Usability Evaluation of Research Database Websites

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Abstract: The last few decades have been characterized by an expanding focus on usability designing and evaluating especially with database research websites that have been built and set into service. Usability is a fundamental attribute for satisfying the quality necessities of any software product. There are a wide variety of usability evaluation techniques that can be used in assessing the interaction between human beings and the interface such as tool-based techniques, evaluator-based techniques, and user-testing methods. The research study focuses on the evaluation of the four-database research websites and discusses the user data that was gathered after carrying out interviews. ProQuest is one of the database research websites which considers as an independent, completely accessible database and gives access to many full content articles from a large number of academic journals. The exploration members were drawn from their most convenient in all the cases. In summation, usability is generally viewed as a fundamental attribute for satisfying the quality necessities of any software product. The results indicate that the participants use the research database page during the semester to do the assignments because the participants were all students. The parts of the research database that they like the most are the filter box, research box, and language options. Students use research databases that have access through the Saudi Digital Library and most of the students preferred the Arabic resources, so they used the Dar Almandumah database.

1. Introduction

With the improvement of the information society, the utilization of the Internet and different types of data and communications technology turns out to be progressively mainstream. Currently, there are millions of database research academic and scholarly websites that have been built and set into service. An ever-increasing number of designers have started to concentrate on whether these database research websites can be utilized easily without any problem. In this manner, how to gauge usability is a significant inquiry in the design of websites. By employing many different evaluating methods, designers have the capacity to understand their users better thereby making designing the works in such a way that all the users' needs are met. The quality of the usability assessment lies in the evaluation procedures and techniques.

The last few decades have been characterized by an expanding focus on usability designing and evaluating. A site fills in as a platform for the academic institutions to associate with the partners notwithstanding helping shape their image. In this way, academic sites ought to give imperative data to a wide range of users with lots of ease. The individuals who utilize instructive or scholastic sites are generally worried about finding the data they are looking for with ease as well as in a timely fashion [1]. As a result, high levels of usability should be achieved.

Usability is generally viewed as a fundamental attribute for satisfying the quality necessities of any software product [1]. In context to web-based items, usability alludes to the procedure or process used to make the navigational possibilities more user-friendly as well as more task adequate to fulfill as the needs of users. If a database research website is not capable of navigating the users to their individual objectives, therefore, these users lose their interest and think about them as a less usable database research website. For straightforwardness, in the event that any software fails to address the client's issue and fulfillment, then it is considered as poor productive and less usable.

Usability refers to one of the most crucial features of any user interface as it is important in measuring how easily the interface can be used. The most suitable definition of usability is: "a measure of the quality of a user's experience when interacting with a product or system - whether a web site, a software application, mobile technology, or any user-operated device" [2]. There are a wide variety of usability evaluation techniques that can be used in assessing the interaction between human beings and

the interface. The main aim is to distinguish areas that should be improved in the interactions to build usability of websites [1].

2. Categories of Usability Evaluation Methods

The usability evaluation techniques could be categorized into 3 main general classifications dependent on the way the usability issues are recognized:

1. Tool-based techniques: This category includes software tools when determining the usability issues of database research websites. The software tools consequently evaluate the level of conformity of a site to the explicit usability guidelines. The vast majority of such tools are vital in evaluating the quality of the site's HTML code with respect to a wide variety of guidelines.

2. Evaluator-based techniques: This classification incorporates techniques that include evaluators during the identification of these problems related to website usability [3]. Heuristic assessment refers to an illustration of a typical usability technique associated with this category. It includes having various evaluators survey the user interface and then determining its conformity to a set of usability standards [4].

3. User-testing methods (user-based techniques): This third category incorporates many techniques that involve the users during the identification of the usability problems. These techniques play a significant role in recording the performance of users through the use of many different sorts of observations or satisfaction via the interviews and questionnaires with the interface that is to be assessed [5].

User testing methods and heuristic assessment are two techniques that are most frequently utilized for evaluating website usability.

