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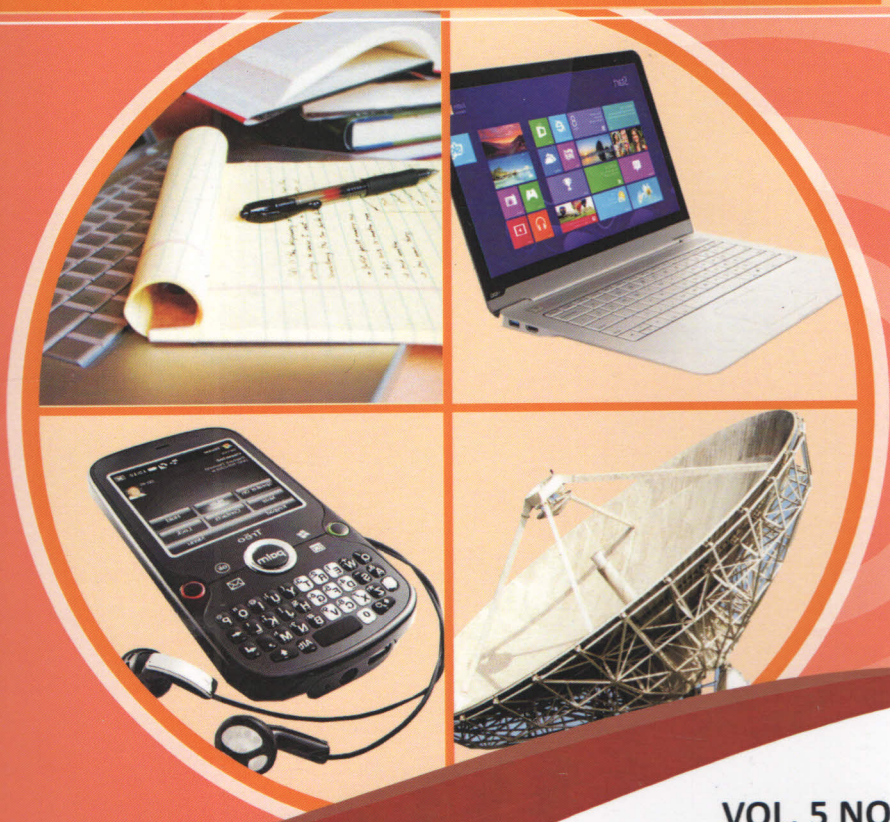

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# ARCHIVAL SYSTEM FOR PROJECTS USING ASSOCIATION APPROACH

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## Abstract

*This paper is aimed to tackle the limitations and shortcomings of the existing system by developing a data mining software that will store completed projects for easy access for anyone most especially students and Lecturers/Supervisors and also researchers who may benefit from the use of its holdings. In this paper, the use of Dreamweaver integrated development environment which embeds the functionality of PHP and a query language (MYSQL) were employed in the development of the archival system since it is a web platform. Once a search query is entered for a project topic, a search result showing similar or related project topics will be displayed at once. This gives a high hit rate as compared to some search engines. The need for an Online Archival system for project management cannot be over emphasized because of the efficient matter in which it eases the stress of consulting past projects manually. The Archival system is recommended for implementation in the University Library and in all Departments of the various Faculties in the University.*

**Keywords**: Data Mining, Archival System, Maintainability, Archivist, Association Rule.

## Introduction

Data mining is the process of extracting interesting non-trivial, implicit, previously unknown and potentially useful information or patterns from large information repositories such as relational database, data warehouses, XML repository and so on (Chen et. al., 1996; Zhao and Bhowmick, 2003). Data mining is also known as one of the core processes of Knowledge Discovery in Databases (KDD).

Association rule mining is an important component of data mining. Association analysis has been broadly used in many application domains. Traditionally, association analysis is considered as an unsupervised technique, so it has been applied in knowledge discovery tasks. Recent studies have shown that knowledge discovery algorithms such as association rule mining can be successfully used for prediction in classification problems. In these cases, the algorithm used for generating association rules must be tailored to the peculiarities of the prediction in order to build more effective classifiers (Moreno et al., 2005).

