Structure and Functions of Metasearch Engines: An Evaluative Study

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ABSTRACT

The present study systematically examines the structure and functions of metasearch engines (MSEs) viz. Dogpile, Metacrawler, DuckDuckGo and Startpage. Further, it identifies the features and services of four metasearch engines and compares them. A checklist method was used to evaluate the four metasearch engines. These check spots are prepared regarding features and services of metasearch engines. The data were collected between April 1 to June 14, 2021, spending two hours daily. Initially, the data was recorded after accessing each MSE, and later, the data was transferred to MS Excel. The study ascertained that out of 101 check spots, Dogpile scored (66) points, Metacrawler (63), DuckDuckGo (71), and Startpage (59). DuckDuckGo is ranked first among all the four metasearch engines with 70.3 %, followed by Dogpile, Metacrawler, and Startpage respectively. A checklist used in the study contains only 101 check spots to compare the metasearch engines. Further, users' perception regarding the four metasearch engines is also not covered in the present study. The present study is the first of its kind, which compares four popular metasearch engines using a checklist method. The outcomes of the study shall help research scholars, librarians, information scientists, faculty members, and common masses choose the appropriate metasearch engine. Further, the study shall also help the developers of e-resources in incorporating more features so that users can benefit.

Keywords: E-resources; Search engines; Search techniques; Dogpile; Metacrawler; DuckDuckGo

1. INTRODUCTION

Metasearch engines use multiple search systems, also called component search systems, for simultaneous search.[1] They are also known as "combined" or simultaneous search engines.[2] Metasearch engine works as an online information retrieval tool that indexes results from several other search engines. However, it does not have processing capability, whereas it compiles the top result of selected search engines in a sequence it uses for their results. Every metasearch engine cannot retrieve the result from all the search engines; instead, they use selected search engines. A single search engine is less efficient and can only retrieve relevant results up to 45 %[3]. Metasearch engines unified several other search engines' results and increased the relevancy of a result. The World Wide Web contains a boundless number of web pages that need a web application to increase the precision and recall of specific information needs. Daniel Dreilinger of Colorado State University first formulated the idea of meta searching. He developed Search Savvy

which unified the result into 20 different search engines and directories at once.[4] Metasearch is a great option for increasing the popularity of libraries and providing a wide variety of services to their users.

The categorisation of metasearch engine groups into two distinct categories viz. Pseudo MSEs and Real MSEs.[5] The pseudo metasearch engines search results from different search engines but present results in one go as a list. Moreover, search results are easy to read; however, they do not remove duplicate or open individual windows for each search engine. Contrarily, real MSEs engines focus on relevant retrieval from the most popular search engines without removing duplicate results from the search result.[6] Identifying the features and services of metasearch engines can help the users significantly. However, users face difficulties identifying the features and services and selecting the right MSE matching their requirements. No study has been conducted which evaluates the metasearch engines. Thus, the present study provides a conceptual understanding of different types of metasearch engines and evaluates the four metasearch engines so that users can select the suitable

one for getting the desired results from the World Wide Web. Further, the study also explains the features and services of metasearch engines. Moreover, the present study's findings shall help research scholars, practitioners, and future perspective students select the appropriate metasearch engine.

2. LITERATURE REVIEW

Several studies have been reviewed to comprehend the progress in metasearch engines. Meng & Yu[7] mentioned that popular metasearch engines are retrieving results from only a few general search engines. Further classified metasearch engines into two categories, namely general-purpose metasearch engines and special-purpose metasearch engines. Also highlighted, metasearch engines follow two types of approaches, i.e., major search engines and large-scale metasearch engines. Another study by Lewandowski[8] explained that because of the retrieval effectiveness of sample queries in Web search engines,it is easy to differentiate between informational, navigational, and transactional queries. However, the metasearch engine queries may be of different purposes. Kayalvizhi & Paul[9] elaborated new solutions regarding duplicate items and missing documents in the metasearch engine resulting from merging activities. Further, it suggests resulting various ways to display search results. Mori, et al.[10] reviewed metasearch engines, namely Yippy, e-Tools. ch, Carrot[2], research, and boogie, based on clustering techniques and identified some existing problems in active metasearch engines. Another study by Pandey, Shukla & Pradhan[11] compared the meta-search engines and web search engines and found that metasearch engines are more relevant in terms of precision than web search engines. However, it revealed that a metasearch engine showed a relatively smaller number of sites than a generic search engine when both searched using keywords.