The past works have provided a few benefits that are accessible to the users provided the usability of sites is thought of or greatly enhanced [4]. Addressing website usability could decrease the number of mistakes, improve exactness, and support inspirational mentalities toward the target interface. Besides, researchers have shown that tending to the ease of use of instructive sites could assist students in enjoying the learning experience, increasing the confidence of students, and encouraging the students to use the database research websites [5]. In spite of the significance of making academic sites usable, a limited number of them were located in the past literature that engaged in the assessment of the usability of such database research websites, including ProQuest database, EBSCO / ERIC database, Arcif database, and Dar Almandumah database. The previous studies that were discovered focused on the significance of usability within the design of academic sites and gave a framework regarding the design characteristics that are significant [6]. Therefore, they should be incorporated when designing such academic database research websites.

Nevertheless, the examinations failed to investigate, and accordingly take into consideration, the design features' relative significance in the ease of use of instructive sites from the perspective of students [1]. However, there has been research carried out to explore such design features' relative importance for the usability of a wide variety of website types like an e-commerce site, search engines and portals, online bookstores, and financial services from the perspective of clients [7]. Nonetheless, no exploration has been directed explicitly to research instructive sites. The exploration portrayed here intends to address the identified gaps within the past writing by assessing the usability of four database research websites [2]. The research has utilized a design that was explicitly generated for the purpose of this examination considering the general significance of the measures that were developed specifically for the usability of instructive sites as per the perspective on students. Therefore, the usability of the information system in this proposed study was assessed using eight criteria: (1) retrieval features; (2) adaptability; (3) efficiency; (4) helpfulness; (5) control; (6) measures of effectiveness; (7) user effort; and (8) affect.

Research questions:

• What are the most common research databases websites used by students?

• How to compare the research database websites considering the Usability SDLC model?

3. Related Works
3.1 Usability Evaluation Methods (UEMs)

Usability refers to a vital factor for all the quality models of software. It is the main factor in developing successful interactive software applications. On the other hand, usability is the most widely utilized concept within the field of software engineering, [6] in addition to defining the demand and use of software systems [8]. Because of such wide importance of the quality factor, numerous usability evaluation methods have been proposed by usability researchers and experts [9].

Recently, numerous usability evaluation methods (UEMs) have been utilized to assess Web applications [10]. Nevertheless, large numbers of these applications actually do not meet most clients' ease of use assumptions and numerous organizations have collapsed because of not considering Web usability issues [11].

Evaluating the usability of an item is vital in identifying the usability issues as well as obtaining

usability measures. The evaluation is crucial in improving the usability of the product when designing or developing it in addition to assessing the degree to which they have achieved the usability objectives.

The usability models are reasonable view which sets out the focus areas to show the ease of use of the current software. These models are useful in the assessment of the usability of the product framework [12]. Ease of use is described into three sections based on their independence on the platform wherein the task is being carried out such as system characteristics, a user characteristic, and task characteristic. Ease of use is a significant quality to impact the acknowledgment of an item. They have has become a significant tool within the toolkits of the ease of use and user experience specialists and scientists. Usability can be assessed by the investigation, testing, and request [13]. For this situation, testing and request are utilized to assess the ease of use of the four sites.

3.2 Website Usability & Accessibility

Website usability assessment is getting the focal point of scientists lately. Usability is a quality property. Website designed as per ease of use guidelines can essentially improve the degree of client fulfillment. Besides, usability is a measure of how it is easy to use a site while accessibility identifies with whether the site can be accessed by anyone [14]. Website accessibility refers to an attribute through which individuals can perceive, navigate, understand, and interact with the web in addition to contributing to the web. It incorporates all types of issues that affect access to the web [15].

The main concern of usability is satisfaction, efficiency, and effectiveness. Effectiveness alludes to the completeness and preciseness with which particular users are capable of attaining specific gains within a particular environment. However, efficiency is the resources that can be utilized in achieving completeness and preciseness while the satisfaction alludes to the level of acceptability and comfort of the system as seen by the users and the individuals who are affected through its utilization. In this way, an available site would profit all users, not simply the individuals who are with special cases. Openness is a subset of ease of use. A site isn't usable except if it is available and while convenience suggests openness, the opposite isn't really evident. Online organizations that give a rich user experience by representing site convenience are bound to prevail over those which don't [15].