The U.S. Working Group on Standards for Archival Description defined archival system as "the process of capturing, collating, analyzing, organizing, and recording

information that serves to identify, manage, locate, and explain the holdings of archival institutions and the contexts and records systems from which those holdings were selected". Clearly, archival description is a complex matter, consisting of a number of inter-related activities required to manage archival materials throughout their existence. The International Council on Archives Commission on Descriptive Standards recognized that descriptive information is required at all stages of the management of archival materials, but narrowed its definition of archival system to cover "the creation of an accurate representation of the archival material by the process of capturing, collating, analyzing, and organizing any information that serves to identify archival material and explain the context and records systems which produced it". The 3rd International Symposium on Archival Training expressed the need, in the interest of both teachers and searchers, to put more emphasis on the study of the history of record keeping and archives at both national and international levels, (www.archivist.org/news/custardproject.asp).

The idea of keeping official documents is very old. Archaeologists have discovered archives of hundreds (and sometimes thousands) of clay tablets going back to the third and second millennia BC in sites like Ebla, Mari, Amarna, Hattusas, Ugarit, Pylos. Archives were well developed by the ancient Chinese, ancient Greeks and ancient Romans (who called them Tabularia). However, they have been lost, since documents were written on organic materials like papyrus and paper. On the contrary, many archives founded since middle age like churches, kingdoms and cities survive and often have kept their official status uninterruptedly till now, they are the basic tool for historical research on this age (Murray, 2009).

The history of archival thought in this century reflects the interaction of archival theory and practice as archivists everywhere have sought to preserve the archival system of the world (Cook, 1997). Former National Archivist of Canada and ICA President, Jean-Pierre Wallot has set the inspiring goal for archivists of "building a living memory for the history of our present". Historians in a postmodernist milieu are now studying very carefully the processes over time that have determined what was worth remembering and, as important, what was forgotten, deliberately or accidentally. Such collective "remembering" and "forgetting" occurs through galleries, museums, libraries, historic sites, historic monuments, public commemorations, and archives-perhaps most especially through archives (Cook, 1997).

Archival thinking over the century should be viewed as constantly evolving, ever mutating as it adapts to radical changes in the nature of records, record-creating organizations, record-keeping systems, record uses, and the wider cultural, legal,

technological, social, and philosophical trends in society. Archival ideas formed in one time and place reflect many of these external factors, which ideas are often reconstructed, even rediscovered in another time and place, or reshaped across generations in the same place. The best archival theorists are those who have been able to recognize and articulate these radical changes in society and then deal conceptually with their impact on archival theory and practice (Cook, 1997).

Exactly one hundred years ago, the Dutch trio of Samuel Muller, Johan Feith, and Robert Fruin published their famous Manual for the Arrangement and Description of Archives. Of course Muller, Feith, and Fruin's work did not spring to life in a vacuum during the 1890s. Archives in various forms had existed for centuries, but modern archival principles per se, despite some obscure precedents, were only articulated in detail in nineteenth-century France and Germany (Cook, 1997).

The existing system of keeping completed projects is not so organized. Energy is sapped and time is wasted because completed projects are just dumped in no orderly manner in a room. Due to the fact that they are not being orderly stacked, it makes the retrieval of a particular project to be difficult. Checking for a particular project for the purpose of studying or reviewing it may prove impossible in most cases.

In this paper, an Online Archival System for Managing Student's Projects was developed. The archival system is based on a Data Mining method called Association Rule Mining by using the Apriori algorithm and it was developed with Dreamweaver which embeds the functionality of PHP programming language and a query language called MYSQL.

## Literature Review

### Data Mining

Data mining, or knowledge discovery, is the computer-assisted process of digging through and analyzing enormous sets of data and then extracting the meaning of the data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases (Hemalatha et. al., 2016).

