint, Word documents, RSS/XML (Rich Site Summary/ Extensible Markup Language) and plain text files were cached and indexed by Yahoo search engine.

2.6 Bing History

Bing is one of the search engine which owned by Microsoft. Bing introduce different search service, such as web, video, images etc. previously was called (Windows Live Search and MSN Search). Microsoft calls it a "decision engine", implying that Bing tries to translate user's search queries and introduce better results. Bing first time used in 2009, the idea of changing MSN search engine to Bing search was by the chief executive officer (CEO) of Microsoft Steve Ballmer [30]. Microsoft did various advertising plans to promote the search engine and Bing obtained a market share of the overall industry in the initial couple of months of the engine's launch. Many different changes were made to the Bing search engine, for example, listing some suggestions related to the queries.

2.7 Bing Features

We highlighted on Bing features, in term of homepage design, shortcuts and other topics discussed in next section. These features discussed in details.

2.7.1 Types Searches of Bing

Bing like other search engines provide several types in term of query type as listed below:

1. Web search: Bing response for user queries and looks through millions of sites to retrieve the most relevant results.
2. Search maps: users can get directions, and locations by using Bing map which also provide several points of interest such train stations, hospitals, airports, and other public places. There are several features for Bing maps:
 - Road reviews: Street view is the default maps and shows vector imagery of streets and geography.
 - Street sides: the imageries of this feature were taken by special cameras, where Bing introduces 360 degrees for some places such as some metro places in USA.
 - Venue maps: Bing introduces over 5300 venues around the world [31].
 - 3D maps: The 3D maps in Bing enable clients to see the cities, buildings, streets etc. users are able to pan and zoom also they can rotate maps as well. To endeavor to accomplish close photorealism, each of the 3D buildings is textured utilizing composites of aerial photography. According to [32], Bing 3D maps support about 100 cities, most of these cities are located in USA, Canada and France.
 - Traffic information and Clear Flow: Bing Maps shows users current traffic information for major highways and roads.
 - Sharing and embedding maps: users can save and share maps.
3. Image search: this service allows the users to search for images.
4. Video search: user can adjust filters in this engine to get results that meet their needs such as the quality of the video, size, duration of the video etc.
5. Advance search: user can be more precious with his query due to the flexibility of use provided by Bing, which support an advance search with high functionality. Bing support logical operator and deals with queries based text, as logical query if

it contains some logical expressions, for example when user insert a query to look for (computers or mobiles), this query is the same as (computer | mobile) and the search engine deal with it as a logical query. Additionally, users also can prevent explicit contents.

6. News search: News features from different sources are totaled and arranged into sections for clients to browse, which contains top stories and classification particular articles, for example, business, governmental issues or stimulation, if there is breaking news the headline for breaking news is plainly recognized and noticeable on the top panel of the page based on user location.

2.7.2 Bing Home Page

Bing's homepage background picture changes day by day. Bing provides users information about the picture that is exhibited in the homepage. Usually the images are of renowned landmarks. The home page can be found on bing.com, logo can be found on the left side.

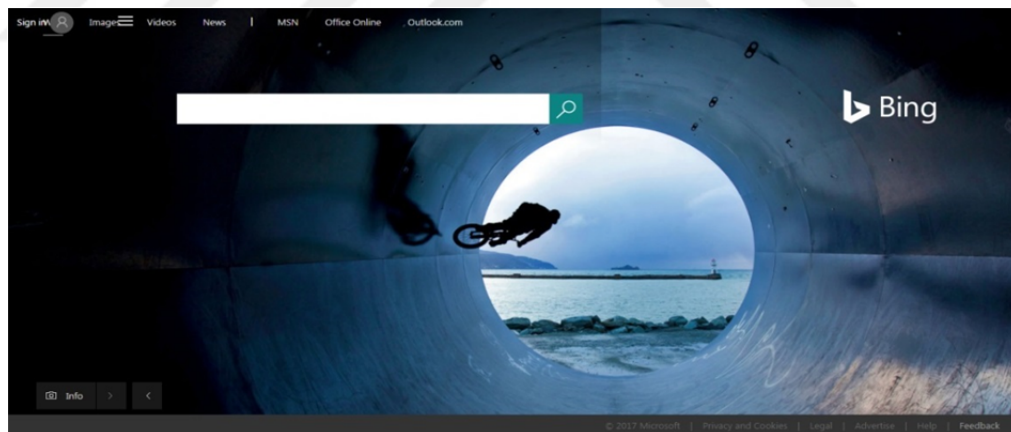


Figure 8 Bing homepage

As it can be seen in the home page of Bing search engine, there are several shortcuts available on the homepage, and these are as below:

- Office online: unlike other search engines, Bing provide a link to access Microsoft office, where user can use office application online to edit or create word, power point, etc.

- MSN: this shortcut direct user to msn search engine.
- News: once the user clicks on this link, Bing will direct him to the news page where the most recent news will be found.
- Video: search for videos.
- Images: search for images.

2.7.3 Bing Translator

Bing provides a translator powered by Microsoft, which translate instantly from one language into another. Auto language detection was added to this service, users can type or past up to 5000 letters using over than 61 languages. Bing also provides another service related to a translation which is chatting between groups of people in different languages, the service will translate the language of each individual to the known language of that individual. User should only do three steps to get enrolled to use this service.

- Registering: users register by inserting their information.
- Participating: user share the code of chatting with other users.
- Start using the service: start chatting and interaction with users.

2.7.4 Bing Results

Bing results can be divided into four main sections as it shown in the figure below:

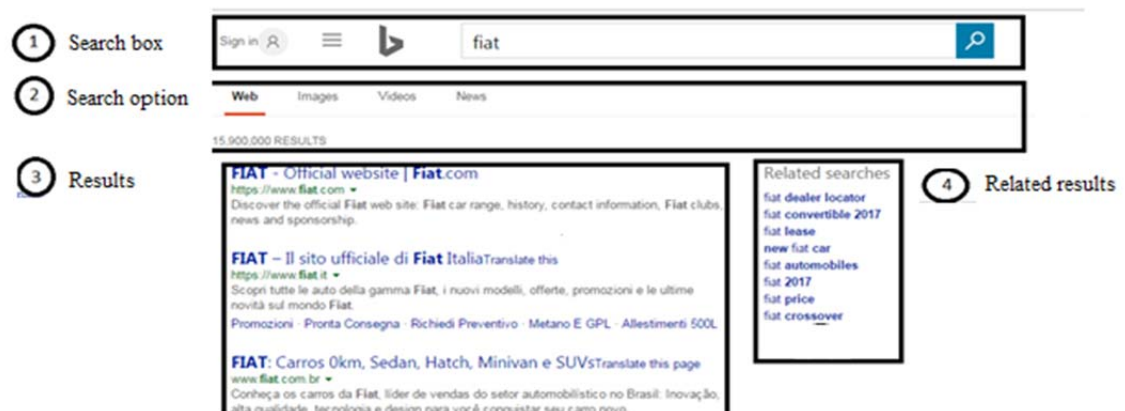


Figure 9 Bing results

1. Search box: in section one user there is a search box, Bing log which is a shortcut take the user back into homepage, sign in button, options (languages, search history, safe search etc.).
2. Search option: section two shows other options for search such as web, images, news, and videos. In addition, it also shows the number of retrieved results.
3. Results: section three shows the retrieved results with a pretty formatting where the titles are blue colored, URLs are in green and the snappiest in gray.
4. Related results: fourth section presents the related results, which could help user and increase the number of his options.

According to the previous details we see that although the three search engines performing the same functionality but each of the three evaluated search engines (Google, Yahoo, and Bing) has different features.

CHAPTER THREE

METHODOLOGY AND RESULTS

Search engines evaluation is one of the topics that researchers are interested in recently. There are several methods used to evaluate search engines from different perspectives, in our study we evaluate the most three famous search engines (Google, Yahoo, and Bing) based on Arabic user perception which is the organization, identification and interpretation of sensory information in order to represent and understand the environment. Our study required conducting a survey which explained in details in this chapter.

3.1 Survey Design

Before we discuss survey design we should know what a survey is. Survey can be defined as a list of questions prepared for a specific purpose which is extracting data from individuals or groups based on their experiments or opinions. These kinds of studies can be conducting face to face with participants, or via emails, phones, mails [33]. The main purpose of survey is to get information and give a reasonable feedback for planning or improving purposes. The processes of designing a survey consider a systematic process. There are several steps that followed to conduct our survey.

3.1.1 Identifying the Goal of this Study

The first step of this study is to determine the goal of conducting the survey which is very important since the next steps such as questions design and choosing the respondents depend on determining the goal of the study. Generally, there are two types of goals in such studies [34]:

- The first one is describing a population, for instance, a group of students are using website for university by using survey it is possible to reveal the degree of satisfaction of this group of students.

- The second type of goals is making comparisons between groups.

Although we are comparing between three search engines, but only one group of respondents are participating in this study, so we are following the first type which is describing the group. Our goal in this study is to reveal the perception of Arabic user against the three search engines (Google, Yahoo, and Bing) based on this group.