3.3 Research Database Websites

Research databases are coordinated assortments of mechanized data or information, for example, periodical articles, books, designs, and sight and sound that can be looked to recover data. Databases can be general, or subject arranged with bibliographic references, abstracts, and additionally full content. The sources recorded might be composed of researchers, experts, or generalists [16]. Research databases that are recovered on the World Wide Web are generally non-charge based, need profundity ordering, and do not file exclusive assets [17]. Membership or commercial databases are more refined with different kinds of ordering highlights, looking through abilities, and help guides. The academic library gives commercial databases to its clients just as non-expense databases. These databases are accessible from the library's website.

The field of study and topic statement decides the sort of database, type of data, and the date of the sources that will be utilized. It is critical to explain whether the subject will require research from diaries, magazines, articles, and books, or just diaries [18]. Prior to an individual starts to look through the databases, it is significant that they build up a very much arranged complete inquiry technique. Figuring out what the catchphrases are and how they need them to connect.

Regardless of whether an individual is composing a proposal, thesis, or examination paper it is a vital assignment to review earlier writing and exploration discoveries. Particularly, they will be searching for confided in assets, no doubt peer explored research article. The study involves the evaluation of the usability of four database research websites such as ProQuest database, EBSCO / ERIC database, Arcif database, and Dar Almandumah database.

3.4 Competitive Analysis (Competitor Benchmarking Approaches)

Comparative analysis has consistently been a typical practice in assessing usability. By contrasting features with competitors, the researcher can decide the item's qualities and shortcomings. In the usability evaluating or designing model, the current items are regularly the best models at the predesign stage due to the fact that they are already completely developed. So even prior to building the item, important data about what highlights uphold client needs and meet client assumptions can be gathered [19]. Useful features can be fused into the new item and potential usability issues can be easily avoided. Libraries have done comparative analysis with items and frameworks, especially on online catalogues and discovery tools. The frameworks are looked at during the analysis with respect to the issues experienced during the tests. The examination is centered on looking at items' usefulness and ease of use.

On the other hand, website benchmarking approaches can be ordered by collateral and type as a system [20]. A consolidated client site viewpoint (fulfillment, reliability, plan, quality) and business site point of view (convenience, viability, procedure, execution) conveys a staggering site benchmarking approach. This offers a wide-scale investigation pathway fit for conveying widespread, definite, at level site benchmarking. A weighted entirety score approach constructs a general site benchmark score, empowering site contender correlations across numerous levels. This methodology offers an itemized manual for business directors, website specialists, and web investigation mediators trying to actualize serious site changes. To benchmark sites, many analysts have adapted the existing business benchmarking approaches such as the Balanced Scorecard and the Technology Acceptance Model [20].

3.5 The Usability Software Development Life Cycle (SDLC) Model

SDLC Model alludes to a series of phases providing a common comprehension of the process of building software [21]. Besides, it relates to the way the software will be realized and developed from the business comprehension and phase of eliciting requirements to converting the business ideas and requirements into features and functions until it is used and under operations to realize the business needs [22]. Therefore, great software engineers should be highly knowledgeable about the ways in which they can successfully select the software development life cycle model on the basis of the business requirements and the project context [23]. As a result, it may be required to select the most suitable SDLC model as per the particular requirements and concerns of the project to guarantee its success.

The SDLC includes the standard usage of strategic approaches to develop programming applications. This idea is material to a wide scope of programming and equipment setups since a framework be comprised of programming alone, of equipment alone, or even a mix of both. A Secure SDLC measure is significant in light of the fact that it guarantees the security confirmation of explicit exercises including design examination, code survey, and entrance testing, which are all fundamental parts of the improvement exertion [24].

Creating software items that adjust security and ease of use to make a synergistic connection among security and convenience is a designing cycle that begins from the primary period of the Software Development Life-Cycle (SDLC), and proceeds through the remainder of the stages: plan, development, and testing [25]. Notwithstanding, a summative assessment of such a cycle should be done

after the product item is totally evolved with cautious regard for estimating the arrangement among security and ease of use (i.e. usable-security), and coordinating such arrangement appropriately inside the SDLC [26].