Data mining derives its name from the similarities between searching for valuable information in a large database and mining a mountain for a vein of valuable ore. Both

processes require either sifting through an immense amount of material, or intelligently probing it to find where the value resides. It is a powerful new technology with great potential to help companies focus on the most important information in the data they have collected about the behaviour of their customers and potential customers. It discovers information within the data that queries and reports can't effectively reveal. Data mining consists of five major elements:

i Extract, transform, and load transaction data onto the data warehouse system.
ii Store and manage the data in a multidimensional database system.
iii Provide data access to business analysts and information technology professionals.
iv Analyze the data by application software.
v Present the data in a useful format, such as a graph or table.

**Data Mining as a Process**

Fundamentally, data mining is about processing data and identifying patterns and trends in that information so that one can decide or judge. Data mining principles have been around for many years, but, with the advent of big data, it is even more prevalent. Big data caused an explosion in the use of more extensive data mining techniques, partially because the size of the information is much larger and because the information tends to be more varied and extensive in its very nature and content. With large data sets, it is no longer enough to get relatively simple and straightforward statistics out of the system. The outline of the data mining process is shown in figure 1.

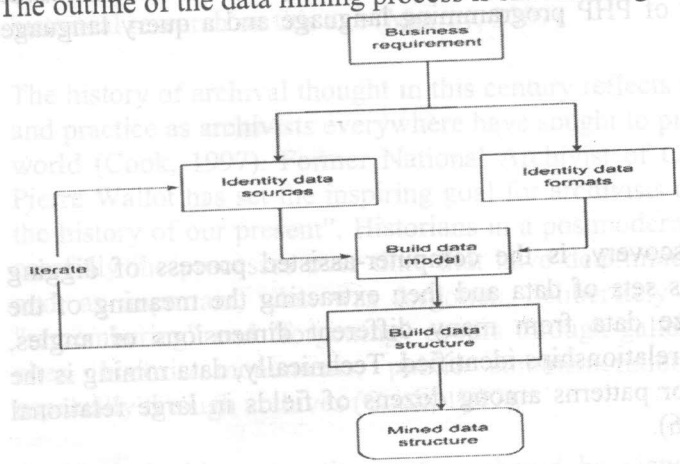


Figure 1: Outline of the Data Mining Process

**Association Data Mining Approach**

The Association Data Mining Approach was adopted in this paper. Association (or relation) is probably the better known and most familiar and straightforward data mining approach. Here, you make a simple correlation between two or more items, often of the same type to identify patterns. For example, when tracking people's buying habits, you might identify that a customer always buys cream when they buy strawberries, and therefore suggest that the next time that they buy strawberries they might also want to buy cream. Building association or relation-based data mining tools can be achieved simply with different tools. For example, within Info Sphere Warehouse a wizard provides configurations of an information flow that is used in association by examining your database input source, decision basis, and output information. The information flow used in association approach is shown in figure 2.

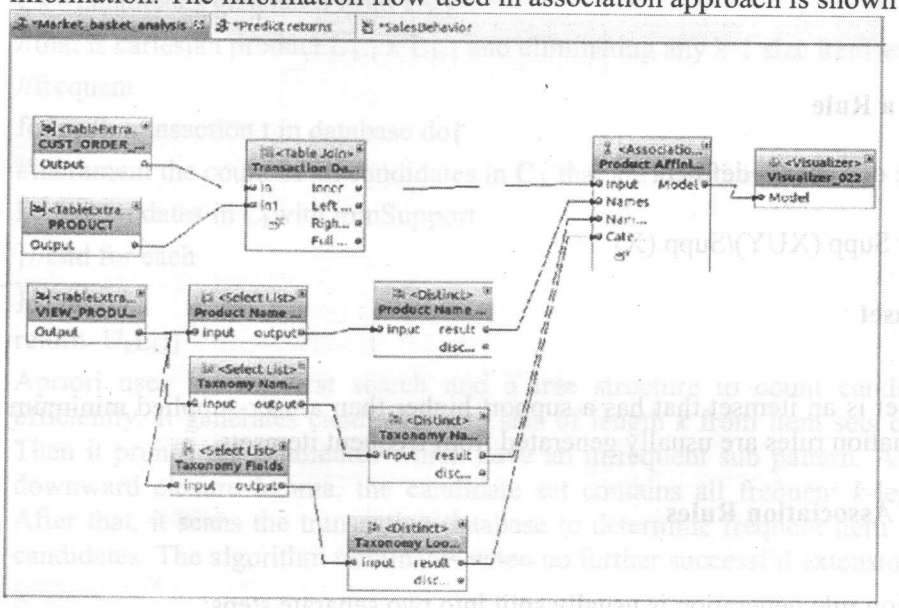


Figure 2: Information flow in Association Approach.