3.1.2 Choosing the Questions Types

A survey question considers a metric for things that cannot be observed directly. The questions should have two characteristics, reliability and validity to get reasonable and meaningful results [35]. Reliability is the degree to which over and over measuring a similar property creates a similar result. In another word, each review question will mean a similar thing to everybody, including those controlling the overview. Validity means how far a survey could question measures the property it is supposed to measure. In order to write a good question for a survey, we should keep in mind the goal of that survey in addition, these questions must be designed according to respondent's perspectives. Although there are many kinds of questions but each kind has pros and cons, below the most popular types of survey questions [36]:

1. Closed ended questions: this kind of questions limit the respondent's answers. The advantages of this kind many such as the time required to answer is short, answers can be easily interpreted and coded and it is perfect for quantities type of researches. It also has some cons where researchers can't extract more meaning and details from the response. Example of this kind of questions:
 - Dichotomous (answers: yes or no).
 - Multiple choice questions (answers: A, B, C and D).
 - Scale questions (answers: for example, range between 1-10).
2. Open Ended Questions: questions that respondents should write their own answers without predefined answers. For example: "What could we do to make your experience more enjoyable?". The pros of this type are that respondents are free to express about what they feel when they answer a question. In addition, researchers can extract more information from the answers of respondents. On other side, there

are some cons in this kind of studies such as time consuming, the difficulty to code the results.

- Unstructured questions (respondent's opinions, or views).
- Sentence, story or picture completion (complete a sentence).
- Thematic Apperception Test (participant give his opinion about a presented picture).

In this study, we used several types of questions for instance, dichotomous, multi choice questions, and unstructured questions.

3.1.3 Target Population

Appropriate individuals or groups should be selected to participate in the questionnaire. This population should be selected carefully, since the yielded results rely on them. Some criteria should be set to choose the right audience for the survey such as age, education level, cultural bias, familiarity with tests and languages. There are several methods to choose participants for instance:

- Simple random (pick names from a hat).
- Systematic random (i.e. every 3rd name).
- Stratified random (separate samples for each subgroup)
- Cluster sampling (treating intact groups that cannot be broken up, such as classrooms, as subjects to be sampled).

In our studies, we ask members of three different faculties work in two different universities in Iraq Kirkuk University (<http://uokirkuk.edu.iq>) and AL-QALEM University (<http://alqalam.edu.iq>) to participate to answer the questions.

We set some criteria to see whether the participants are suitable for our questionnaire or not. The participants should be using all the three search engines, and they should be using Arabic language while they are using the search engines otherwise the participant will be excluded. We told them the most important thing they should care about is avoiding bias during their answers, they should answer all the questions without neglecting any question and finally we told them to ask us if there is something

ambiguous and not clear to understand. The number of respondents was 48 from three different colleges (college of engineering, college of economy, and college of law). We should mention that the number of the academic numbers is greater than the number of participants, about 78 college members were found in these three colleges but only 50 participants (two questionnaire forms were neglected because some information was missing within these two forms) were matching our criteria which are: using the three search engines and have knowledge about the three tested search engines (Google, Yahoo, Bing). While designing our questionnaire we avoid using complex words to make sure that questions are clear and easy. The questions in this study can be divided into four sections:

- Information about the participants such as the age of participants, gender, name of college.
- Participant's experience with the three search engines (Google, Yahoo, and Bing) for instance, to what extent the participant is familiar with and knows about the three search engines?
- Search engines features: there are many common and non-common features of the three search engines, we included some of the common features in our questionnaire and excluded the non-common ones, since they are not comparable. In another word in case if included these non-common features, participants will not be able to make a choice since the compared feature might not be exist in one or two of the three engines. We tabulated these features as shown in the table below.
- In section four, the questionnaire included several types of questions such as the results, search mode, shortcuts etc.

Table 3 Engine feature

Feature	Google	Yahoo	Bing
Search web	Yes	Yes	Yes
Search images	Yes	Yes	Yes
Search video	Yes	Yes	Yes
Safe search	Yes	Yes	Yes
Maps search in Arabic	Yes	Yes	No
Search for carriers	No	Yes	No
Search for books	Yes	No	No
Shopping	No	Yes	Yes
Advertising Programs	Yes	Yes	Yes
Questions/answers	No	Yes	Yes
Snippets	Yes	Yes	Yes
Translation	Yes	No	Yes
Multi backgrounds	Yes	No	Yes

Table 4 Features details

Feature	Details
Search web	Searching for queries in the web
Search images	Searching for images
Search video	Searching for movies, videos, TV shows etc.
Advance search	This feature makes the user able to get more specific results while writing his query
Safe search	User can filter explicit search results
Maps search in Arabic	Search for maps, locations in Arabic
Search for carriers	User can search for jobs
Search for books	Ability to look for book using the titles, author's name
Shopping	Users can do search for stuff they want to do shopping
Advertising Programs	Users can advertise their products and their business as well
Questions/answers	Service make users able to ask questions and get answers from other people
Snippets	snippets are brief explanation of the contents of the page under each result
Translation	the ability of search engines to translates texts from language to another
Multi backgrounds	User can switch the background of search engine according to his well.

3.1.4 Constraints

In this study we used three search engine (Google, Yahoo, Bing) due to the popularity of these three search engines in Arabic societies, in addition these three search engines were used in [10]. We didn't use Yandex search engine because most of participants are not familiar with this search engine. To ensure from getting a vast range of opinions and avoid bias we decided to choose participants from two different universities (which are the only two universities available in Kirkuk) and from each university we selected participants from three different colleges (law, economy and engineering) so we can get different preferences and answers. The way that we followed to get the responses by designing a survey rather than interviews because interviews required more time than surveys. We should mention the reason stands behind not making a comparison between the maps of the three search engine which is missing Arabic language in Bing's maps.

3.2 Results

After collecting the forms that we distributed to the participants and the data were collected as well, then we analyzed and coded these data. Each question was coded and analyzed separately in this section we viewed the results that we got.

As mentioned previously our participants are 48 faculties members in two different Iraqi universities (24 participants from each university). All the participants are native Arabic speakers. We introduced the results for each question in our questionnaire as bellow:

Table 5 Ages of participants

Q1	University 1	University 2	Total
23-25	5	6	11
26-30	5	4	9
31-35	3	4	7
36-40	7	8	15
41+	4	2	6

As shown in table 5, we can see that participants have different ages between 23 and older than 41 years old. The majority of participants are between (36-40) whereas only 6 participants older than 40 years.

Q2: Gender: There are 28 male participants and 20 female participants.

Q3: Name of your college

Table 6 Participants' colleges

Q3	University 1	University 2	Total
Engineering college	8	8	16
Economy college	8	10	18
Law college	8	6	14

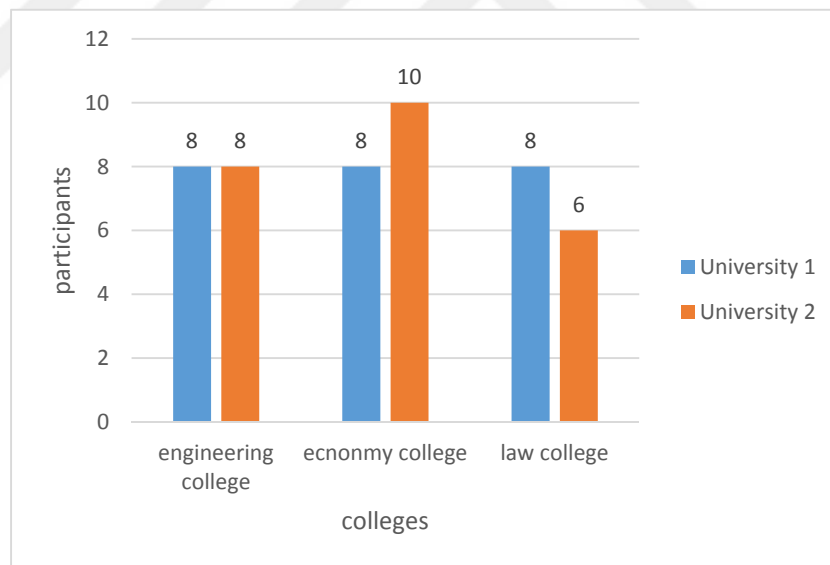


Figure 10 Participants colleges

We mentioned previously that all the participants are faculty members, where (8) participants from each college (law, engineering, and economy) in Kirkuk University (University1) participated in this study. In AL-QALEM University (University2), there

were 8 participants from college of engineering who accepted to participate in this study, 10 participants from college of economy and only 6 participants from college of law.

Q4: How long have you been using internet (using computers or mobiles)?