4. Methodology

Evaluation methods for the usability of websites vary significantly with regards to the complexity, procedures, and accuracy. Usability inspections refer to one of the widely used methods for evaluating the usability of websites in addition to user testing [27]. In this case, user testing methods and heuristic assessment are utilized to evaluate the website usability of the four main database research websites [28]. To effectively carry out this proposed research on the "Evaluation of the Usability of Websites [1] [29]," the methodology consisted of two parts, firstly, the literature review and secondly, the interviews with students [30]. An examination of the relevant past literature was carried out to compare the four databases research websites using the usability SDLC model [21].

The four main database research websites were chosen for evaluation. The research study was centered on the evaluation of the four websites using the chosen criteria and then comparing each other. The main aim of this proposed research study was to analyze the user data that was gathered after carrying out interviews. The questionnaire method was adopted in recording the usability of the databases.

The research participants performed searches for information on the Internet. The participants were observed by the researcher when performing the search [31]. After the search, the study sample participated in the interview on the databases they use and the user ability to survey the pages.

The research participants answered six questions after each search. The questions were as follows:

1- When was the last time you used a research database, and how often do you use it?

2- What are the steps used to find resources that are related to your project?

3- How would you improve the process of finding sources in the database?

4- How often do you use the research database page?

5- What parts of the research database did you like the most? Why?

6- How much time do you spend on each website?

The study used the usability Software Development Life Cycle (SDLC) model to determine user's needs when visiting the four research databases websites as well as a competitive analysis (competitor benchmarking approach) to measure efficiency [21]. All through the testing, the study likewise gathered

qualitative feedback on why and how students use the research database and whether were reflective of typical needs they have [32].

A total of 30 undergraduate students were recruited to participate in usability testing: seven participants from the summer semester and 23 participants from the first and second semester in the College of Computer and Information Systems as shown in Table 1.

Table 1. Participants in usability testing

Semester	Number of students	Course	Type of usability Test
First	13	Project course	Moderated In-Person
Second	10		Moderated In-Person
Summer	7		Moderated Remote

The study used Remote usability testing with seven students during the summer semester because of the coronavirus COVID-19 the pandemic and used Moderated In-Person with 23 students during the first and second semester.

The exploration members were drawn from their most convenient in all the cases. Interview of the chosen students for one year in the course in the College of Computer Science and Information Systems. The paper focused on the evaluation of the four database research websites and comparing each other by analyzing data from past literature and interviewing the students regarding their use of research databases.

5. Results and Discussion

The research study aimed at determining the most common research databases used by students in addition to how to compare the research database websites by identifying appropriate usability evaluation methods. Therefore, the study used Remote usability testing with seven students during the summer semester because of the coronavirus COVID-19 pandemic and used Moderated In-Person with 23 students during the first and second semester. The students were interviewed for one year in the course in the College of Computer and Information Systems. The main focus of the paper was the evaluation of the four database research websites and comparing each other.

The data collected from the user interview indicated that the degree to which this representative sampling of students was satisfied with the self-descriptiveness, user control, learnability, and ease of use associated with each database evaluated. With regards to the websites used, the results of the interview indicated that 21 of the students use the Dar Almandumah database, 3 of the students use Arcif database, 2 of the students use ERIC, and 4 of the students ProQuest as shown in the figure below.
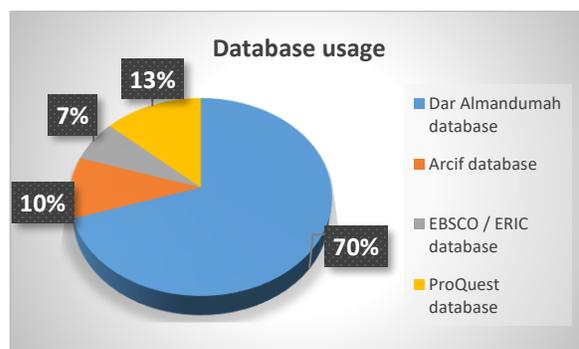

Figure 1. databases usage

The study reached a set of results which answers the study questions as the following.

6. The Most Common Research Databases Websites Used by Students

The most common research databases websites used by students are Dar Almandumah database, Arcif database, ERIC, and ProQuest. Nevertheless, the appropriate usability evaluation methods to compare the research database websites are user testing method and heuristic assessment. Heuristic assessment involves surveying the user interface and then determining its conformity to a set of usability standards. However, the user-testing method recording the performance of users through the use of many different sorts of observations or satisfaction via the interviews and questionnaires with the interface of the four databases to be assessed.