Neralla[12], et al. described that the most popular web browsers match the user's query with relevant documents depending on ranking algorithms. In addition, results are ranked accordingly to relevancy and provide the relevant score and brief description of a user query. Kumar & Prakash[13] compared the precision and recall ratio in google and yahoo using simple, simple, and complex multiword queries. The study found that the precision ratio of simple multi-word queries of google is high (0.97) whereas yahoo had high precision for complex multi-word queries (0.76). Additionally, Google had a high recall of around 0.92 for simple one-word queries, while Yahoo had a higher relative recall of around 0.61 for complex multi-word queries. Another study by Kayalvizhi & Paul[9] suggests new solutions regarding duplicate items and missing documents in results during merging activities of metasearch engines. The authors also suggested collecting feedback from users to improve ranking so that the resultscan be displayed in a better way. Kanwa[22], et al. discussed that MSEs are helping users in saving their time because instead of several search engines, users can use one MSE. These search engines provide relevant results in a short time, eventually saving time for users. Nevertheless, results based on semantic query also gives results out of the context. Maille[23], et al. found that while using MSE, it extracts main phrases from the title. Also, MSE clusters the main phrases in retrieving results by a self-organising map neural network.

3. OBJECTIVES OF THE STUDY

The study aims to achieve the following:
- To identify the features and services of four popular metasearch engines, viz., Dogpile, Metacrawler, DuckDuckGo and Startpage; and
- To compare the features of four popular metasearch engines using checklist method and rank the MSEs under study.

4. METHODOLOGY AND SCOPE OF THE STUDY

Figure 1 illustrates the workflow of evaluation of metasearch engines. The study began with a comparison and evaluation of the structure and functions of MSEs. The study uses a checklist method to evaluate the four popular MSEs. The checklist method helps to decode the features provided for interpreting and decoding the textual material. The checklist method has been used in several studies in the past to compare library services, computer programmes, portals, mobile applications, etc. The checklist method was used first time in 1849 to compare the collection in the American libraries.[14-15] Hence, an online survey was conducted to ascertain the features and services of four popular MSEs with the help of a checklist. However, preparing the checklist required a thorough understanding of previous checklists for similar studies. A study conducted by de Sarkar[16] was consulted while preparing the checklist. Besides this, several other checklists were developed[17-18] for evaluating 20 metasearch engines. Study by Bhardwaj[19], Zhang and Cheung[5] was also used while for a checklist of this study. Isfandyari-Moghaddam[17] studied the search capabilities of 20 metasearch engines and compared and analysed the features of search engines using four general criteria viz. search operators, restrictors, results presentation and, other criteria. Surprisingly, no specific checklist was found which is used specifically in evaluating the MSEs.

Consequently, a modified checklist was prepared with altogether 101 check spots through the merging of the previously studied checklist, which has been updated further, including the additional checkpoints derived from the browsing of metasearch engines. Data collection was done between April 1 to June 14, 2021 spending two hours daily. Initially, the data was recorded after accessing each MSE, and later data was transferred to MS-Excel. Further, the collected data were analysed using MS-Excel and presented in Tables.

The study is confined to four metasearch engines, viz. Dogpile Metacrawler, DuckDuckGo, and Startpagewere compared. Out of the four metasearch engines under

investigation, two metasearch engines recently originated, while others are a decade long. These four metasearch engines are selected based on popularity and unique features and future potential, and based on features listed on their websites and research conducted by other researchers, and content analysis methods.

a private search engine that blocks tracker and cookies and doesn't store search history.