Table 7 Use of internet

Q4	University 1	University 2	Total
0 - 1 y	3	4	7
2 - 3 y	6	9	15
4-5 y	8	5	13
More than 5 y	7	6	12

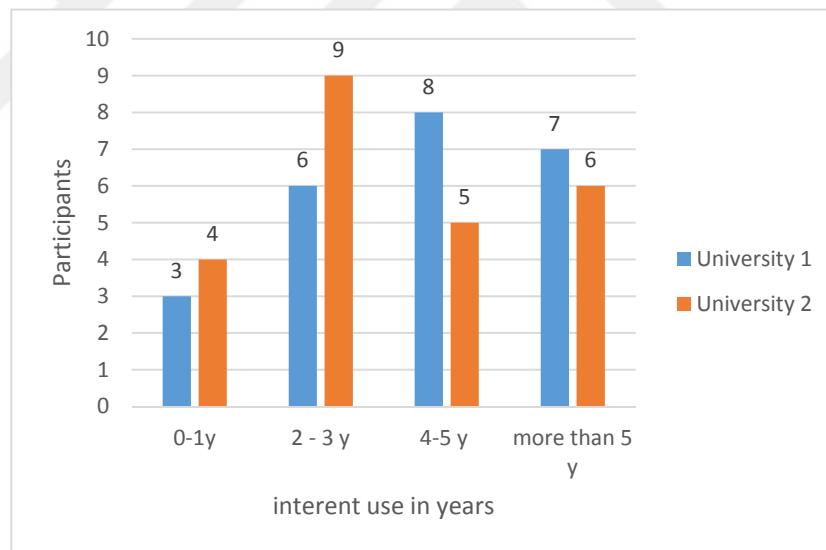


Figure 11 Use of internet

This question highlighted the experience of participants in term of the number of years for using internet; the table and the figure above clarify this.

Q5: How many hours per day do you spend on average using internet (using computers or mobiles)?

Table 8 Use of internet in hours

Q5	University 1	University 2	Total
0 – 1 h	3	3	6
2 - 3 h	7	6	13
4-5 h	8	9	17
More than 5 h	6	6	12

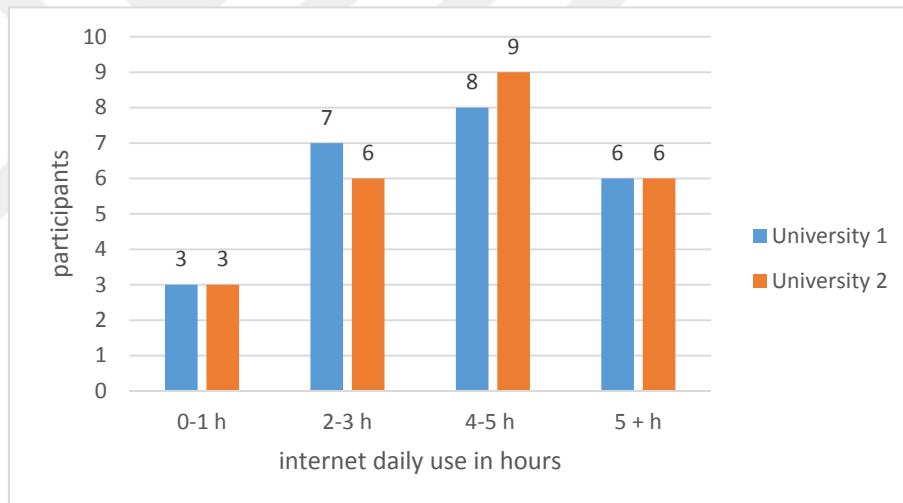


Figure 12 Use of internet in hours

The maximum daily uses of internet between participants were between (4-5) hours per day, a small portion of participants (6) used internet only for one hour. We can see that both universities are using internet in almost the same number of hours per day.

Q6: Why do you switch between search engines?

Table 9 Reasons for switching between search engines

Q6	University 1	University 2
Looking for better results	10	3
The retrieved results are not relevant	15	8
Check all the retrieved results in all the used engines	7	5
Response time	3	8

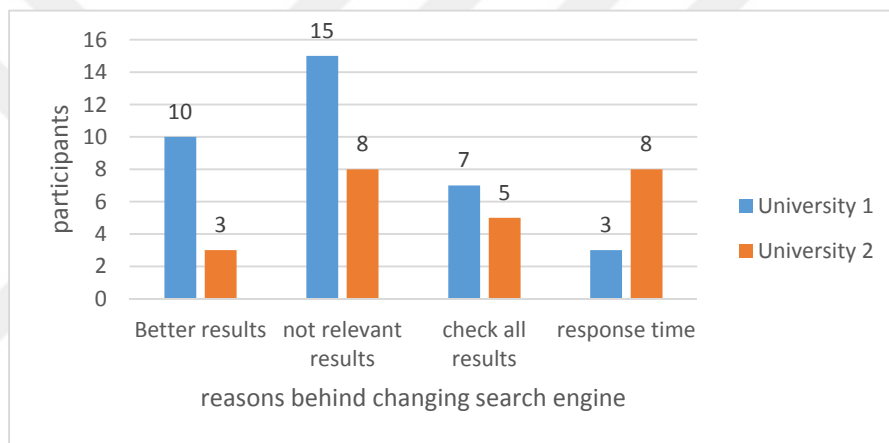


Figure 13 Reasons for switching between search engines

There are several reasons would make the use switch between search engines, we gathered the most common reasons in this question to see what make the Arabic users switch between the engines. Fifteen participants of university-1 stated that the reason of switching between users is that the retrieved results are not relevant so they look for the same query of close to it in other engines. The same thing happened when we asked the participants in university-2 this question, where 8 participants think that the retrieved results are not enough to meet their needs. Some participants look for better results and about 12 participants they want to check all the retrieved results in several search engines. It is worthy to say that 8 participants in university-2 said that when they switch between search engine to get the results as fast as it can whereas only 3 participants from university-1 agreed with them.

Q7: Which one of the three engines has more useful shortcuts on its home page?

Table 10 Shortcuts

Q7	University 1	University 2	Total
Google	8	5	13
Yahoo	4	13	17
Bing	12	6	18

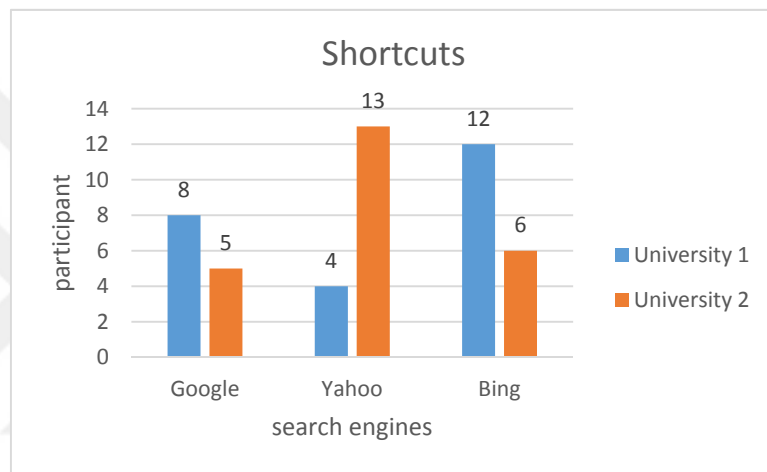


Figure 14 Useful shortcut

Our results showed that Bing came in the first place in term of useful shortcuts which are buttons found on the home page in each search engine that ease the use of the users, Yahoo came in the second place and finally Google. Although Yahoo has many shortcuts on its home page but the results showed that most participants preferred the simplicity and the usability in the Bing shortcut.

Q8: Which engine presents snippets that give clearest idea about pages' contents?

Table 11 Snippets

Q8	University 1	University 2	Total
Google	10	12	22
Yahoo	8	7	15
Bing	6	5	11

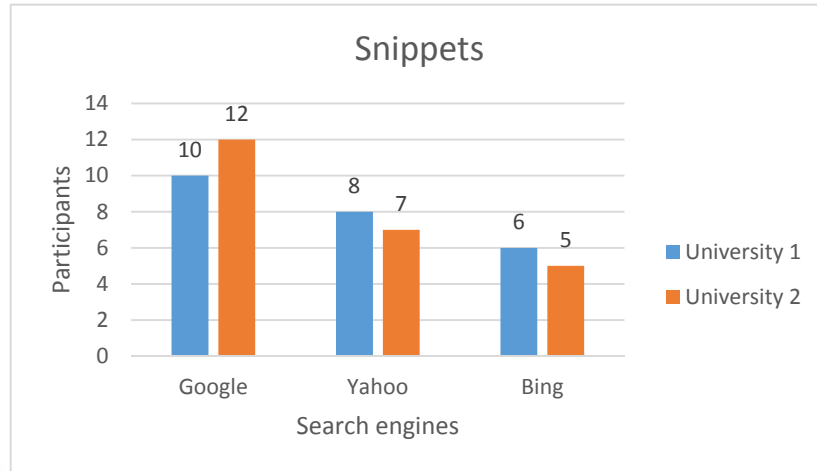


Figure 15 Clearest snippets

The results showed that Google snippets present the clearest snippets between the other two engines, Yahoo almost the same as Google and Bing came in the last place.

Q9: Are you interested in advertisement?

Table 12 Advertisement

Q9	University 1	University 2	Total
Yes	13	21	34
No	11	3	14

The results of this questions showed that 34 participants are interested in advertisements and only 14 participants showed that they don't care in advertisements.

Q10: What kind of advertisements you are interested in (if previous answer was yes)?