With regards to the last time the participants used the research database and how often they use it, the research participants replied as follows: 4 students said last month, 6 students said last week, and 10 students said yesterday. The students used different steps to find resources that are related to the project. However, all of the students use research databases that have access through the Saudi Digital Library and most of the students used the Arabic resources, so they used the Dar Almandumah database. Relating to how they would improve the process of finding sources in the

database, 19 of the students talked about the time they spent to find the resources they need and two of them about the features of the database.

Concerning how often the students use the research database page, they replied that all of them use the research database page during the semester to do the assignments because the participants were all students. In regard to the amount of time spent on each website, the results were as follows: 3 choose less than 1 hour, 7 choose 1-3 hours, 15 choose 3-6 hours, and 5 choose more than 6 hours.

Most of the students indicated that the parts of the research database that they like the most are the filter box, research box, and language options. The filter box was chosen because the filters allow users to focus on the resources that match their needs and interests with specific features. However, the research for selecting the research box was that the website interface should assist users in finding the information or resources without dealing with a lot of navigational barriers. Finally, the language options were identified by many students because most websites allow to check or change the language preference as the preferred language for the users. A language option provides the website visitors the possibility to choose between the languages to use the content in their preferred language.

7. Comparing the Four Database Research Websites Considering the Usability SDLC model
7.1 ProQuest Database

ProQuest database gives a lone source to scholastic journals, papers, reports, working papers, and datasets close by countless pages of digitized chronicled fundamental sources and in excess of 450,000 computerized books. Famous abstracting and requesting makes this information viably protected, while content devices, including second reference record and reference generators, improve the board and sharing of assessment as per Figure 2.
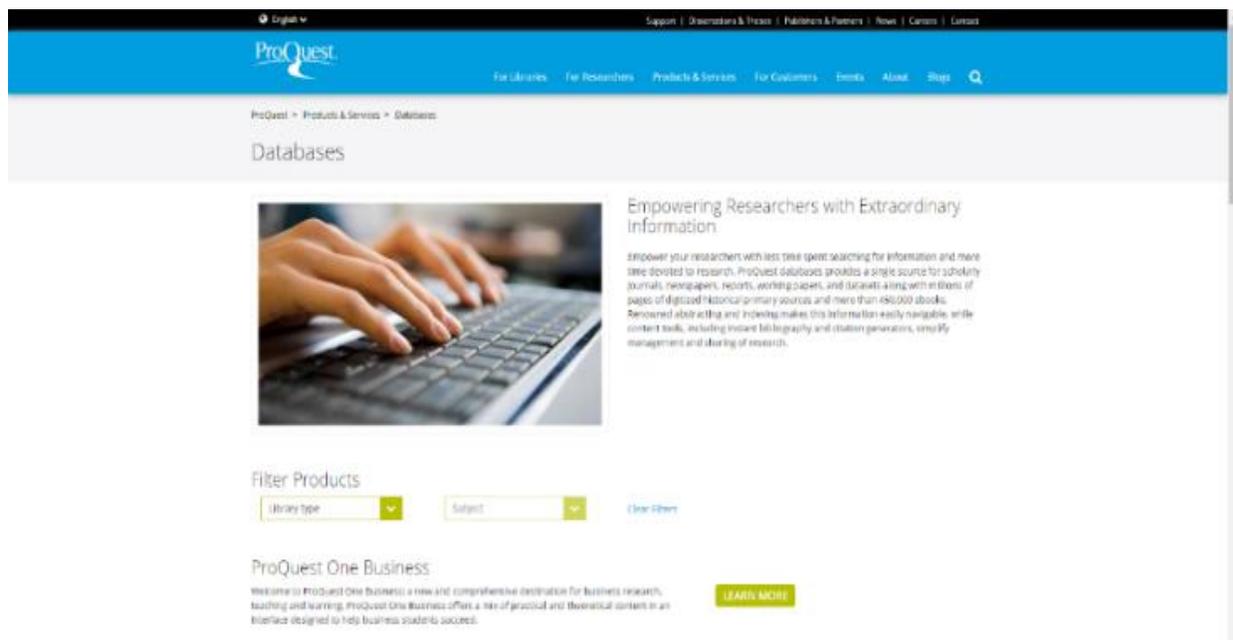

