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THE USE OF RECOMMENDER SYSTEMS IN RESEARCH: A CASE STUDY OF KADUNA STATE COLLGE OF EDUCATION, GIDAN WAYA- KAFANCHAN.

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ABSTRACT

Most of knowledge management systems and electronic commerce use recommender systems as the underlying tools for identifying a set of items that will be of interest to a certain user. A recommender system is a type of information filtering system by drawing from huge data sets the system's algorithm can pinpoint accurate user preferences. This Study examined the use of Recommender Systems in Research using Kaduna State College of Education, Gidan Waya, Kafanchan as a case study. The study carried out with two objectives which were transformed into the research questions and null hypothesis. The study made use of cross-sectional correlation survey research design as a plan for data collection. The population of the study consisted of 498 lecturers of Kaduna State College of Education, GidanWaya, Kafanchan. It was difficult to reach all target population; stratified random sampling technique was employed to select 90 teachers as sample of the study. A null hypothesis was postulated and tested at 0.05 level of significant. Some of the major findings show that only 27.8% of the sampled population are using Recommender systems in research. The data collected from questionnaires which were analyzed using descriptive statistics and chi-square of significance. The study therefore

Introduction:

A recommender system is a type of information filtering system. By drawing from huge data sets, the system's algorithm can pinpoint accurate user preferences. Once you know what your users like, you can recommend them new, relevant content. And that's true for everything from movies and music, to books.

Netflix, YouTube, Tinder, and Amazon are all examples of recommender systems in use. The systems entice users with relevant suggestions based on the choices they make.

Recommender systems can also enhance experiences for: News Websites, Computer Games, Knowledge Bases, Social Media Platforms and Stock Trading Support Systems

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recommends the use of Recommender systems in carrying out research. Research paper recommender systems can help the researcher avoid such time-consuming searches by allowing each researcher to automatically take advantage of previous searches performed by others in order to cope with the 21st century research.

Keywords: *Recommender System, Content-base filtering, Research, Collaborative Filtering, Websites, Hybrid filtering.*

Nowadays, internet is available everywhere due to the advances in technology. There are cell phones, computers and smart watches that have internet connection capabilities and they are really cheap to buy. People are using these tools and provide more and more information through internet. Therefore there is a huge information overload and it is growing day by day. Information is obtained by not only personal computers and mobile phones, but also cash registers which people use when they are shopping. Cash registers are recording every user transaction. As a result, corporate databases store excessive amount of data like point-of-sale transactions and credit card purchases. For instance,Wal-Mart operates a chain of discount department stores and every day it collects20 million point-of-sale transactions. In addition to this, research centers have huge databases for scientific purposes. Astronomical observatories store images of galaxies and they record every second of the universe. As a result, databases have grown from gigabytes to terabytes. To emphasize its significance, if we assume that each book requires 1 megabyte, then a terabyte is equivalent to about 1 million books. As a result, large data sets have become available everywhere. What will the information holders do with this huge data set? Huge data set can be beneficial if it is monitored and managed appropriately. In this sense, data mining is needed. Data mining is a technique to discover patterns in data. It also provides finding associations, changes, anomalies and statistically significant structures in data. It is easier to apply data mining techniques now than in the past. While the data is growing, scientists and engineers propose more improvements in technology such as available and affordable computing power. Therefore data mining has become popular in many applications, because raw data by itself does not provide much information. They have to process, organize, structure or present the data in a given context in order to make it useful and gain more insights. Several companies use data mining for many reasons. To name a few examples, Facebook uses data mining methods for

prediction of activeness of users within 3months time period. British law enforcement and intelligence agencies use data mining to predict the future behavior of people so that they can take precautions against crimes or security threats. We can give more examples from the e-commerce sector. E-commerce sites use recommendation systems to offer effective suggestions. Netflix (the largest DVD-by-mail rental company) andAmazon.com use data mining to provide recommendations to their customers. So they are recommending new products which customers might also be interested in besides the other products in their website. Recommendation is done also with personalization. So people are going to see recommended products which they are interested in. Moreover the results may be useful for prediction in order to guess future buying behavior. Recommendation systems are popular not only in e-commerce sector, but also in digital media sector. The websites which offer music, movie or photography use recommender systems. An internet radio can choose the next song to play using data mining algorithms, or a movie website can suggest a movie which users may like. There is too much to watch, listen to or read. So people need to filter, make choices and select only the content or information that is relevant or interesting for them personally. Therefore data mining helps them to eliminate unrelated content.(Capraz, 2016).