**Important Concepts in Association Rule Mining**

Association Rule Mining or induction is the extraction of interesting correlations, frequent patterns, associations or casual structures among sets of items in transactional databases or other data repositories (Sotiris & Dimitris, 2006). To select interesting rules for the set of all possible rules, constraints on various measures of significance and

interest can be used. The best constraints are minimum threshold on support and confidence.

**Support of an Itemset**

The support supp(X) of an itemset X is defined as proportion of transaction in the dataset which contain the itemset. Mathematically,

Supp(X) = Number of Transactions which contain the item X/Total Number of Transactions

**Confidence of a Rule**

The confidence of a rule is defined:

Conf (X->Y) = Supp (XUY)/Supp (X)

**Frequent Itemset**

Frequent itemset is an itemset that has a support higher than a user-supplied minimum support. Association rules are usually generated from frequent itemsets.

**Generation of Association Rules**

Association rule generation is usually split into two separate steps:

I. Firstly, minimum support is applied to find all frequent itemsets in the dataset
II. Secondly, these frequent itemsets and the minimum confidence constraints are used to form rules.

While the second step is straight forward, the first step needs more attention. Finding all frequent itemsets in a dataset is difficult since it involves searching all possible itemsets (item combinations). The set of possible itemsets is the power set over $I$ and has size $2n - 1$ (excluding the empty set which is not a valid itemset). Although the size of the power set grows exponentially in the number of items $n$ in $I$, efficient search is possible using the downward-closure property of support (also called anti-monotonicity) which

guarantees that for a frequent itemset, all its subsets are also frequent and thus for an infrequent itemset, all its supersets must also be infrequent. Exploiting this property, efficient algorithms (e.g., Apriori and Eclat) can find all frequent itemsets.

**APRIORI Algorithm Pseudocode**

Procedure Apriori(T, minSupport) { //T is the database and minSupport is the minimum support
L1= {frequent items};
for(k= 2; $L_{k-1}$ !=Ø; k++) {
Ck= candidates generated from $L_{k-1}$
//that is cartesian product $L_{k-1}$ x $L_{k-1}$ and eliminating any k-1 size itemset that is not
//frequent
for each transaction t in database do{
#increment the count of all candidates in $C_k$ that are contained in t
$L_k$ = candidates in $C_k$with minSupport
}//end for each
}//end for
return $U_k L_k$;}

Apriori uses breadth-first search and a tree structure to count candidate item sets efficiently. It generates candidate item sets of length $k$ from item sets of length $k - 1$. Then it prunes the candidates which have an infrequent sub pattern. According to the downward closure lemma, the candidate set contains all frequent $k$-length item sets. After that, it scans the transaction database to determine frequent item sets among the candidates. The algorithm terminates when no further successful extensions are found.

**Data Mining Tools**

Recently, the very large data sets and the cluster and large-scale data processing are able to allow data mining to collate and report on groups and correlations of data that are more complicated. Now an entirely new range of tools and systems are available, including combined data storage and processing systems. Data can be mined with different data sets, including, traditional SQL databases, raw text data, key/value stores, and document databases. Clustered databases, such as Hadoop, Cassandra, CouchDB, and Couchbase Server, store and provide access to data in such a way that it does not match the traditional table structure.

In particular, the more flexible storage format of the document database causes a different focus and complexity in terms of processing the information. SQL databases impost strict structures and rigidity into the schema, which makes querying them and analyzing the data straightforward from the perspective that the format and structure of the information is known.

**Data Mining Techniques**

The analytical techniques used in data mining are often well-known mathematical algorithms and techniques. What is new is the application of those techniques to general business problems made possible by the increased availability of data and inexpensive storage and processing power. Also, the use of graphical interfaces has led to tools becoming available that business experts can easily use (Doug, 2011).