Figure 2. ProQuest database

ProQuest is made up of independent, completely accessible database. While ProQuest Central gives admittance to a great many much-pined for full content articles from a large number of academic diaries, it additionally gives admittance to data not accessible in other totaled assets, for example, The ProQuest platform provides the profound subject access. Today, the organization gives instruments to revelation and reference the board and stages that permit library clients to find, oversee, use and offer exploration acquired from legitimate substance. ProQuest is the biggest, multidisciplinary, full-text database accessible within the market.

7.2 EBSCO/ERIC Database

ERIC contains records and connections to a huge number of full-text archives as indicated in Figure 3.
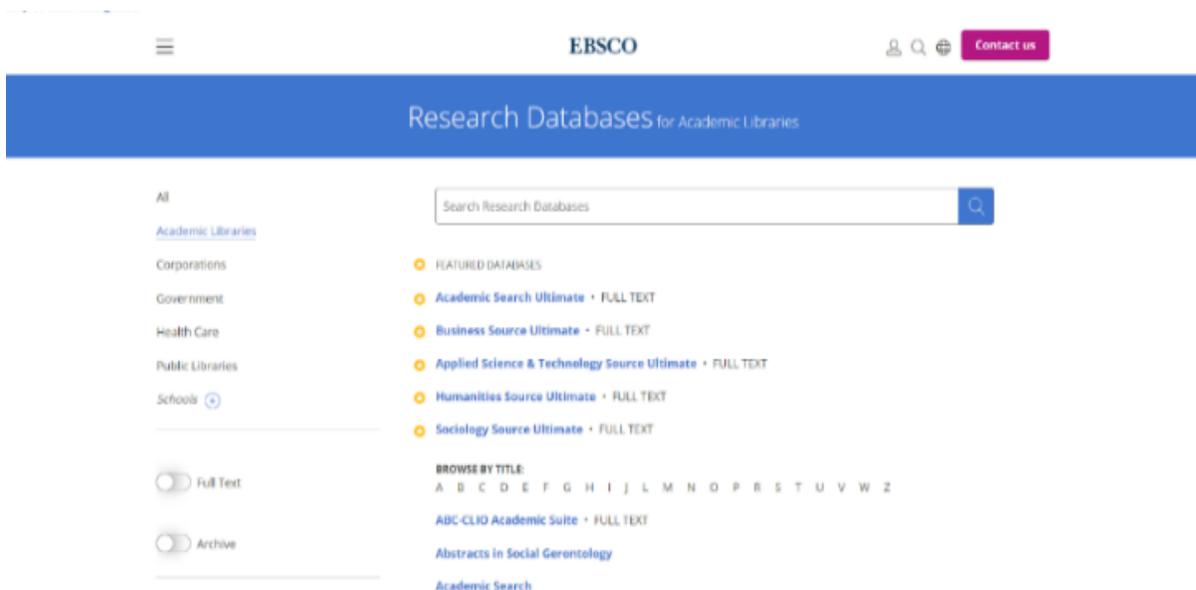
Figure 3. EBSCO database

It incorporates records for an assortment of source types, including diary articles, books, meeting papers, educational plan aides, theses and strategy papers. Further, scientists can restrict query items by schooling level, for example, well as on the target group.

EBSCO and ProQuest databases are ordinarily utilized unknown dialect database. Through the correlation of the EBSCO database and ProQuest database on the substance and the recovery framework, it shows that EBSCO data set incorporates significantly more key periodicals, different diaries and full content diaries which is continuing to refresh, and the full content diary consideration makes some more extended memories length [33]. In addition, the inquiry capacities and advancements are all the more impressive, which is better for exact recovery and expert nature of databases. As to the utilization of database s, libraries could account their own expenses, pick the stage with higher caliber on the substance and recovery framework and more far reaching points of interest.

- Basic and progressed search choices

EBSCOhost serves both new and experienced specialists with an assortment of highlights to refine indexed lists.

- Reliable, peer-reviewed content

EBSCOhost offers great articles authorized from trustworthy distributers perceived by library experts, picked to meet the particular requirements of analysts.