Table 13 Kind of advertisements

Q10	University 1	University 2	Total
Fashion	2	8	10
Cars	2	6	8
Electronic	1	10	11
Tourism	5	9	14
Education	6	7	13
Clothes	1	8	9
Other	2	4	6

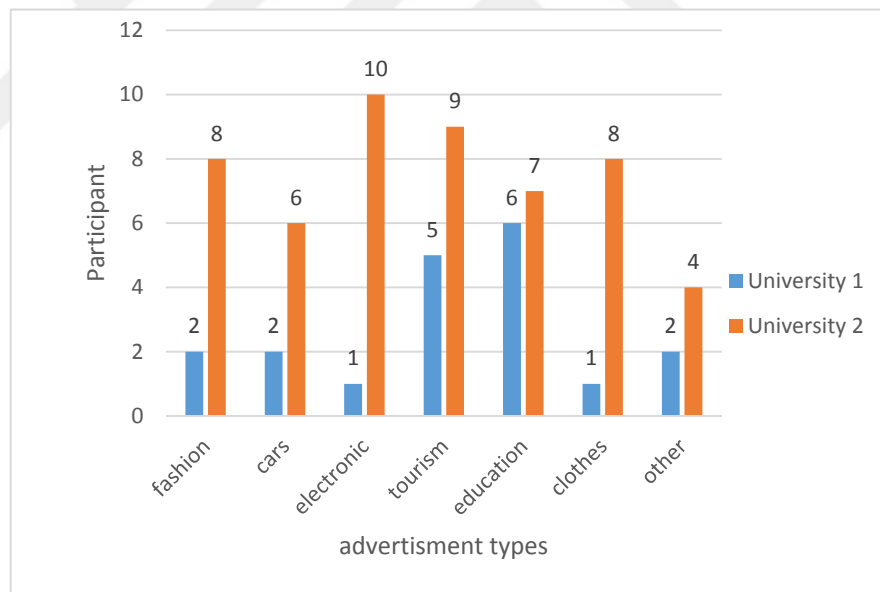


Figure 16 Kinds of advertisements

The results showed that the most common advertisement is tourism where 14 participants selected it as the most favorite advertisement.

Q11: Which engine offers closest advertisements to your interest?

Table 14 Related advertisements

Q11	University 1	University 2	Total
Google	5	8	13
Yahoo	11	9	20
Bing	8	7	15

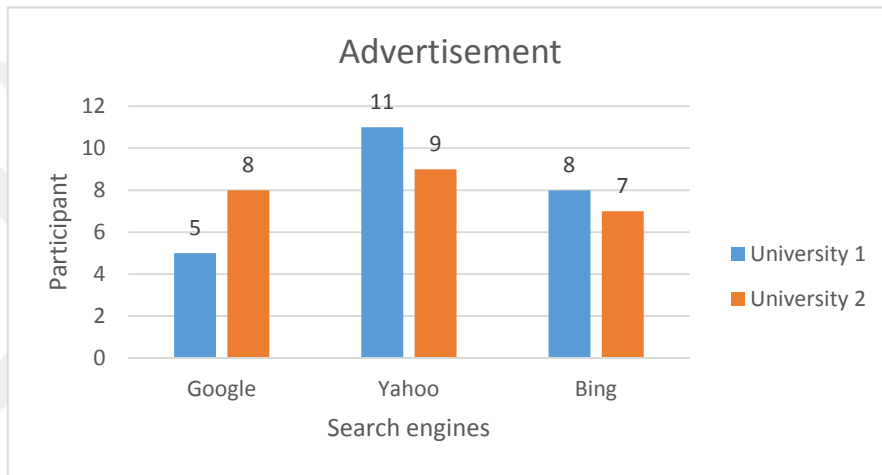


Figure 17 Related advertisements

According to the results the most search engine that presents related advertisements is Yahoo where 20 participants consider Yahoo is the best in term of retrieving related advertisements. Bing came in second place and Google in the last place.

Q12: Which search engine you usually use to do the following?

Table 15 Most used search engines for text, images and video

Q12	University 1			University 2		
	Google	Yahoo	Bing	Google	Yahoo	Bing
Search text	11	5	8	9	8	7
Search image	5	10	9	3	11	10
Search video	8	9	7	12	5	7

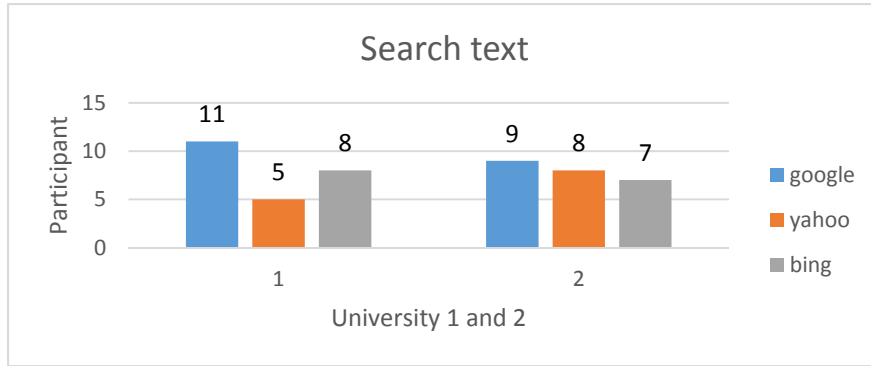


Figure 18 Text search

- Text:** Our questionnaire showed that the most used search engine in term of text is Google, were 20 participants prefer Google to search for text than another search engine. Yahoo and Bing almost the same results.

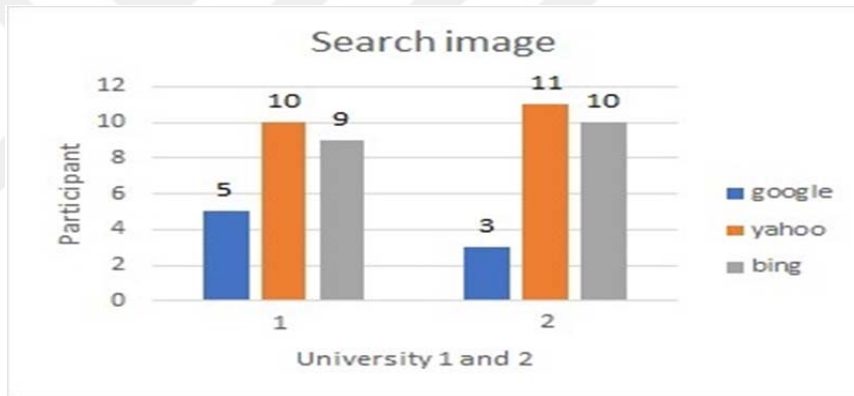


Figure 19 Image search

- Image:** With images Yahoo is more popular than other two in term of image search where 21 participants prefer search for image using Yahoo search.

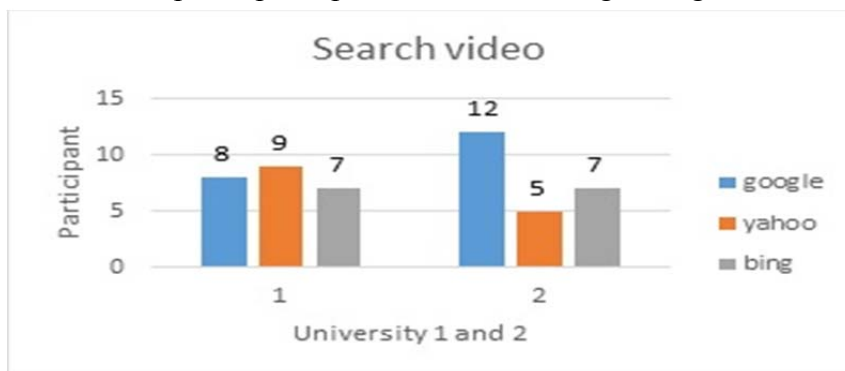


Figure 20 Video search

- **Video:** Twenty participants took see that Google is better for searching videos.

Q13: What kind of search you usually look for?

Table 16 Kind of search

Q13	University 1	University 2	Total
Academic	3	11	14
Media	10	9	19
Questions	1	4	5
Games	0	9	9
News	2	15	17
Economy	7	13	20
Health	6	8	14
Politics	7	9	16

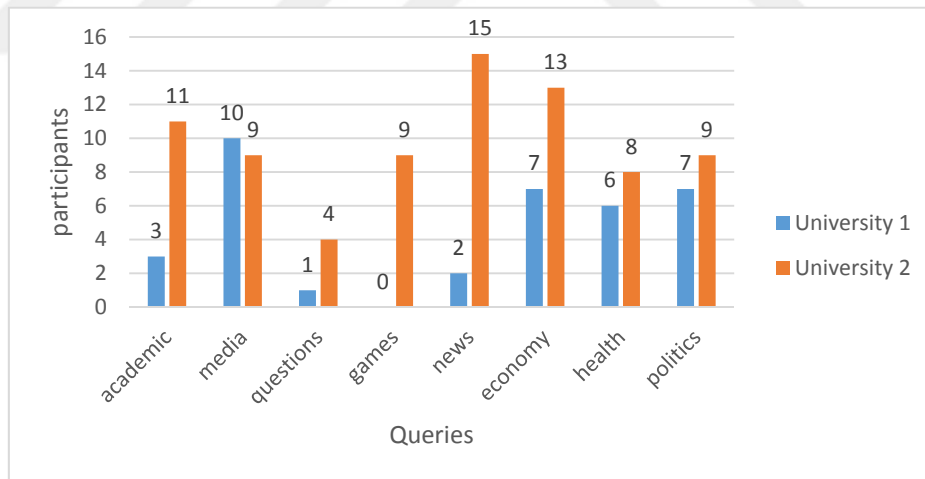


Figure 21 Kind of search

Most of the participants (20) search for topics related to economy, media came in the second place, the minimum number of topics that people are interested in is questions where only 5 participants use questions as queries. We can see that the participants in

university-2 are interested in news more than other queries where 15 participants selected news.