Examples of Data Mining Techniques are (Doug, 2011):

- Artificial Neural Networks: Non-linear predictive models that learn through training and resemble biological neural networks in structure.
- Decision Trees: Tree-shaped structures that represent sets of decisions. These decisions generate rules for the classification of a dataset.
- Rule Induction: The extraction of useful if-then rules from data based on statistical significance.
- Genetic Algorithms: Optimization techniques based on the concepts of genetic combination, mutation, and natural selection.
- Nearest Neighbour: A classification technique that classifies each record based on the records most similar to it in an historical database.

**Archival System** The rise of ubiquitous computing has created a need for wide-area durable storage (Weather spoon et al., 2001). An online dictionary defines archive in three relevant ways: a place or collection containing records, documents or other materials of historical interest, a long-term storage area, often on magnetic tape, for backup copies of files or for files that are no longer in active use, and a file containing one or more files in compressed format for more efficient storage and transfer. The first definition is interesting because it is simply a place. The concept is applicable to the idea of layered storage in that one only cares to know the information has been stored and can be retrieved. The second definition might also be applicable to media content in the context of long-term, perhaps offline, storage. The third definition is not so much a place as it is a methodology for reducing the quantity of digital storage needed.

## METHODOLOGY

In this paper, the Apriori Algorithm for Association Rule Mining was used on a Dreamweaver integrated development environment that embeds the functionality of

PHP and a query language called MYSQL. Association Rule mining is often used in conjunction with some measures such as, Support and Confidence. Association is used to find occurring patterns in many data (Devi and Sarojini, 2012). A random database of project archives would be generated and Association data mining approach was be used in the process. The Association approach used in this paper helps when a search is being made on a particular project topic; the result of the search brings out all topics relating to the search item. For example a search on a web based project brings out results on all web related projects in the archive.

The Apriori Algorithm that was proposed by Agrawal and Srikant (1994; 1995) was used in this study. This approach is an iterative process. Each iteration has two steps;

**Step 1**: To generate a set of candidate item sets.

**Step 2**: To prune all the disqualified candidates (such as, all infrequent item sets)
Using data mining approach to archival system on completed project enables one to get a large amount of information on different completed projects and finding the one that fits in best for the intended purpose.

**System Analysis**

System analysis can be defined as the process of analyzing a system with the essential goal of improving or modifying it. It can also be defined as the methodical study of a system, its current and future required objectives, and procedures in order to form a basis for the system design. The purpose of analysis is to produce a clear requirement specification of the newly designed or upgraded system efficiently and effectively. It requires the ability to analyze the essential features of a system. This knowledge of a system is achieved through the investigation of the system and its environment.

**Analysis of the Existing System**

The current that is the existing system of retrieving completed projects does not enhance research because a particular project might have been done consecutively. Because of the poor archival system of these projects, a supervisor may not know that a particular project was recently done, and he/she would just approve that the same project again. Figure 3 shows shelved record boxes of projects.



Figure 3: Shelved Record Boxes (www.wikiwand.com/en/archive). (1505 × 1204 madison-historical.siue.edu).

The use of the existing system of storing completed projects is old as students have to exhaust their energy and time in search of existing projects. On the shelved record boxes as shown in figure 3, there are quite a number of completed projects. It could therefore take a lifetime for a student to know which one will actually be of paramount usefulness to him or her.

**Description of the Proposed System**

The proposed archival system needs proper analysis and careful design before implementation as the overall goal is to develop a scalable, high performance archive of completed projects. The system design describes and various operations such as the screen layout, images and others. The emphasis of system design is how to develop a new system that helps to achieve the goal and objectives of archival system of completed projects and overcome some of the shortcomings or limitation of the existing system. The system design is used to structure the architectural requirements to develop a system which has undergone the best possible design stage of turning the design to its efficient, best performance and accurate level of interaction.