Background to the Study

The explosive growth of the world-wide web and the emerging popularity of e-learning and e-commerce has caused the collection of data to outpace the analysis necessary to extract useful information. Recommender systems were developed to help close the gap between information collection and analysis by filtering all of the available information to present what is most valuable to the user (Resnick and Varian, 1997).

One area of the web that has seen continued growth is the online publication of research papers. The number of research papers published continues to increase, and new technology has allowed many older papers to be rapidly digitized. A typical researcher must sift through a large quantity of articles manually, relying on keyword-based searches or paper citations to guide them. The search results of researchers with similar interests can help direct a more effective search, but the process of sharing search results is often too cumbersome and time consuming to be feasible. A recommender system can help by augmenting

existing search engines by recommending papers based on the preferences of other researchers with similar interests.

Many people are accessing online services for daily activities which involve sharing personal information with the service provider. Such online services are social networks, academic researches and online shopping. In social networks, people get in touch with other people, and also create as well as share data which includes personal information, images and videos. The provided contents of the user can be access by service providers and they have the right to build up the collected data and issue them to third parties. Online applications are important part of daily life for millions of users. People use the internet to search for valuable materials and interact online. The range and amount of content that is offered to users is often huge, automated recommender systems are employed. By providing personalized suggestions, these systems can help people find interesting media, boost sales through targeted advertisements, or help people meet new friends. Because of their automated nature, recommender systems can meet the demands of large online applications that operate on a global scale.

Recommender systems have proved to help achieving this goal by using the opinions of a community of users to help individuals in the community more effectively identify content of interest from a potentially overwhelming set of choices. Two recommendation strategies that have come to dominate are content-based and collaborative filtering. Content-based filtering rely on rich content descriptions of the items that are being recommended, while collaborative filtering recommendations are motivated by the observation that we often look to our friends for recommendations. Systems using recommendations have been developed in various research projects. The system called Tapestry is often associated with the genesis of computer-based recommendation systems. Later, several research projects have focused on recommender systems, either by introducing new concepts, or by combining old concepts to make better systems. Recommender systems have also been deployed within commercial domains, for example in e-commerce applications. A well-known example is Amazon, where a recommender system is used to help people on items they would like to purchase. Many online communities within the movie domain use recommender systems to gather user opinions on movies, and then produce recommendations based on these opinions. Examples are MovieFinder2 and Movielens3. New popular music services like Pandora4 and

Last.fm5 also make use of recommendations to configure personalized music players (Mortensen 2007).

Recommender system is classified in the category below:

1) Content based recommendation: In such recommendation consumer will recommend item same to the ones consumer favored in the past.
2) Collaborative recommendation: In such recommendations techniques, consumer will recommend item that person with same tastes and predilections alike in past.
3) Hybrid Recommendations: In Hybrid recommendations, collaborative and content-based recommendation methods are combined.

Research Motivation

Many researchers don't use recommender systems in research, they prefer the brick-and-mortar store to get books or article while other use the general web. Recommender systems provides the users with more personalize information

Researchers spend considerable time searching for relevant papers on the topic in which they are currently interested. Often, despite having similar interests, researchers in the same lab do not find it convenient to share results of bibliographic searches and thus conduct independent time-consuming searches. Research paper recommender systems can help the researcher avoid such time-consuming searches by allowing each researcher to automatically take advantage of previous searches performed by others in the lab. Existing recommender systems were developed for commercial domains to assist users by focusing towards products of their interests. (Agrwal et.al, 2008)

Problem Statement

The problem with general web is that users during search are face with the problem of high recall with low precision, spelling variant, synonyms and homonyms. Internet users and online shoppers have come to expect personalized experiences. At the very least, they want websites to make recommendations so they don't waste time sifting through things they don't like.

Recommender systems are a great way for any business to personalize their offers.

Whether your goal is to keep people on your platform (YouTube) or show users exciting, new offers like books (Amazon) – a recommender system is the answer.