Q14: Which search mode do you usually use while searching in Google?

Table 17 Search mode in Google

Q14	University 1	University 2	Total
Default	14	17	31
Advance	10	7	17

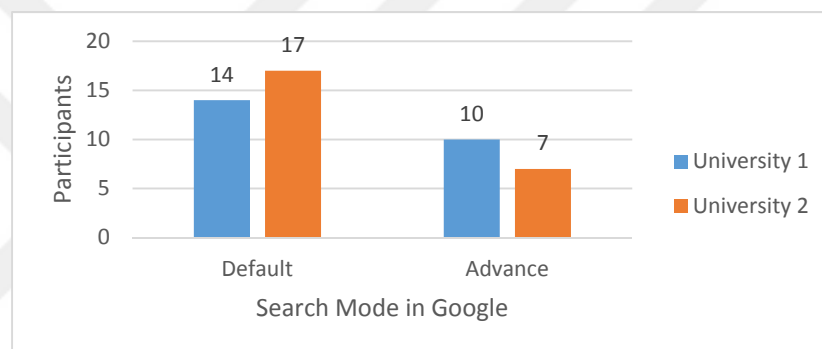


Figure 22 Search mode in Google

Thirty-one participants prefer using defaults search mode rather than using advance search mode in Google whereas only 17 participants are using advanced settings.

Q15: If your answer for question (14) was Advance setting, generally do you think with Advance setting you get more relevant results?

Table 18 Participants opinion of advance search in Google

Q15	University 1	University 2	Total
Yes	10	7	17
No	0	0	0

Only 17 participants choose advance setting in Q15, 17 participants think that with advance settings users get more relevant results with Google.

Q16: Which search mode do you usually use while searching in Yahoo?

Table 19 Search mode in Yahoo

Q16	University 1	University 2	Total
Default	14	13	27
Advance	10	11	21

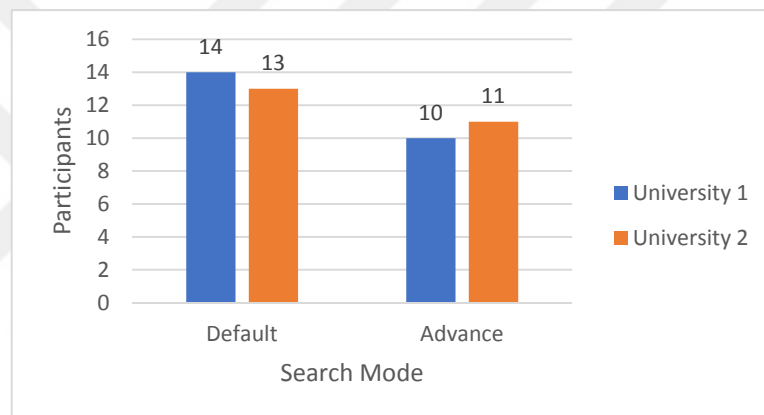


Figure 23 Search mode in Yahoo

The participant split into two parts in this question where (27) goes with defaults search settings, and the others (21) go with advance search settings.

Q17: If your answer for question (16) was Advance setting, generally do you think with Advance setting you get more relevant results?

Table 20 Participants opinion of advance search in Yahoo

Q17	University 1	University 2	Total
Yes	8	5	13
No	2	6	8

Thirteen people think that advance search in Yahoo help users to retrieve better results whereas 8 are not agreeing with this.

Q18: Which search mode do you usually use while searching in Bing?

Table 21 Search mode in Bing

Q18	University 1	University 2	Total
Default	21	23	44
Advance	3	1	4

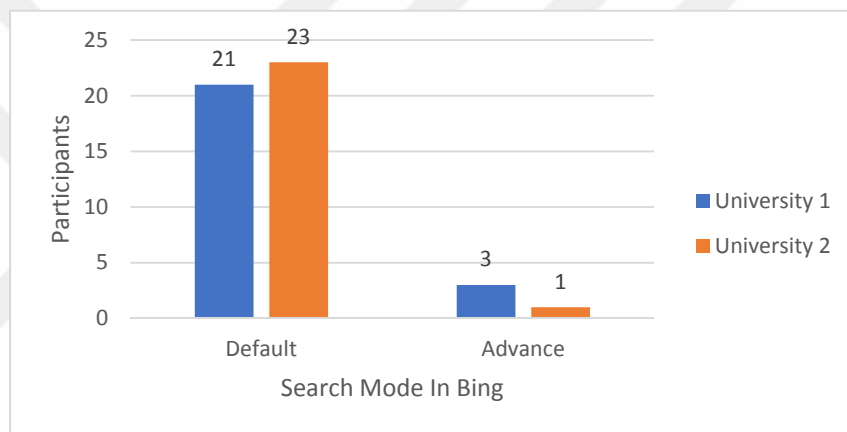


Figure 24 Search mode in Bing

We see that in Bing only 4 participants go with advance search and 44 participants selected defaults settings. That's may be explained because Bing dose not present an interface for users to filter their results.

Q19: If your answer for question (18) was Advance setting, generally do you think with Advance setting you get more relevant results?

Table 22 Participants opinion of advance search in Bing

Q19	University 1	University 2	Total
Yes	2	1	3
No	1	0	1

Three participants think that advance search mode retrieves more relevant in Bing, only one participant's thing the opposite.

Q20: When you search for query and get results do you mainly?

Table 23 Number of clicks

Q20	University 1	University 2	Total
Click 1-3 result	7	5	12
Click 4-6 results	5	7	12
Click 7-9 results	6	9	15
Click 10 results	2	2	4
Click 10+ results	4	1	5

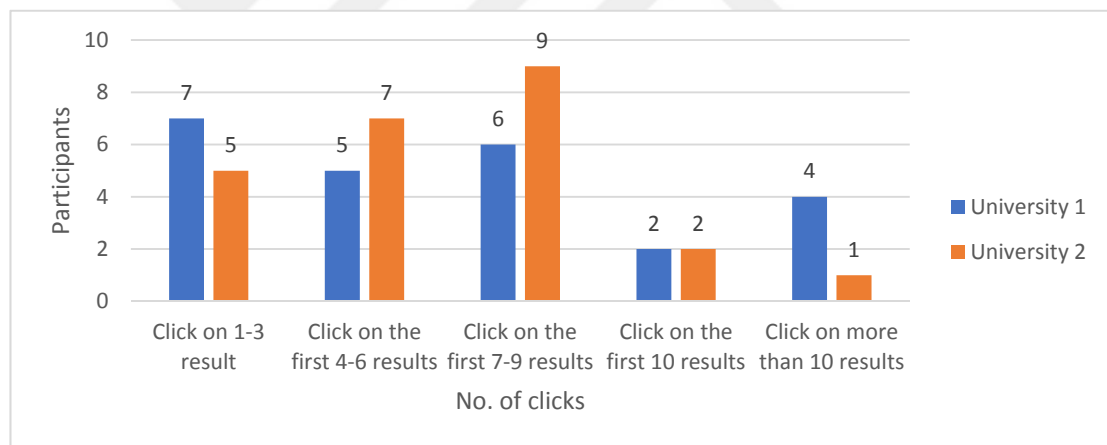


Figure 25 Number of clicks

The majority of participants click between (7-9) clicks where (15) participants stated that they click between (7-9) results. Only 4 participants click 10 results.

Q21: Do you check beyond the first page of results in Google?

Table 24 Checking the first page in Google

Q21	University 1	University 2	Total
Yes	19	15	34
No	5	9	14

Thirty-four participants stated that they check beyond the first pages, 14 participants stated that the first page is enough for them.

Q22: If the previous answer is YES, how may pages you look through?