Startpage: It is founded in 2006. It is almost similar to DuckDuckGo; it does not store search history, and cookies provide add-on facility and app and extension features.[25]
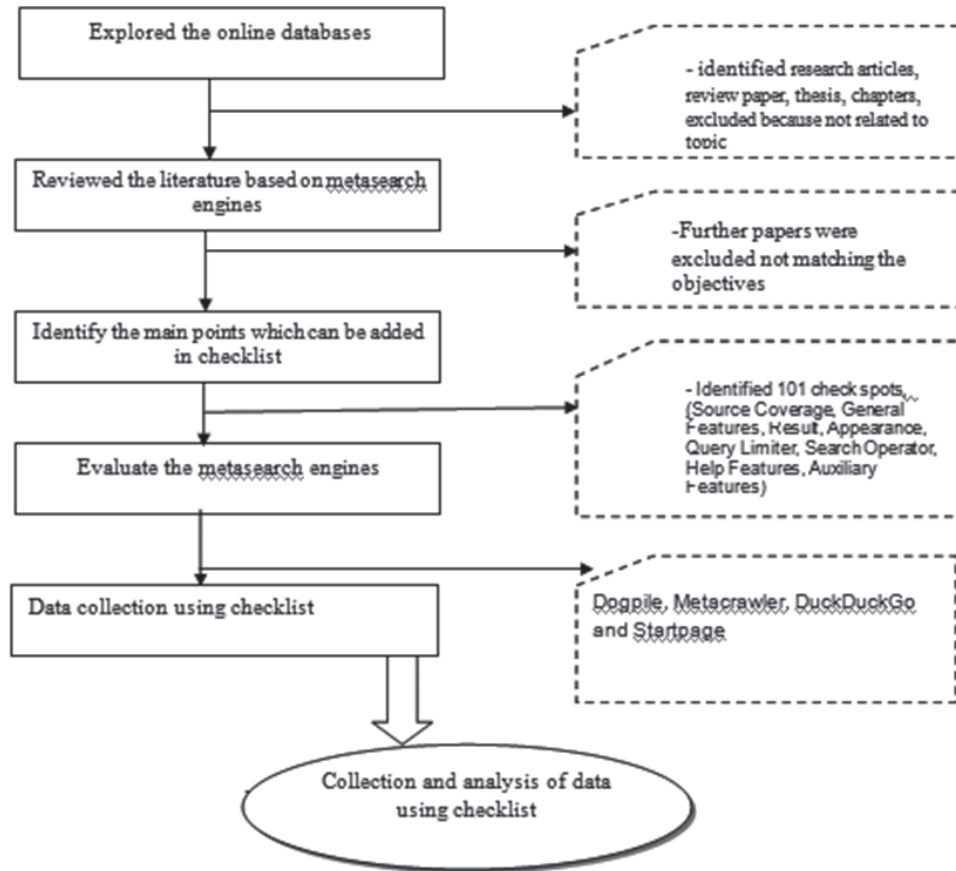

Figure 1. Steps in evaluation of metasearch engines.

5. OVERVIEW OF METASEARCH ENGINES

Metasearch is an excellent choice for searching multiple search engines at a time. Metasearch engines are divided into four types[6], the present study evaluates the four metasearch engines viz. Dogpile, Metacrawler, DuckDuckGo, and StartpageThe present study evaluates the following metasearch engines:

Dogpile: This metasearch engine became functional in 1996 and was created by Aaron Flin. It fetches the result from Ah-ah, Ask Jeeves, Fast, Findwhat, Google etc.[5] In 2008, Dogpile initiated a program name "search and rescue program" aimed to donate money to animal-related charities.[20] Dogpile is one of the oldest metasearch engines still existing.

Metacrawler: This metasearch engine collects results from Google, Yahoo, Bing, Ask and other popular search engines and it is one of earliest Web-based search engines which became operational since June 1995 whereas first developed in 1994.[1]

DuckDuckGo: It was founded by Gabriel Weinberg on February 29, 2008, in Valley Forge, Pennsylvania. It is

6. RESULTS OF DATA ANALYSIS

An evaluative study of all the MSEs features was performed with the help of a specially designed checklist and the precision ratio of all four metasearch is calculated based on the queries.

6.1 Source Coverage

Source coverage influences the popularity of the metasearch engine. Table 1 illustrates that MSEs coverage is highly variable in their range from 1 to 14 out of 21 sources. Startpage is a Netherland-based metasearch engine retrieves results from only Google search engines after 2009. DuckDuckGo is the second least source covered in this study, with seven sources, including Yahoo, Search BOSS, Wolfram Alpha, Bing, Yandex, DuckDuckGo Bot (web crawler), and Wikipedia. But it also covers several other sources. Dogpile is third-least coverage with 13 sources, including About.com, Ah-ha, Ask-Jeeves, Looksmart, springs, Search Hippo, Fast, FindWhat, Overture, Teoma, Open Directory and it also cover Google and Bing-like

search engine which share market around 92.2 % and 2.27 % respectively worldwide between May 2020 to May 2021.[21] Metacrawler covers the highest number of sources.[14] The sources cover by the metacrawler are About.com, Ah-ha, Ask-Jeeves, Looksmart, Springs, Search Hippo, Fast, FindWhat, Overture, Teoma, Open Directory, Inktomi, Yahoo, and Bing. Further, the study suggests that any of the selected metasearch engines do not dnot cover two sources, Business.com and MSN do not covered by any of the selected metasearch engines. Ask Jeeves is only covered by Dogpile. Inktomi is covered only by a metacrawler. The bottom two-source in the table, i.e., Yandex, and

DuckDuckGo Bot are only covered by DuckDuckGo. Startpage is the only metasearch engine not covering the Bing search engine.