Research Aim and Objectives

The research work aims at determining the comparative effect of using recommender system as a tool in research among teachers in Kaduna State College of education. The objectives are as follows:

The specific objectives are to:

1. To determine the effect of using recommender system among teachers education in Kaduna state college of education, Gidan waya.
2. To determine recommender system literacy of teachers in Kaduna state college of education, Gidan waya.

Recommender System (RS)

Personalization has become one of the key features of on-line content. For instance,

Amazon frequently recommends items to customers based on their previous purchase

history. Similarly, Facebook ranks and displays news feeds as to match personal interests of their users. The engines behind personalization are known as recommendation systems (RS). These systems analyze the behavioral patterns of users in an attempt to infer user preferences over artifacts of interest. Figure 1 gives two examples of recommender systems (RS).

Recommendation systems aim to improve accuracy of suggestions which users might interest. Recommender systems are based on cognitive science, information retrieval, approximation theory. It emerged as an independent area in mid 1990s with the focus on structures of ratings. In recommendation systems, the main job is to find unseen and unrated items for a user in order to choose the correct items with the highest estimation values. The systems try to estimate ratings by using domain knowledge, similarity algorithms and machine learning approaches. So a recommender system is responsible for predicting the rating or preference that a user would give to an item. When a user creates his order profile, the system has to get the user preferences in order to provide his interesting recommendations. Both consumers and sellers can benefit from recommendation systems. Due to the recommendation systems, users can reach the interesting and related items easily. Recommendation systems can be applied to a variety of applications. For example, some of the recommended items are movies, songs, news, books, research articles, social tags, search queries and products in general. In addition to this, there exist recommendation systems for

jokes, restaurants, financial services, life insurance, friends (like Facebook or dating websites), and followers (like Twitter) (Viljanac, 2014)

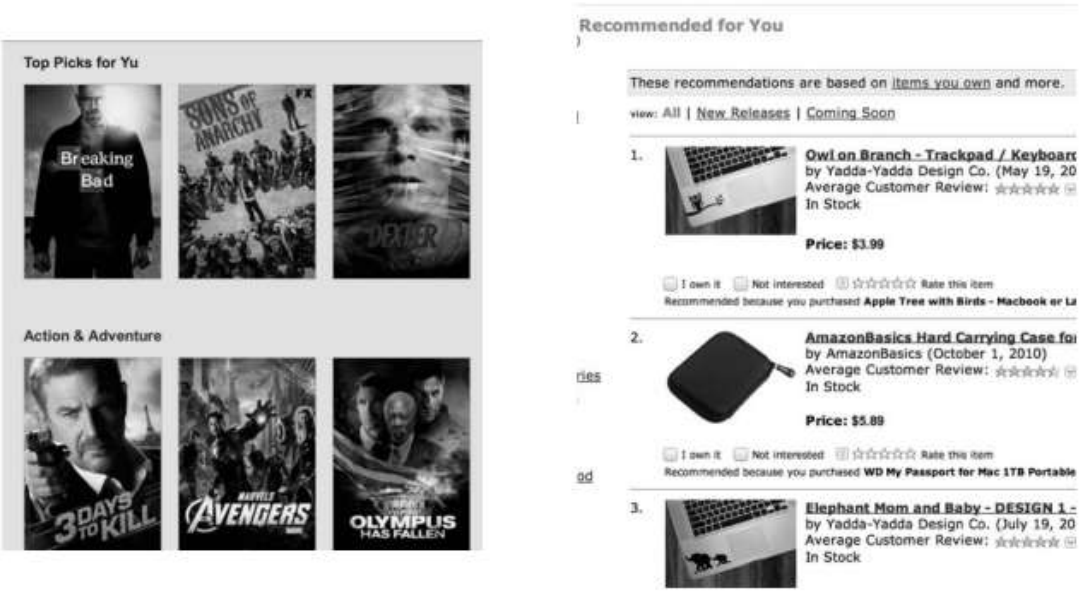
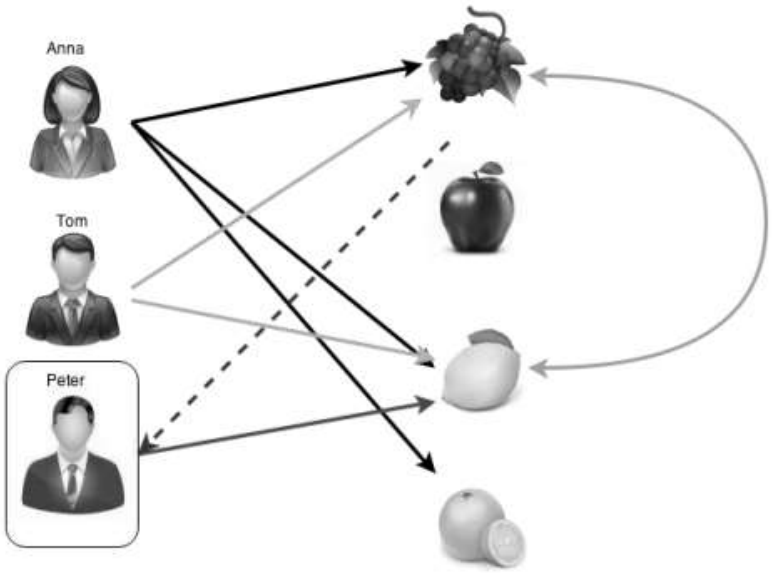