**Improvement of the Proposed System over the Existing System**

The proposed system is one of the most relevant storage solutions today. It is aimed at modifying the shortcomings of the existing system. Even the Library where completed projects are stored manually is in constant need of storage space. This is made tougher due to the rising rate of completed projects. It does not speak well of a library if it needs to store documents such as projects outside its workspace. Even businesses today are making use of archival storage facilities in order to store their documents and files. For any business, it is important to store your documents neatly and in an organised manner. For this reason, archival storage systems are essential for an efficient office.

On the supervisor's part, the improvement of the proposed system over the existing system helps to know if a particular project has been done especially for projects that have been flooded. It reduces repetition of project topics thereby helping students to be able to sit down, think very well and come up with a reasonable project topic. This is a logical step as the proposed system minimizes the clutter in the supervisor's office in cases where students have to come with hard copies of their completed projects and saves the space which can be utilised for other important purposes. The proposed system facilities have extensive storage methods where projects are stored in a completely secured area which is fire and flood proof.

Other significant improvements of the proposed system over the existing system are: documents can be retrieved easily as at when needed, it reduces the time students spend to consult past projects manually, it aids research, eliminates time wastage, it reduces stress for both students and supervisors, maximum security of projects is guaranteed, it is easy to access and so convenient. It is mobile.

**System Design**

System design comes after the analysis. It allows the researcher to put to reality all the information gotten from the analysis stage. It is a process whereby definite specification of a system are produced. System design can further be discussed under the following categories: preliminary design and structured design.

**Preliminary Design**

The proposed system is designed with the idea of simplicity. The system is responsible for the storage of information such as projects which include the date of completion of the project and the supervisor's name. The system will make information on the desired project available as at when needed.

**Structural Design**

The design of the system is structured in such a way that allow various project searches to be displayed after imputing the first two characters and after the searches have been displayed you can then click on view and the desired search output will be displayed. The projects are being displayed in Pdf format. The figure 4 shows the schematic flowchart of the proposed system.

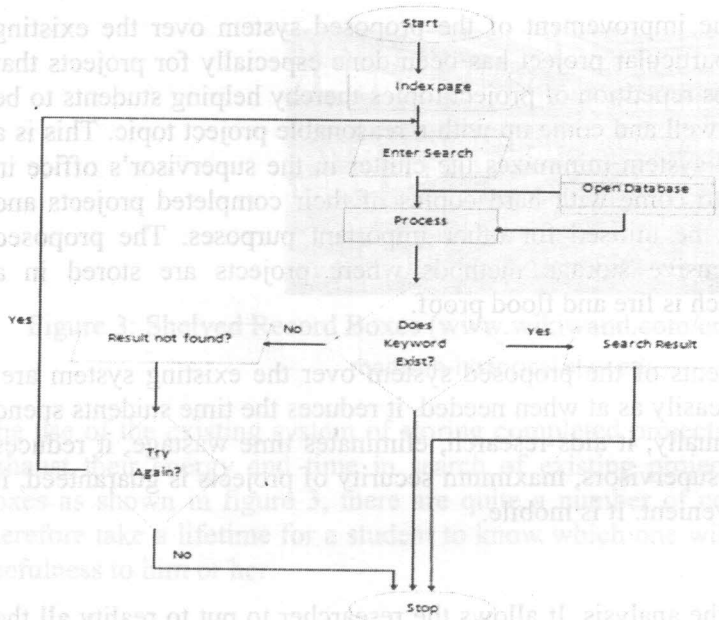


Figure 4: Schematic Flow Chart of the Proposed System.

**Menu Design**

The computer and other components must be correctly connected. The computer should be powered on and wait until it finishes booting into the windows environment. A web server need to be started either locally or remotely. Once the project folder is placed in the web server directory, the user needs to locate it by typing "LOCAL HOST" into the address bar of a typical browser, where all available project folders will be listed. The user checks on the archival system project folder which automatically loads the index page that contains a simple search text field, where users are preamble with "Type Your Search Here". As user types in these search keywords, after the third (2nd) letter of word, it indexes search result where users can click and access needed documents. The search text box helps to look for a particular word or sentence as the user types in it. This was accomplished through the use of the Query.

**Input Design**

The input design explains how data are gathered into the system or the ways data are organized in order for the successful processing state. This design of input focuses on how the search word is being processed.