Table 25 Checked pages in Google

Q22	University 1	University 2	Total
One page	4	3	7
Two pages	6	5	11
Three pages	6	4	10
Four pages	2	3	5
More	1	0	1

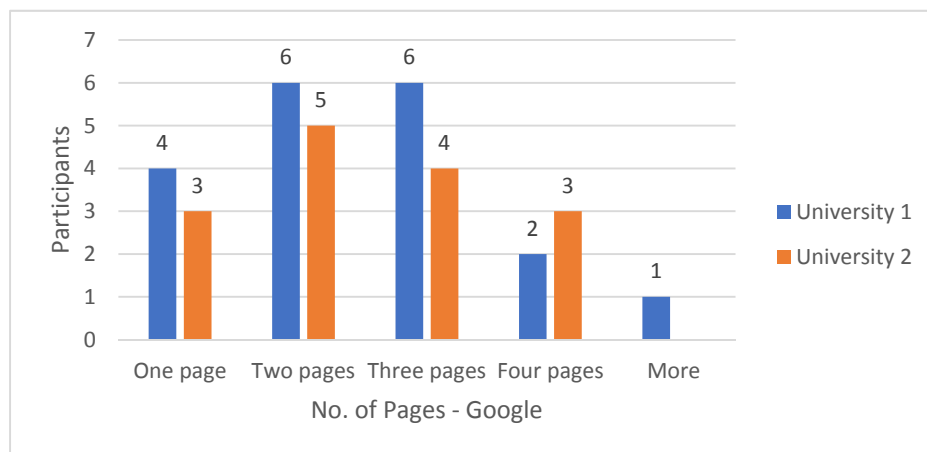


Figure 26 Checked pages in Google

The results showed that about 11 participants from both universities check the first two pages in Google; also, ten participants stated that they check the first three pages usually. Only one participant from university-1 checks more than 4 pages.

Q23: Do you check beyond the first page of results in Yahoo?

Table 26 Checking the first page in Yahoo

Q23	University 1	University 2	Total
Yes	22	18	40
No	2	6	8

Forty participants stated that they check beyond the first pages, 8 participants stated that the first page is enough for them.

Q24: If the previous answer is YES, how many pages you look through?

Table 27 Checked pages in yahoo

Q24	University 1	University 2	Total
One page	2	5	7
Two pages	3	1	4
Three pages	9	6	15
Four pages	7	6	13
More	1	0	1

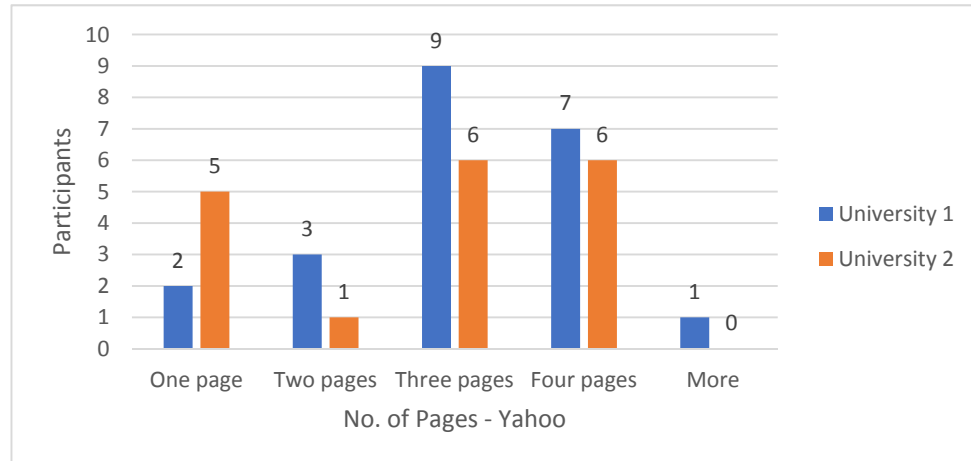


Figure 27 Checked pages in Yahoo

In yahoo 40 participants check beyond the first page and only 7 participants think that it is enough with one page. We can notice that different answers were given by the 33 participants who think that the first page is not enough, we can see that the majority of participants (28 participants) think that the first (3-4) pages is suitable to check and find what they look for.

Q25: Do you check beyond the first page of results in Bing?

Table 28 Checking the first page in Bing

Q25	University 1	University 2	Total
Yes	20	17	37
No	4	7	11

Thirty-seven participants stated that they check beyond the first pages, 11 participants stated that the first page is enough for them.

Q26: If the previous answer is YES, how many pages you look through?

Table 29 Checked pages in Bing

Q26	University 1	University 2	Total
One page	2	2	4
Two pages	1	2	3
Three pages	9	7	16
Four pages	2	4	6
More	6	2	8

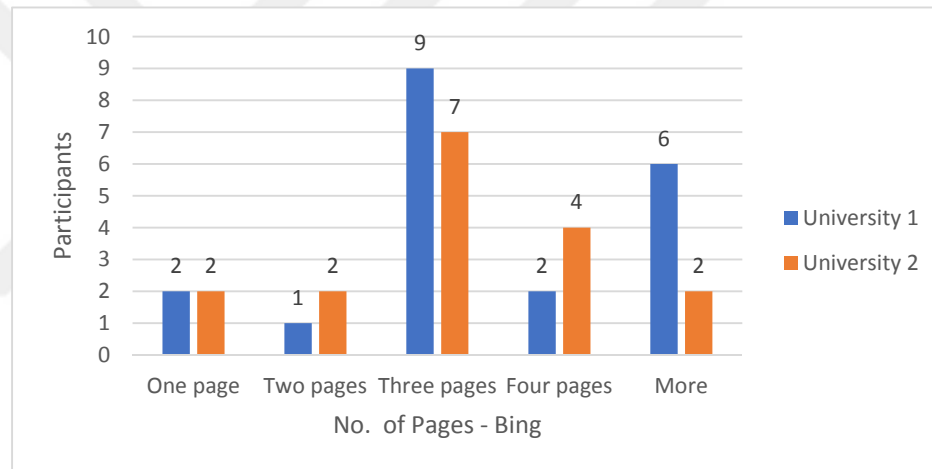


Figure 28 Checked pages in Bing

Another big number of participants think that the first page is not enough to find what they need, whereas 4 participants think it is enough.

We can see that the majority of participants (16) check the first three pages. We noticed that 8 participants check more than four pages in Bing.

Q27: In general, do you AGREE or DISAGREE that related searches are helpful?

Table 30 Agreement level in University-1 related search

Q27	University 1		
	Google	Yahoo	Bing
Totally agree	14	3	9
Partially agree	5	10	7
Partially disagree	4	9	6
Totally disagree	1	2	2

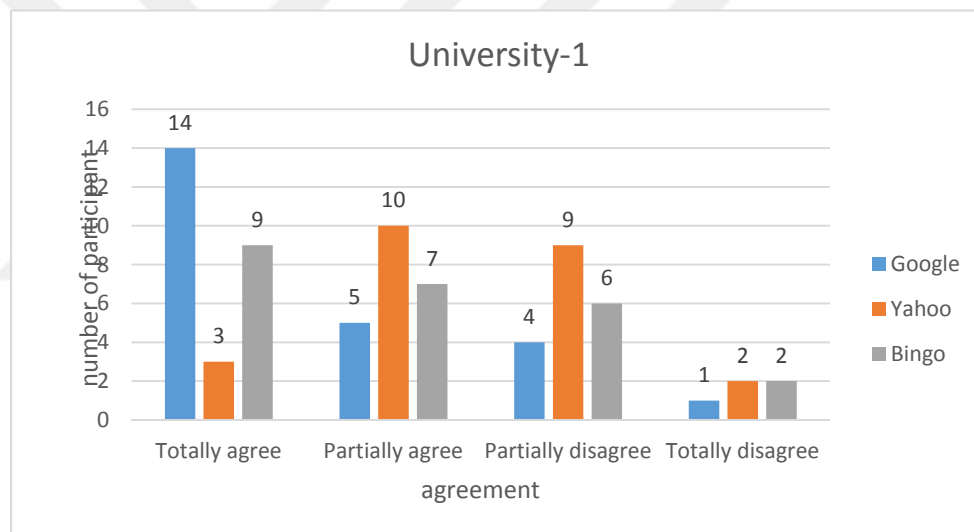


Figure 29 Agreement level in University-1 related search

Fourteen participants from university-1 totally agree with related searches are helpful in Google, only one participant in Google totally disagreed with this.

Table 31 Agreement level in University-2 related search

Q27	University 2		
	Google	Yahoo	Bing
Totally agree	11	13	10
Partially agree	10	9	10
Partially disagree	2	1	2
Totally disagree	1	1	2

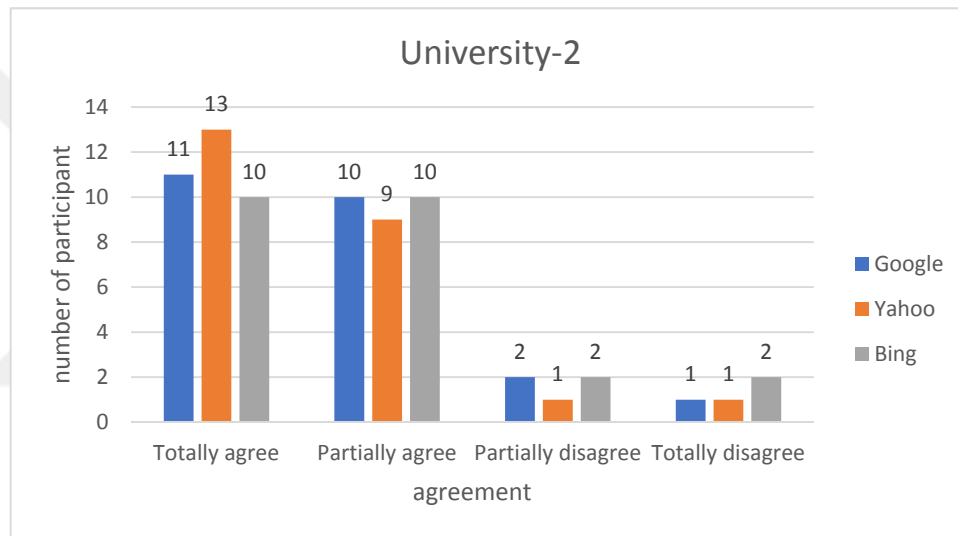


Figure 30 Agreement level in University-2 related search

In university-2 (Figure 31, table 31) we noticed different responses from the participants, where 13 participants totally agree that Yahoo related results are helpful, Yahoo is the winner according to the results. In general, most of the participants in university-2 agree that related search is helpful.