Similarly, Wolfram Alpha and Search BOSS are only covered by DuckDuckGo. Dogpile and Metcrwaler coverage is maximum but DuckDuckGo and Startpage likely recently evolving metasearch engines that have mall coverage areas but in comparison of these two DuckDuckGo is still ahead of Startpage in the context of source coverage. Undoubtedly, MSE is an intuitive way to dig the Internet optimally by increasing Web coverage.[24] Thus, what is source coverage of the MSE is essential to know before starting the search.

Table 1. Source coverage

Search engines	Dogpile	Metacrawler	DuckDcuk-Go	Startpage
About.com	✓	✓	×	×
Ah-ha	✓	×	×	×
Ask-Jeeves	✓	✓	×	×
Fast	✓	✓	×	×
FindWhat	✓	✓	×	×
Google	✓	✓	×	✓
LookSmart	✓	✓	×	×
Open Directory	✓	✓	×	×
Overture	✓	✓	×	×
Search Hippo	✓	✓	×	×
Sprinks	✓	✓	×	×
Business.com	×	×	×	×
MSN	×	×	×	×
Inktomi	×	✓	×	×
Teoma	✓	✓	×	×
Yahoo	×	✓	✓	×
Search BOSS	×	×	✓	×
Wolfram Alpha	×	×	✓	×
Bing	✓	✓	✓	×
Yandex	×	×	✓	×
DuckDuckGo	×	×	✓	×
Score (maximum) 21	13	14	6	1

Note: ✓ means Yes and × means No.

6.2. General Feature

The studies revealed that almost all the metasearch engines included in this study support image, video, news, and web search in their interface. Table 2 illustrates that audio search is only available in Dogpile and Metacrawler. Interestingly, DuckDuckGo provides a map rendering facility for an interactive map. Dogpile and Metacrawler are unilingual and support only English,while the remaining two, DuckDuckGo and Startpage are multilingual that support different languages. All four metasearch have the features to provide related search on their interface. However, automatic suggestions regarding content exist. Metacrawlers don't have such a feature. Autosuggestion is available in the remaining three metasearch that helps during typing in the search box and automatically suggests words. The rest of the general feature, including help, private search, FAQ, and mobile and desktop support interface, is available in all metasearch engine. Except in Metacrawler, the bookmark facility is available in all three metasearch engines like Dogpile, DuckDuckGo, and Start page. Comparing the overall general feature of all four metasearch engines DuckDuckGo and Dogpile has a maximum score of 15 out of 17 features. Startpage and metacrawler have 14 and 13 respectively.

6.3 Result Appearance

Result appearance means how retrieved result appears in the metasearch engine with their basic format. Metasearch engines retrieve the result from multiple search engines. Search engine source is also available in all four metasearch engines, while clicking the result hyperlink directs the navigator to their respective website. The adult filter feature helps us to remove adult content from the website; that feature is also available in all meta-search engines; somewhere, it is also known as a safe search. A Uniform Resource Locator is available in all metasearch engines for the result retrieved from multiple sources. The sequential number is not mentioned in metacrawler because it provides the provision of the infinite scroll, but the remaining metasearch engine provides a sequential number at the end of the page maximum of up to five mentioned on one page; the next option is given for further scroll. The translation facility is only mentioned on the DuckDuckGo interface. The DuckDuckGo and Startpage is a private search engine hence the private view of results provides an anonymous feature on their website. But Metacrawler and Dogpile don't provide any such feature. Opening a new tab and using a keyword shortcut on a particular metasearch