**Output Design**

The output design is developed to meet the system design requirements and present the query result clearly. Efficient and intelligent output design improves the system's relationship to help the user experience desired result like it is done in the archival system of completed projects. The output design is made hidden before the query of the project topic is input in the search textbox, once an entry is made into the search box, the corresponding output as regard the search is with details below the search box.

**Database Design**

A database design is an organized mechanism that has the capability of storing information through which a user can retrieve, update and store information in an efficient and effective manner.

**Results**

Screen shots displaying the interface of various modules of the Online Archival system are shown in this section.

1. Search Page: Upon launching the system, the first page to be displayed is the search page which is shown in the figure below 5. This is where queries are entered in terms of project titles or name of authors.

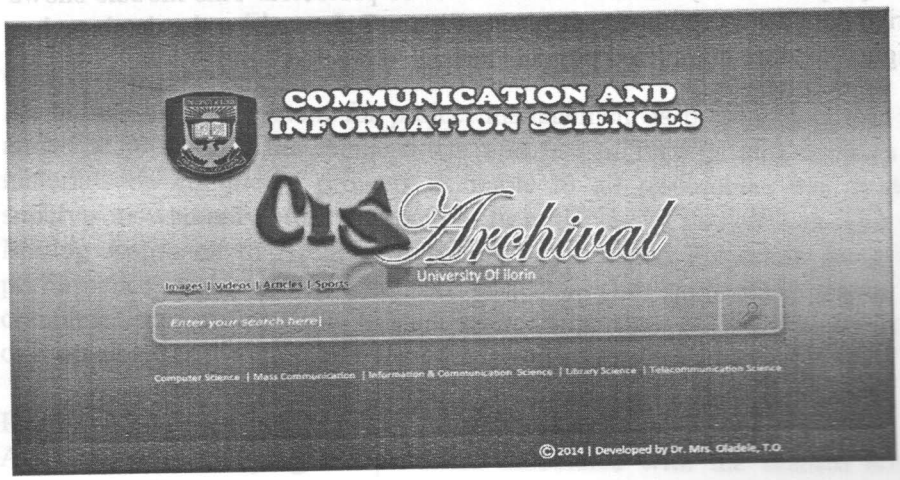


Figure 5: Search page

2. Search Result: After a search query is entered in figure 5, a search result showing similar or related project topics will be displayed as shown in figure 6.

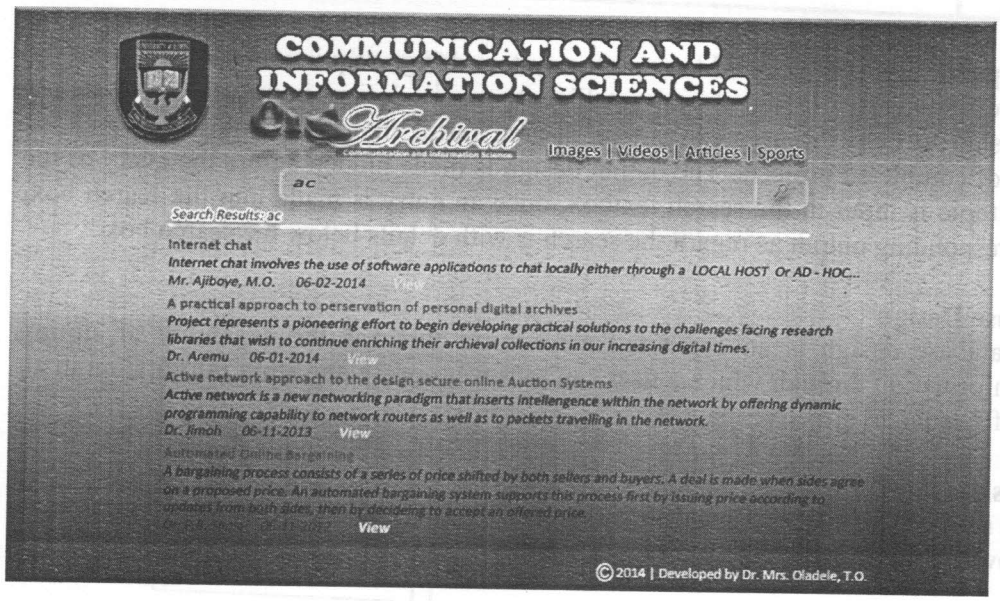


Figure 6: Search Result

3. Data is the purpose of any database and it must be protected. This module shows how queried data are stored in the database. Figure 7 shows how the database has been designed to store completed projects through a created table.