- Citation help

Clients can see, save, print, email or fare references in numerous arrangements straightforwardly from the database.

- Ability to save searches and results

Clients can save searches and articles in a secret word ensured organizer for later reference [33].

- Customization

Adjust EBSCOhost interface marking and highlights, including search limiters and expanders, language inclinations, print alternatives, connect choices and that's only the tip of the iceberg. Use EBSCO applications to additional upgrade your EBSCOhost experience [34].

- Mobile access

EBSCOhost perceives when clients are getting to the site from a cell phone or tablet and will show a portable amicable variant.

- Accessibility

EBSCOhost highlights text-to-discourse for HTML articles, ARIA tourist spots and that's only the tip of the iceberg [35].

- Privacy

COPPA consistence implies EBSCO doesn't request or require individual data to get to its database.

7.3 Arcif Database

Figure 4. Arcif database

As in Figure 4, the database has numerous important features that make it suitable to students. The features are discussed below:

- Straightforwardness

The logical idea of ARCIF takes into consideration a totally unambiguous cycle, where admittance to all bibliographic information, wellsprings of references, determination standards and genuine outcomes will be conceded [36].

- Autonomously

The consequences of ARCIF are not dependent upon any political, sex, or strict thought processes, just logical and expert norms.

- Nonpartisanship and Objectivity

ARCIF depends exclusively on scholarly models, which means total non-arrangement on any side.

- Reports

ARCIF's yearly reports award readers a detailed look at the controls, colleges, scholastic bodies, nations and specialists in the Arab world, in light of general positioning and number of references.

- Extensiveness

Both in subjects and nations of root, ARCIF's consistently growing database has a wide cluster of results from all controls, beginning from 20 Arab nations.

- Dependability and Competency

The entirety of ARCIF's information is given by unique sources, our command for straightforwardness guarantees fastidiousness.

7.4 Dar Almandumah Databas

Dar Almandumah is the main organization in the field of Arabic insightful and scholastic full-text database. It is a Saudi organization established in 2004 with a broad combined involvement with getting sorted out and overseeing advanced data, creating database and web crawlers. Since its foundation, the organization works expertly to serve the Arab insightful and scholarly society by building and creating scholastic full text spent significant time in many controls as shown in Figure 5.

Dar Almandumah Databases contains in excess of 1800 particular periodical and scholarly Arabic diary titles, in excess of 2200 scholastic meeting titles and about 125.000 theses. The substance is refreshed every day, and new issues are added when the delivered. Likewise, new diary titles are habitually added subsequent to consenting to the copyright arrangement with distributers and colleges.

Because of this enormous and developing substance (About 800,000 investigations), Dar Almandumah database have become an unmistakable and the most utilized database in the Arabic Gulf nations and the Arab world all in all. Dar Almanduma's six enormous databases incorporate by far most of Arab magazines and logical diaries in full content. Besides, Dar Almandumah network incorporates a specific database for Arabic theories, which is viewed as the reference to the Arab researchers in all technical studies and scholarly teaches. More than 70,000 logical theories from different Arab colleges, (30,000) 30,000 of them are in full text.
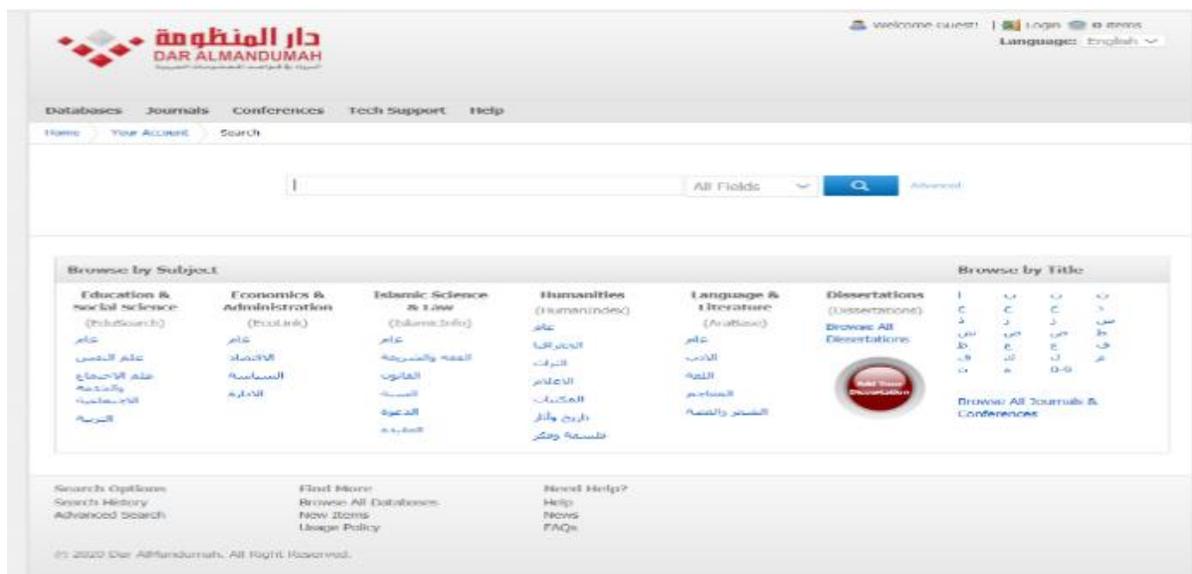
Figure 5. Dar Almandumah database