Table 2. General features

Features	Dogpile	Metacrawler	DuckDcukGo	Startpage
Image search	✓	✓	✓	✓
Video search	✓	✓	✓	✓
News search	✓	✓	✓	✓
Web search	✓	✓	✓	✓
Audio search	✓	✓	×	×
Map Rendering facility	×	×	✓	×
Search box	✓	✓	✓	✓
Multilingual	×	×	✓	✓
Unilingual	✓	✓	×	×
Related searches	✓	✓	✓	✓
Autosuggestion	✓	×	✓	✓
Help	✓	✓	✓	✓
Private search	✓	✓	✓	✓
FAQ	✓	✓	✓	✓
Bookmark	✓	×	✓	✓
Mobile support	✓	✓	✓	✓
Desktop support	✓	✓	✓	✓
Score (Maximum) 17	15	13	15	14

engine interface is available in all selected metasearch engines. While talking to search filters Dogpile, Startpage and DuckDuckgo provide search filters, but Metacrawler does not have such an option on their interface. In this category feature listed in table 3,the maximum score is obtained by DuckDuckGo (11), followed by Startpage (10), Dogpile (9). The lowest score is obtained by Metacrawler (8).

engine that will increase the effectiveness of search result and help to get exactness in their result. Search operators are very common in any of the databases and using the search operator for searching the result is an art. In this checklist total of 11 check spots is mention where all the check spots are tested by using different types of queries in their respective selected metasearch engine with their appropriate designation. The study found that every search

Table 3. Result appearance

Features	Dogpile	Metacrawler	DuckDcukGo	Startpage
Description	✓	✓	✓	✓
HTTP/ HTTPS address	✓	✓	✓	✓
Search Engine Source	✓	✓	✓	✓
Adult filter	✓	✓	✓	✓
URL link of search result	✓	✓	✓	✓
Sequential number	✓	✓	×	✓
Translation	×	×	✓	×
Anonymous view	×	×	✓	✓
Search filter	✓	×	✓	✓
Open in new Tab	✓	✓	✓	✓
Keyword shortcut	✓	✓	✓	✓
Score (Maximum) 11	9	8	10	10

6.4. Query Limiter and Search Operators

Query limiters help to limit the result to a certain extent and filter the result. Language and date limiter are available in all the metasearch engines, but the place limiter is only available in DuckDuckGo. The regional filter and theme change option is available only in the setting section of DuckDuckGo and Startpage, but these features are not available in the remaining two metasearch engines. The result per page limiting option is also given in Dogpile, Metacrawler, and Startpage but not in DuckDuckGo because that has a provision of infinite scroll. One more limiter is not possible in any of the metasearch engines that popular search engines like google provide the maximum number of results (Hits) per query. The sorting option on either side from a-z or z-a is unavailable in any of the metasearch engines. Similarly, the limiter like oldest to latest or latest to oldest is also unavailable in selected metasearch engines. Table 4 illustrates that DuckDuckGo scored the highest (5) points along with Startpage (5) points, while Dogpile and Metacrawler scored 3 points each.

Table 5 giving check spots of search operators which help users to customize the search query in metasearch

operator selected as check spots in the checklist is working on all the selected meta-search engines and it is done manually on the search engine interface. Thus, all the metasearch engines get the maximum score of 10 out of 10 in this table.

6.5 Help Features

Help features are essential for the success of search engines and provide ease to users in using its services. The study found that every metasearch engine has an online tutorial on a different online platform and the user will easily learn how to access the search engine. Some metasearch engines like DuckDuckGo support Twitter, Blog, privacy newsletter, and Reddit-like features, whereas Startpage also supports all these features plus Facebook, youtube. The remaining two metasearch engine has no such detail to support this online platforms, but the remaining search engine also provides online chat. Hide message is not supported by Metacrawler, but the remaining have this option on their interface. It is identified that all four-metasearch engine has enough help features. Still, some metasearch engines provide

Table 4. Query limiter

Limiter	Dogpile	Metacrawler	DuckDcukGo	Startpage
Language	✓	✓	✓	✓
Date	✓	✓	✓	✓
Place	×	×	✓	×
Regional filter	×	×	✓	✓
Theme	×	×	✓	✓
Result per page	✓	✓	×	✓
Maximum result	×	×	×	×
Sorting by a-z	×	×	×	×
Sorting by z-a	×	×	×	×
Filter from latest to oldest	×	×	×	×
Filter from oldest to lastest	×	×	×	×
Score (Maximum) 11	3	3	5	5