3.3 Findings and Discussions

In this section, we classified and analyzed the responses of the participants based on their genders, and ages. As we mentioned previously, 28 male and 20 females in different ages (23 to more than 41 years old) in order to see the preferences of both genders and for all participants ages.

Q4: How long have you been using internet (using computers or mobiles)?

In this question, we noticed that the experience of males in using internet is more than females since as shown in the table below:

Table 32 Use of internet by gender

Q5	Female	Male	Total
0 – 1 y	5	2	7
2 - 3 y	8	7	15
4-5 y	4	9	13
More than 5 y	3	10	13

Were the majority of females (n=8) used internet for 2-3 years, whereas the majority of males used internet more than 5 years. We noticed that most participants are increasingly using the Internet as their age increases.

Q5: How many hours per day do you spend on average using internet (using computers or mobiles)?

Table 33 Use of internet in hours by gender

Q5	Female	Male	Total
0 – 1 h	4	2	6
2 - 3 h	8	5	13
4-5 h	6	11	17
More than 5 h	2	10	12

Most of females (n=8) spend (2-3h/day) on internet and (n=11) of males spend (4-5h/day). We can say that males spend more hours per day on internet than females. We couldn't find a linear relationship between the ages and the number of hours that participants spend on internet.

Q6: Why do you switch between search engines?

Participants showed different answers divided between both males and females. We noticed that most of females and males switch between search engines to get better results or because the retrieved results are not relevant, young participants showed that they care about response time more than old participants.

Q7: Which one of the three engines has more useful shortcuts on its home page?

Most of the young participants showed their interesting in the shortcuts of Bing search engine for both males and females (f=5, m=6) another 2 females who their ages between (31 to 41+) preferred Bing's shortcuts and only 3 participants who their ages between (31-35). About 7 females preferred yahoo shortcuts and 14 males with different ages choose yahoo shortcuts as their favorite shortcuts. Three females and 10 males with different ages like Google shortcuts.

Q8: Which engine presents snippets that give clearest idea about pages' contents?

The table below show the gender distribution in term of clearest snippets:

Table 34 Clearest snippets by gender

Q8	Female	Male	Total
Google	8	14	22
Yahoo	7	8	15
Bing	5	6	11

We noticed that majority of females and males preferred Google with different ages.

Q9: Are you interested in advertisement?

Table 35 Interested in advertisement by gender

Q9	Female	Male	Total
Yes	15	19	34
No	5	9	14

The majority of males and females are interested in advertisements, most of females who are not interested in advertisements are between (31-41+), the 9 males who are not interested in advertisements have different ages.

Q10: What kind of advertisements you are interested in (if previous answer was yes)?

Table 36 Kind of advertisements by gender

Q10	Female	Male	Total
Fashion	7	3	10
Cars	3	5	8
Electronic	3	9	11
Tourism	8	6	14
Education	6	7	13
Clothes	5	4	9
Other	3	3	6

According to the results we noticed that most of females from different ages are interested in fashions, clothes, tourism more than males who showed their interesting in electronics, cars and educations more than females.

Q11: Which engine offers closest advertisements to your interest?

Table 37 Related advertisements by gender

Q11	Female	Male	Total
Google	9	4	13
Yahoo	5	15	20
Bing	6	9	15

Seven females out of 9 who their ages between (21-31) think that Google presents closest advertisements, and 15 males think that Yahoo offers closest advertisements.

Q12: Which search engine you usually use to do the following?

Table 38 Most used search engines for text, images and video by gender

Q12	Female			Male		
	Google	Yahoo	Bing	Google	Yahoo	Bing
Search text	5	7	7	15	6	8
Search image	6	9	8	2	12	11
Search video	9	4	5	11	10	9

Most of females who are between (21 and 26) preferred Google to search for text, for male different ages preferred Google for text search. Yahoo image search was the most favorite search engine for the females in term of image and 12 males also preferred Yahoo image search. In term of video search 9 female think that Google video search is better and also 11 males think the same think.

Q13: What kind of search you usually look for?

Table 39 Kind of search by gender

Q13	Female	Male	Total
Academic	6	8	14
Media	10	9	19
Questions	2	3	5
Games	3	6	9
News	4	13	17
Economy	6	14	20
Health	5	7	14
Politics	4	12	16

Most of the participants who selected games are young participants, three of them are females and the other six participants are males. We noticed that in term of news, economy and health, males are interested more than females, most of participants who selected news are between (36-41).

Q14: Which search mode do you usually use while searching in Google?

Table 40 Search mode in Google by gender

Q14	Female	Male	Total
Default	18	13	31
Advance	2	15	17

Unlike males, females are not familiar with advance search mode in Google where only two females who are (41+) years old and both of them are from engineering college.

Q15: If your answer for question (14) was Advance setting, generally do you think with Advance setting you get more relevant results?

Table 41 Participants opinion of advance search in Google by gender

Q15	Female	Male	Total
Yes	2	15	17
No	0	0	0

All the participants showed their agreement that advance settings get relevant results.

Q16: Which search mode do you usually use while searching in Yahoo?

Table 42 Search mode in Yahoo by gender

Q16	Female	Male	Total
Default	14	13	27
Advance	6	15	21

In Yahoo 6 females from different colleges and different ages use advance search mode, and 15 males as well.

Q17: If your answer for question (16) was Advance setting, generally do you think with Advance setting you get more relevant results?

Table 43 Participants opinion of advance search in Yahoo by gender

Q17	Female	Male	Total
Yes	5	8	13
No	1	7	8

Only one female and 7 males don't see advance search is useful.

Q18: Which search mode do you usually use while searching in Bing?

Table 44 Search mode in Bing by gender

Q18	Female	Male	Total
Default	18	26	44
Advance	2	2	4

The majority of male and female are using default search engine in Bing.

Q19: If your answer for question (18) was Advance setting, generally do you think with Advance setting you get more relevant results?

Table 45 Participants opinion of advance search in Bing by gender

Q19	Female	Male	Total
Yes	2	1	3
No	0	1	1

Only one male see that advance search in Bing is not useful.

Q20: When you search for query and get results do you mainly?

Table 46 Number of clicks by gender

Q20	Female	Male	Total
Click 1-3 result	6	6	12
Click 4-6 results	4	8	12
Click 7-9 results	7	8	15
Click 10 results	2	2	4
Click 10+ results	4	1	5

The majority of females click between 7-9 clicks, we noticed that most of these females are young and from different colleges. For males, different ages and colleges click between 4-9 clicks.

Q21: Do you check beyond the first page of results in Google?

Table 47 Checking the first page in Google by gender

Q21	Female	Male	Total
Yes	18	16	34
No	2	12	14

Most of females and males check beyond first page in Google, those who choose No are from different colleges and ages.

Q22: If the previous answer is YES, how many pages you look through?

Table 48 Checked pages in Google by gender

Q22	Female	Male	Total
One page	3	4	7
Two pages	5	6	11
Three pages	5	5	10
Four pages	3	2	5
More	1	0	1

We noticed that most of young male and female check only the first two pages and in some cases the first three.

Q23: Do you check beyond the first page of results in Yahoo?

Table 49 Checking the first page in Yahoo by gender

Q23	Female	Male	Total
Yes	16	24	40
No	4	4	8

Most participants whether they were males or females regardless their ages or colleges check beyond the first page.

Q24: If the previous answer is YES, how may pages you look through?

Table 50 Checked pages in yahoo by gender

Q24	Female	Male	Total
One page	3	4	7
Two pages	3	1	4
Three pages	7	8	15
Four pages	2	11	13
More	1	0	1

Most of females with different ages check the first three pages, and most of males check the first four pages.

Q25: Do you check beyond the first page of results in Bing?

Table 51 Checking the first page in Bing by gender

Q25	Female	Male	Total
Yes	15	22	37
No	5	6	11

In Bing, we noticed that number of females and males who don't check beyond the first page is increased comparing with Google and yahoo. Most of the males and females where between (21-31).

Q26: If the previous answer is YES, how may pages you look through?

Table 52 Checked pages in Bing by gender

Q26	Female	Male	Total
One page	2	2	4
Two pages	2	1	3
Three pages	8	8	16
Four pages	2	4	6
More	1	2	8

We can say that both males and females from different ages and colleges almost similar.