The Usability SDLC model indicates that there are five main phases namely design, code, testing, maintenance, and requirement. All four research databases websites have undergone five phases in their development and utilization. However, there are varying users' needs when visiting different sites. According to the usability Software Development Life Cycle (SDLC) model, the usability practice of the users of ProQuest database and EBSCO / ERIC database is context specification while that of Arcif database and Dar Almandumah database requires usability specifications. Context specification tests focus on how the way system as well as its units and modules behave in specific usage contexts while a usability specification refers to system specification covering usability of a website. ProQuest is a multidisciplinary full-text database with a variety of content types while ERIC contains links and records to many full-text documents.

The Arcif database allows for access to all bibliographic data through a completely unambiguous process while the Dar Almandumah database has an Arabic academic and scholarly full-text database. Therefore, as per the design phase of SDLC, the four databases have effectively documented usability guidelines in addition to verifying usability requirements. The user interface review indicates that unlike other databases, ProQuest has filter products the enable the users to focus their topic. However, EBSCO has a user interface pattern that allows the researchers to determine the library to access to article and the type of text to obtain. Dar Almandumah and Arcif databases adopt interactive designs that enable the researchers to access the information they need.

On the other hand, the four database research websites are effectively maintained through usability review to determine the areas that need improvement.

8. Conclusions

The improvement of the information society has led to the use of the Internet and different types of data and communications technology turns out to be progressively mainstream. ProQuest is made up of an independent, completely accessible database while ERIC contains records and connections to a huge number of full-text archives. Through the correlation of the EBSCO database and ProQuest database on the substance and the recovery framework, it shows that the EBSCO database incorporates significantly more key periodicals, different diaries, and full content diaries than ProQuest. Concerning, ARCIF, the consequences or results are not dependent upon any political, sex, or strict thought processes, just logical and expert norms. However, Dar Almandumah is the main organization in the field of Arabic insightful and scholastic full-text database.

The results indicate that 21 of the students use the Dar Almandumah database, 3 of the students use the Arcif database, 2 of the students use ERIC, and 4 of the students ProQuest. Therefore, a significant number of students prefer to use the Dar Almandumah database. Furthermore, the Arcif database allows for access to all bibliographic data through a completely unambiguous process while the Dar Almandumah database has an Arabic academic and scholarly full-text database.

According to the usability SDLC model, context specification is the usability practice of the users of

ProQuest and EBSCO / ERIC databases. Nevertheless, the Arcif database and Dar Almandumah database adopt usability specifications to meet the needs of the users of the website [37]. ProQuest is a multidisciplinary full-text database with a variety of content types while ERIC contains links and records to many full-text documents.

To conclude, the results show that the participants use the research database page during the semester to do the assignments because it is easy to access through participants who were all undergraduate students. Participants indicated that the parts of the research database that they use the most are the filter box, research box, and language options. Students prefer to use research databases that have access through the Saudi Digital Library, and they use the Arabic resources such as the Dar Almandumah database.

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