Table 5. Search operator

S. No.	Operators	Dogpile	Matacrawler	DuckDuckGo	Startpage
1.	General search	✓	✓	✓	✓
2.	Complex search	✓	✓	✓	✓
	Boolen operator				
3.	AND	✓	✓	✓	✓
4.	OR	✓	✓	✓	✓
5.	NOT	✓	✓	✓	✓
6.	Parentheses	✓	✓	✓	✓
7.	Proximity	✓	✓	✓	✓
	Other operators				
8.	Phrase	✓	✓	✓	✓
9.	Truncation	✓	✓	✓	✓
10.	wildcard	✓	✓	✓	✓
	Score (Maximum) 10	10	10	10	10

*Note: ✓ means Yes and × means No. * For website address, pl. refer to Table 1*

extra features for the user to interact with friends and family. Table 6 indicates that DuckDcukGo and Startpage scored (11) points each, followed by Dogpile (10). The lowest points are scored by Metacrawlers (9).

6.6 Auxiliary Features

Some auxiliary features are useful to Internet users to effectively use MSEs. Therefore, the study also ascertained the availability of such features in MSEs.

Table 7 illustrates that the total number of hits and response time per query features are not available in any of the MSEs. Hyperlinking of the result displayed and typing provision of an upper and lower letter in the search box is also available in all the metasearch engines. DuckDuckGo and Startpage are privacy-based search engines; hence, both only provide privacy settings. All the results in a single page feature do not exist in any of the MSEs. Print is possible in all meta-

Table 6. Help features

Features	Dogpile	Metacrawler	DuckDcukGo	Startpage
Online tutorial	✓	✓	✓	✓
Help message	✓	✓	✓	✓
Online chat	✓	✓	✓	✓
E-mail facility	✓	✓	✓	✓
Query submission	✓	✓	✓	✓
Hide message	✓	×	✓	✓
Advertisement	✓	✓	×	✓
Newsletter	×	×	✓	✓
Spelling adjustment	✓	✓	✓	✓
Online communities	×	×	✓	✓
About us	✓	✓	✓	✓
Score (Maximum)11	10	9	11	11

search engines except Startpage. Startpage follows the privacy policy for their retrieved result. Terms of use are not mentioned in the DuckDuckGo and Startpage, maybe because they follow strict privacy guidelines. The unit of measure in a setting is available only in DuckDuckGo, while the unit of temperature setting is only available in Startpage on Celsius and Fahrenheit scale. The site encryption provides by DuckDuckGo and Startpage. Some of the important features are that lack in Dogpile, Metacrwaler, and Startpage are available in DuckDuckGo like Hakone will help to reduce the risk of a security incident, Favicon that is a small icon at the bottom right of search results associated with those particular websites, the page break number and lines, and recipe search is only available in DuckDuckGo metasearch engine. Table 6 shows that the maximum score is attained by DuckDuckGo (14) points, followed by Startpage (8) points, Dogpile (6), and Metacrawlers (6) points.

6.7 Comparative Feature-wise Analysis of MSEs

Table 8 shows the comparative features of four metasearch engines and shows number of features available in each MSE. Further, feature wise analysis was done and illustrated in Table 9. Table 9 reveals that Search operators selected for metasearch engines scored the highest, 100 % followed by Help features at 93.2 %, with a result appearance 84.1 %. Query limiters received the lowest score of 36.4 %. Some categories, such as auxiliary features, Source coverage, received less than a 50 % score. These areas need more attention to improve

the metasearch engine functionality. The metasearch engine under study obtained above 70 % score only in four categories: general features, result appearance, search operators, and help features. The remaining three categories perform below average in delivering the services (Fig. 2).

6.8 Total Score and Ranking of MSEs

The data captured after accessing each MSE was analysed using a five-point rating scale. The evaluation checklist was used on all four MSEs to avoid biases in analysis. Further, a numerical rating was assigned to each feature of the MSEs. Maximum score in the checklist was 101 check spots wherein scale followed is:(1) 90-101 is rated as Excellent; (2) 80-89 is considered Good; (3) 70-89 is ascertained as 'above average'; while (4) 60-69 average. It is ascertained that less than 59 shall be rated 'Below average' on the basis of accumulated score in Tables 2-8. Table 10 illustrates the cumulative scores of each metasearch engine wherein DuckDuckGo, scores 71 points (70.3 %) and is rated 'Above Average'. Another MSE namely Dogpile with 66 points (65.3 %) and Metacrawler 63 (62.4 %) are ranked 'Average'. Another MSE namely Startpage with 59 (58.4 %) is rated 'Below Average' using the score defined in the checklist. Three sites scored less than 70 % and did not have certain basic functionalities. None is ranked 'excellent' as per the scale defines in the study. It is found that all four-search engine lacking in various advance features and developers should work on those (Fig. 3).