Figure 1: Examples of Recommendation Systems. (Xin, 2015)

Content Based Filtering (CBF)

Content-based recommendations use methods which focus on item descriptions and characteristics. These methods create a profile for every user (*content-based profile*) that memorizes characteristics of previously viewed items. Comparing the information from the profile and item descriptions recommender system tries to find items suitable for the user. In other words content-based algorithms recommend those items that are similar to the items, which have been previously viewed by the user. For example, a system recommending movies would analyze the movies a user likes to find out what they have in common in terms of content, i.e. actors, directors, genres, et cetera. This information will constitute the user's preferences, which are used to find movies with a high degree of similarity to the liked ones. Unfortunately content-based recommenders have a few drawbacks. One of them is the so-called *new user problem* in which the user has to view or rate certain amount of items before his preferences could be understood. Also, sometimes they may recommend items that are too similar to each other and provide the user with unnecessary information.(Viljanac, 2014)

Figure below illustrates an example of content-based recommending. Peter is the person receiving recommendations and he likes lemons. By comparing Anna's and Tom's likes it is obvious that the they both like lemons and grapes. The recommending engine therefore concludes that lemons and grapes are similar. If Peter likes lemons than he is recommended with grapes.



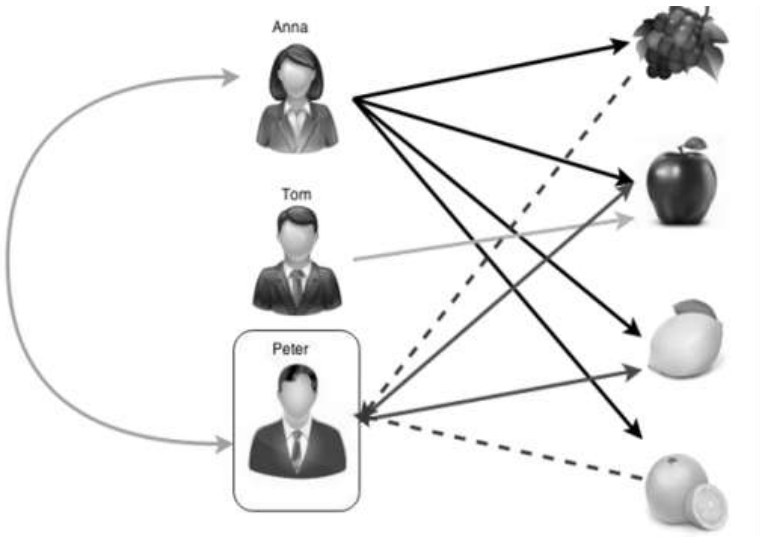
Content-based recommendations. (Viljanac, 2014)

Collaborative Filtering (CF)

Collaborative recommender systems collect feedback information from the users that rate items. They connect the users, which manifest similarities in ratings and use that information for recommendations. In short, collaborative filtering algorithms recommend those items, which were approved by similar users. This kind of recommending is also called *personalized recommending*. A movie recommender system would find peers, users who have similar rating patterns to the user receiving recommendations. The movies with the highest ratings according to the peers, and which the user has not yet seen, would then be recommended.