Q27: In general, do you AGREE or DISAGREE that related searches are helpful?

Table 53 Agreement level by gender

Q27	Female			Male		
	Google	Yahoo	Bing	Google	Yahoo	Bing
Totally agree	12	7	12	13	6	7
Partially agree	4	8	5	11	9	12
Partially disagree	3	4	3	3	6	5
Totally disagree	1	2	1	1	1	3

In general participants (male and female) showed different responses. Were the majority of females stated good respondents as totally agree that Google related search are useful. The same thing with males who presented high responses as totally agree.

CHAPTER FOUR

CONCLUSION

This study investigated in the perceptions of Arabic users to evaluate three search engines (Google, Yahoo, and Bing) to reveal how the Arabic users feel against the features and performance of these three-search engines. As mentioned previously that we used these three search engines due to the popularity that they have in Arabic societies rather than other search engines such as Yandix, we also design this survey instead of interviews due to the time required to collect the answers. Bing unlike Yahoo and Google in term of supporting Arabic language in its maps, where the Arabic language is not supported in Bing's maps so we did not evaluate the maps of these engines. Our demography were selected from two universes and from three different colleges to avoid bias and to get a vast range of answers and preferences. The majority of participants think that the design of Bing is more attractive since it changes the background periodically in contrast with Google and Yahoo. In addition, more helpful shortcuts in Bing comparing with both Google and Yahoo. Although Yahoo presents the highest number of shortcuts on its homepage, but most of the participant prefer Bing's shortcuts which mean the participants prefer the simplicity design. Google must work on improving its homepage design which is not seems to be very likable. In term of snippets Google presents the clearest snippets, Yahoo and Bing needs to work harder on snippets by giving clear and short snippets so users can know the contents of this page.

The results also showed that Yahoo presents related advertisements more than Google and Bing. We concluded that Google is the most common search engine in term of text searching, Bing and Yahoo came after Google respectively in term of search for text. In term of image searching we noticed that most of the participants consider Yahoo is the most common used search engine, Bing came in second place and finally Google. In

term of video search Google is the most used for this purpose between the Arabic users. In general all the three tested search engines have some issues in term of searching, the algorithms should be improved to retrieve more relevant results for the Arabic queries. The most used search mod in both Google and Yahoo is the default search settings whereas most of the participants in Bing use advance search. Most of participants see that the advance search is helpful in all the three search engines. Most of the participants check beyond the first page in all the three search engines, where the majority of participants showed that lowest checked pages in Google which means most of the users can find their needs within the first two pages while in Yahoo and Bing the number of the checked pages increase up to three pages or more and that indicate that there is an issue with search results ranking in Yahoo and Bing. To see how far that Arabic users, agree that related search is helpful or not, most of participants thing that Google presents a useful related work than the other two search engines. All the three engines have cons and pros based on the results that we have got. In general, the strength of Google comparing with other two search engines in term of search appears in text and video search and related search as well, whereas the strength of Yahoo appears in image search and retrieving relevant advertisements more than Google and Bing, Yahoo also show several strength sides for instance the clarity of snippets is close to Google.

We should also discuss the search mode (default and advance search mode), in both Google and Yahoo users can easily filter their results with a user interface whereas in Bing there is no interface for users to filter their results. According to our results we noticed that there are many participants who are using default mode during their searching whereas in Bing only few participants use advance mode in Bing. We were asked by many participants about Bing map which do not support Arabic language. The attractive homepage of Bing captivated many participants which make its homepage more pretty than other homepages based on the participants results. We should mention that unlike Bing, both Google and Yahoo homepages have no modern design. Our recommendation is to improve the performance in all the three engines, make the three engines support Arabic language, improve the used algorithms to enhance the results

based on Arabic queries and improve the features. In order to answer the research question, we can say that most of the Arabic users perceptions goes with Google.

Future Work

Due the giant number of Arabic users, companies and foundations should increase their focusing on Arabic users and queries as well. We are planning to test other search engines such as Yandex to cover all the used engines to reveal the point of view of Arabic users. We might use other methods for evaluating. We will do interviews rather than surveys with more participants with different carriers. We also want to see the accuracy and the reliability of location names of search engines maps by evaluating these maps based on Arabic participants.

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APPENDIX A

Survey

Section one: Participants Information

1. Age

- a) 23-25
- b) 26-30
- c) 31-35
- d) 36-40
- e) 41+

2. Gender

- a) Male
- b) Female

3. Name of your college.

- a) College of Engineering
- b) College of Economy
- c) College of Law

Questions

Section Two: participants experience

4. How long have you been using internet (using computers or mobiles) (choose one)?

- a) 0-1 year
- b) 2-3 years
- c) 4-5 years
- d) More than 5 years

5. How many hours per day do you spend on average using internet (using computers or mobiles). (Choose one)?

- a) 0-1 hours
- b) 2-3 hours
- c) 4-5 hours
- d) More than 5 hours

6. Why do you switch between search engines (select more than one if needed)?

- a) Looking for better results
- b) The retrieved results are not relevant
- c) Check all the retrieved results in all the used engines
- d) Response time

Section three: Homepages

7. Which one of the three engines has more useful shortcuts on its home page?

(choose one)

Google

Yahoo

Bing

Note: Shortcuts represents the buttons in the home pages of each engine which sometimes take us into other useful pages such as (whether, mails, news etc.).

8. Which engine presents snippets that give clearest idea about pages' contents?

(choose one)

Google

Yahoo

Bing

9. Are you interested in advertisement?

Yes

No

10. What kind of advertisements you are interested in (if previous answer was yes).

(Select more than one option if needed)?

a) Fashion

b) Cars

c) Electronics

d) Tourism

e) Education

f) Clothes

g) Others

11. Which engine offers closest advertisements to your interest? (choose one)

Google

Yahoo

Bing

Section four: Result

12. Which search engine you usually use to do the following?

	Google	Yahoo	Bing
• Search for texts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Search for images	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Search for videos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. What kind of search you usually look for (select more than one if needed)?

a) Academic	<input type="checkbox"/>
b) Media	<input type="checkbox"/>
c) Questions (Why, What,....)	<input type="checkbox"/>
d) Gaming	<input type="checkbox"/>
e) News	<input type="checkbox"/>
f) Economy	<input type="checkbox"/>
g) Health	<input type="checkbox"/>
h) Politics	<input type="checkbox"/>

14. Which search mode do you usually use while searching in **Google**?

Default setting	Advance setting
<input type="checkbox"/>	<input type="checkbox"/>

15. If your answer for question (14) was Advance setting, generally do you think with Advance setting you get more relevant results?

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

16. Which search mode do you usually use while searching in **Yahoo**?

Default setting	Advance setting
<input type="checkbox"/>	<input type="checkbox"/>

17. If your answer for question (16) was Advance setting, generally do you think with Advance setting you get more relevant results?

Yes

No

18. Which search mode do you usually use while searching in **Bing**?

Default setting

Advance setting

19. If your answer for question (18) was Advance setting, generally do you think with Advance setting you get more relevant results?

Yes

No

20. When you search for query and get results do you mainly (choose one):

- a) Click on 1-3 result.
- b) Click on the first 4-6 results.
- c) Click on the first 7-9 results.
- d) Click on the first 10 results.
- e) Click on more than 10 results

21. Do you check beyond the first page of results in **Google**?

Yes

No

22. If the previous answer is YES, how may pages you look through (choose one)?

- a) One page.
- b) Two pages.
- c) Three pages.
- d) Four pages.
- e) More.

23. Do you check beyond the first page of results in **Yahoo**?

Yes

No

24. If the previous answer is YES, how many pages do you look through (choose one)?

a) One page.

b) Two pages.

c) Three pages.

d) Four pages.

e) More.

25. Do you check beyond the first page of results in **Bing**?

Yes

No

26. If the previous answer is YES, how many pages do you look through (choose one)?

a) One page.

b) Two pages.

c) Three pages.

d) Four pages.

e) More.

27. In general, do you AGREE or DISAGREE that related searches are helpful?

• **Google** (choose one)

a) Totally agree

b) Partially agree

c) Partially disagree

d) Totally disagree

• **Yahoo** (choose one)

a) Totally agree

b) Partially agree

c) Partially disagree

d) Totally disagree

- **Bing** (choose one)

a) Totally agree

b) Partially agree

c) Partially disagree

d) Totally disagree



CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: AZEEZ, Suad

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Marital Status: Married

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EDUCATION

Degree	Institution	Year of Graduation
B.Sc.	University of Baghdad /College of Education Ibn Al-Haitham, Baghdad, Iraq	2001
High School	Al- Ramela High School	1997

WORK EXPERIENCE

Year	Place	Enrollment
2013- Present	Directorate General of Educational Planning	Assistant Manager
2009-2012	ICTD center / training department	Head of training Section Trainer
2003-2008	Department network and maintenance	Head of Maintenance Section
2001-2002	general directorate of curricula / ministry of education as a scientific checker	Research Assistant

FOREIGN LANGUAGES

English

HOBBIES

Reading, Travel, Movies, Sports.