Table 7. Auxiliary features

Features	Dogpile	Metacrawler	DuckDuckGo	Startpage
Review	×	×	✓	×
Total number of hits	×	×	×	×
Response time per query	×	×	×	×
Snippet feature	✓	✓	✓	✓
Hyperlink of the result displayed	✓	✓	✓	✓
Typing provision of upper and lower cases in search box	✓	✓	✓	✓
Privacy setting	×	×	✓	✓
Duplicate result avoided	✓	✓	✓	✓
Provision of all result in a single page	×	×	×	×
Print	✓	✓	✓	×
Terms of use	✓	✓	×	×
Privacy score	×	×	×	✓
Unit of measure in setting option	×	×	✓	×
Site encryption	×	×	✓	✓
Hackone	×	×	✓	×
Favicons	×	×	✓	×
Page break numbers	×	×	✓	×
Page break line	×	×	✓	×
Unit of temperature setting	×	×	×	✓
Recipe search	×	×	✓	×
Score (maximum) 20	6	6	14	8

Note: * Website address, see Table 1
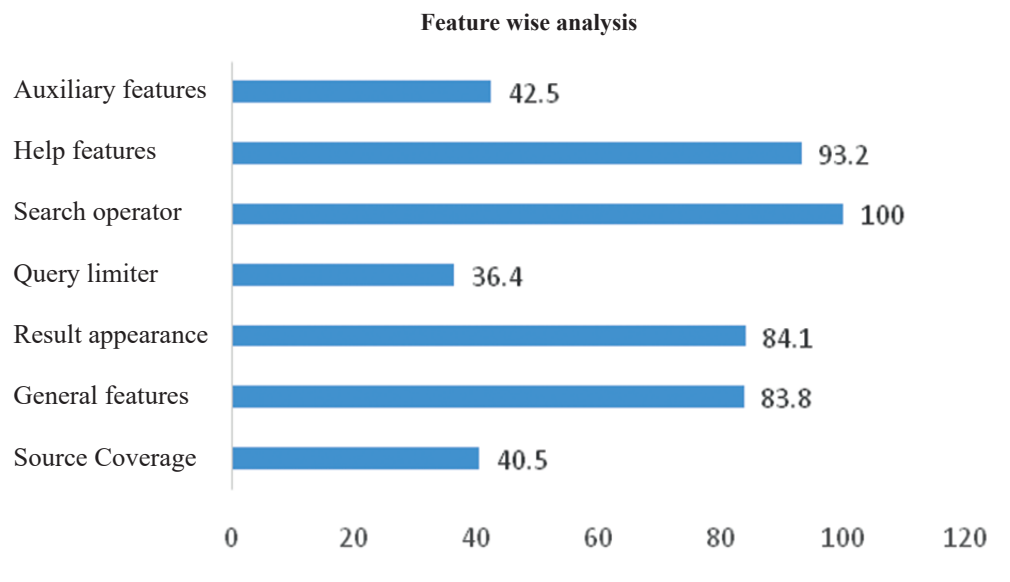
Feature wise analysis
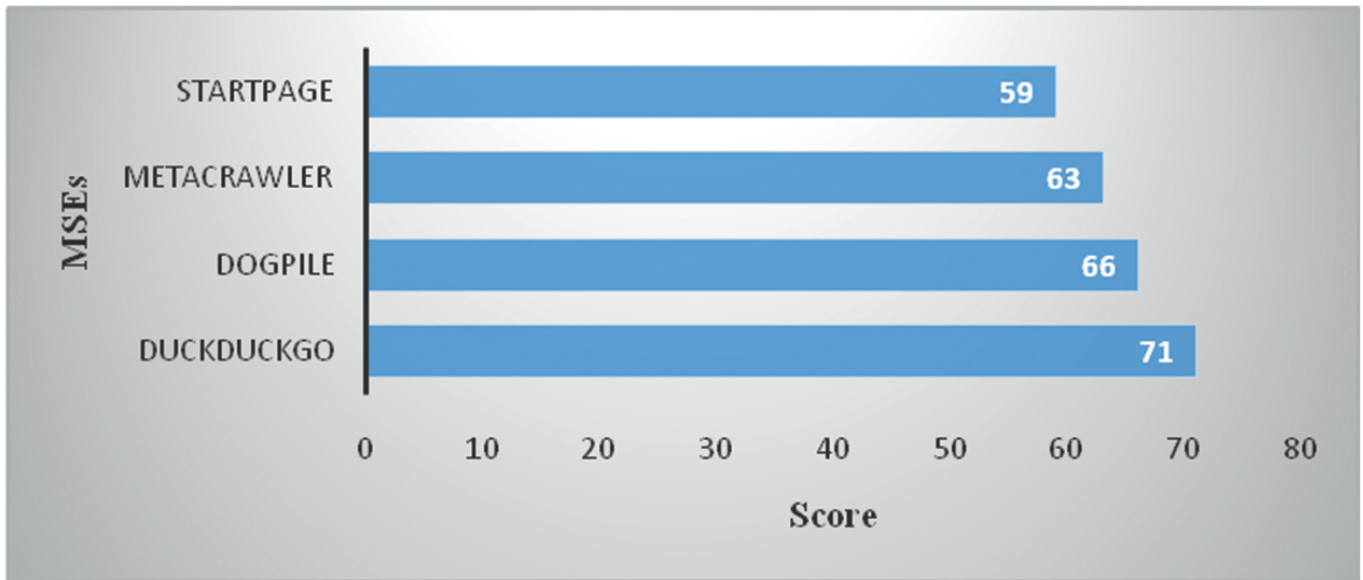