Collaborative recommenders take advantage of human judgments but also suffer from the *new user problem*. In addition, they suffer from so called the *new item problem* that causes new items to be ignored (i.e. not recommended) until a certain amount of users have rated the item.

Figure below illustrates an example of collaborative recommending. Peter is again the person receiving recommendations but this time he likes lemons and apples. If we search for the person with similar preferences like him then we can notice that Anna also likes lemons and apples. She is a user similar to Peter. Because she also likes oranges and grapes, both items are recommended to Peter. (Viljanac, 2014)



Collaborative recommendations. (Viljanac, 2014)

There are two main branches of recommender systems; content based filtering and collaborative filtering. Content based filtering (CBF) approaches create relationships between items by analyzing inherent characteristics of the items. Collaborative filtering (CF) systems do not analyze an items properties, but instead take advantage of information about users' habits to recommend potentially interesting items. The analysis of user behavior patterns, allows collaborative filtering systems to consider characteristics that would be very difficult for content based systems to determine such as the reputation of the author, conference, or journal. CF approaches are also well suited to handle semantic heterogeneity, when different research fields use the same word to mean different things.

In many domains, there is an ever increasing number of users while number of items remains relatively stable. However, in domains such as research paper

recommendation, the number of users (researchers) is much less than the number of items (articles). Collaborative filtering systems face two major challenges in the research paper domain: scalability to high dimensional data and data sparsity. In a typical recommender system there are many items. For example, Amazon.com recommends specific books of interest from a large library of available books. Item-based approaches that determine similarity measures between items do not perform well since the item space is extremely large. A user based approach allows us to leverage the relatively small number of users to create an efficient algorithm that scales well with the huge number of research papers published each year. An intuitive solution used by early collaborative filtering algorithms is to and users with similar preferences to the current user and recommend other items that group of users rated highly. Even with a relatively small number users, however, this approach is computationally complex. The use of clustering algorithms to pre-determine groups of similar users has been used to significantly increase performance (Ungar and Foster, 1998; Mobasher et al., 2000).

Hybrid Filtering

Both of the above-described techniques are efficient only in certain conditions and have different kinds of drawbacks. For this reason hybrid recommender systems have been developed in a way that they combine abilities of both collaborative and content-based recommendations. As an example, such a system could implement the two methods separately and then combine their results. A hybrid approach could also incorporate any other method, such as recommending items based on what has been consumed in locations close to the user (Viljanac, 2014).

Research Questions

To investigate the above stated problem, the following research questions were formulated:

1. What is the level of recommender system literacy amongst teachers in Kaduna state college of education, Gidan waya?
2. How does recommender system usage affect research in Kaduna state college of education, Gidan waya?

Hypothesis

Ho: There is no significant effect of the use of Recommeder Sytem (RS) as a tool in research in Kaduna state college of education, Gidan waya;

Methodology

The study adopted descriptive research design. Since the study is cross sectional, the design was considered suitable because it will assist in establishing the relationship in the perspective of teachers using recommender system in Kaduna State College of Education.

The population of the study was ninety (90) from five (5) out of the 7schools in the college. There are 478 academic staff in the college (information source: Kaduna State College of Education, 2019). Stratified random sampling technique was adopted in selecting research participant and the instrument for data collection was questionnaire structure by the researcher which consists of section A and B. A consist of personal information of the respondent while B comprises of six (6) item of the respondent view on the use of recommender system as a tool in research. LIKERT scale of four (4) rating was used as follows: Strongly Agreed (SA)(4), Agreed (A)(3), Disagreed (D) (2) and Strongly Disagreed (SD)(1).

Research questionnaire were personally administered by the researcher with permission from deans of the school considered and retrieved a soon as they are completed/ the test instrument was subject to validation by two validates, one from the department of sociology, Mrs. Amina K. Duniya of Kaduna State University and one from Kaduna State College of Education. Data was collected and analyzed using descriptive statistics and chi-square of significance was used to test the hypothesis at 0.05 level of significance.

Result

Table 1: The Distribution Sample

S/NO	Name Of School	Total Number of Teachers	Number of Sampled Teachers
1	School of General Education	109	30
2.	School of Adult and Non formal Education	28	5

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3.	School of Secondary Education: Vocational and technical	61	15
4	School of Secondary Education: Languages	61	15
5	School of Secondary Education: Sciences programme	88	25
	Total	347	90

The table above shows the distribution sample collected from the five different school of the college. Ninety samples were collected out of the academic staff.