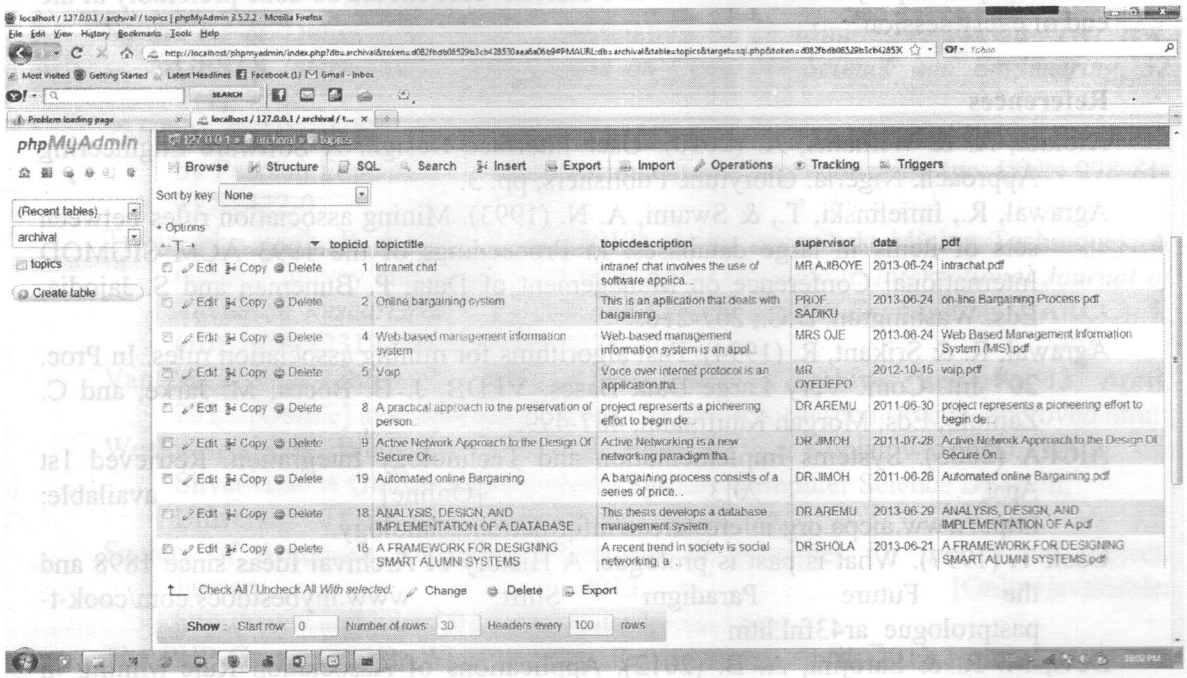


Figure 7: Database of Stored Projects.

## Conclusion

An online archival system for project management is presented in this paper. This is aimed at promoting the management and use of records and archives and to make materials on completed projects available to all researchers and students and also supervisors who may profit and benefit from the use of its holdings. This paper on Data Mining Approach to Archival System of Completed Project is for a scalable, high performance archive of completed projects. The application makes materials on completed projects available to students and supervisors. This system is a very efficient one which eases the stress of consulting past projects manually.

## Recommendations

After carefully studying the problems associated with the manual archival system, concerted efforts were made to solve the problem by providing an online storage medium for completed projects. The following recommendations are made concerning the proper utilization of the system: Great awareness should be made concerning the use of the newly designed system. It should be implemented in the University Library and in all Departments of the various Faculties in the University. It should be updated with

more completed projects at least once in a session. This should be done preferably at the end of every session.

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