Figure 2. Feature-wise analysis of MSEs.

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Figure 3. Score after analysis of MSEs.

Table 8. Comparative feature-wise analysis of MSEs

No.	Features (No)	Dogpile	Metacrawler	DuckDuckGo	Startpage
01	Source Coverage (21)	13	14	6	1
02	General Features (17)	15	13	15	14
03	Result Appearance (11)	9	8	10	10
04	Query Limiter (11)	3	3	5	5
05	Search Operator (10)	10	10	10	10
06	Help Features (11)	10	9	11	11
07	Auxiliary Features (20)	6	6	14	8
	Score (Maximum -101)	66	63	71	59

Table 9. Feature-wise analysis of metasearch engines (MSEs)

No.	Feature	Total score	Percentage
01	Source coverage	34/84	40.5
02	General features	57/68	83.8
03	Result appearance	37/44	84.1
04	Query limiter	16/44	36.4
05	Search operator	40/40	100
06	Help features	41/44	93.2
07	Auxiliary features	34/80	42.5
	Score: (Maximum -404)	259/404	64.1

Table 10. Total score and ranking of MSEs

ASNSs	Total score	% of features	Rank
DuckDuckGo	71/101	70.3	Above Average
Dogpile	66/101	65.3	Average
Metacrawler	63/101	62.3	Average
Startpage	59/101	58.4	Below Average

7. CONCLUSION

DuckDuckGo is ranked first among all the four metasearch engines with 70.3 % features availability followed by Dogpile, Metacrawler, and Startpage. Hence DuckDuckGo has more features compared to three other MSEs. Global Statcounter is a website that shares data related to the market share of the search engine world

and country-wise that also confirmed that DuckDuckGo is the only metasearch engine that shares the market around 0.59 % after other popular search engines like Google, Bing, Yahoo!, Baidu and Yandex. Similarly, in India DuckDuckGo is the fourth largest market share with 0.06 %, after Google, Bing, and Yahoo!

Data interpretation reveals that a rating system used in this study is an effective way to present the data collected from multiple sources for all four MSEs. DuckDuckGo is ranked first in all four metasearch engines with 70.3 % and rated as above average, and the other three are Dogpile (65.3 %), MetaCrawler (62.4 %), and Startpage (58.4 %). The study identified the features and services of four popular metadata search engines. The outcome shall help the users to understand the services and features of these search engines which lead to access the information conveniently for study and research. Further, another objective is achieved which help users in choosing the suitable search engine. Therefore, the study compares the four MSEs meticulously. Thus, raking has been done so that it helps the users in choosing the metadata search engines. Further, the study also helps us to acquaint research scholars, faculty members, and the common masses with the features and services of MSEs. MSE is an intuitive way to get information from the Internet, and using MSE, and its services optimally increases the coverage of the Web.[24] Information literacy instructors can also use the findings to educate the users about the availability of features in different MSEs. Nevertheless, the study covers only four MSEs; therefore, the features and services of other MSEs are not explored. Thus, further, the study may be undertaken using the checklist prepared under the study to evaluate the other MSEs.

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