Research Question 1

1. What is the level of recommender system literacy amongst teachers in Kaduna state college of education, Gidan waya?

Table 2: Distribution of Recommender System literacy of Respondents

I use recommender system	Frequency	Percentage %
Yes	25	27.8
No	65	72.2

From the table above, it shows that 25 (27.8%) of the respondents are literate about the use recommender system in carrying out research and 65 (72.8%) of the respondents are not Recommender Systems literate. This indicates that minority of the respondents are literate about Recommender system.

Research Question 2

How does recommender system usage affect research in Kaduna state college of education, Gidan waya

Table 3: Respondents Opinion about Recommender system

S/N	ITEMS DESCRIPTION	SA	A	D	SD	TOTAL

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1	**Recommender System in research** are useful	65 (72.2)	10 (11.1)	8 (8.9)	7 (7.8)	100 (90)
2	I am aware of the need to use **Recommender System in research**	32 (35.6)	21 (23.3)	24 (26.7)	13 (14.4)	100 (90)
3	**Recommender System yields results in short period of time**	29 (32.2)	26 (28.9)	15 (16.7)	20 (22.2)	100 (90)
4	I now use **Recommender System in carrying out research**	24 (26.7)	16 (17.8)	22 (24.4)	28 (31.1)	100 (90)
5	**Using recommender System in Research** is to me more preferable to traditional method in meeting the needs research	14 (15.5)	26 (28.9)	27 (30.0)	23 (25.6)	100 (90)
6	I use the Amazon **Recommender System** search for books and articles	13 (14.4)	17 (18.9)	23 25.6)	37 (41.1)	100 (90)

To provide a clearer position of respondents on each issue considering that there can be only two positions of agree or disagree, therefore, the two agree columns and disagree columns were added together for the purpose of interpretation (Nkom, 1982 cited in Kukwi, 2003).

Therefore, from table 3, the first item clearly shows that 83.3% of teachers agree that that recommender systems are useful but some of them not been using them while 16.7% of teachers disagree that with the fact that recommender systems are useful in carrying out research.

From second item, 58.9% of the teachers are aware of the need to use recommender systems in carrying out research. However, 41.1% of teachers used for this study are not aware of the need to use recommender systems as a tool in research.

The third item shows that 61.1% of the teachers agree that recommender system yield more result in shorter period of time. However, 38.9% of the teachers disagree with the fact that when recommender system are used in searching for information, more result will be gotten in shorter period of time.

Moreover, item 4 shows that minority of the respondents represented by 44.5% of teachers agree that they now use recommender systems as a tool in research while 55.5% do not use recommender systems.
Furthermore, from item 5, minority of the respondents represented by 44.4% of teachers agree that using recommender systems in research is more preferable than the traditional methods in meeting research needs while 55.6% disagree.
Finally, minority of the teachers represented by 33.3% agrees that they have use recommender systems like amazons to search and buy books and articles for research. However, 66.7% of the teachers have not use recommender systems like Amazon for research purposes.

Hypothesis testing

The postulated was tested at 0.05% alpha level of significance. This subsection presents the result of the Chi Square analysis on the hypothesis.
Ho: There is no significant effect of the use of Recommeder Sytem (RS) as a tool in research in Kaduna state college of education, Gidan waya.

Table 4: Chi Square result of the use of Recommender Systems in research

Variable	df	α	$X^2_{Cal.}$	$X^2_{Tab.}$	Decision
1. Science					
2. Gen.Education					
3. Languages					
4. Voc. & Tech					
5. Adult& Nonf					
	4	0.05	5.02	9.48	Accept Ho

Table 4 shows the Chi Square result for the use of Recommender Systems in Research in Kaduna State College of Education. From the table, it is evident that the calculated X^2 which is 5.02 is less than the critical value of the X^2 which is 9.48 at 0.05 level of significant with 4 degrees of freedom. The null hypothesis was therefore accepted against the alternative hypothesis. Hence, there is no significant difference in the use of Recommender System as a tool for carrying out research in Kaduna state college of Education, GidanWaya, Kafanchan.

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Summary

This study tries to explicate the use of Recommender Systems in research using Kaduna State College of Education, Gidan Waya, Kafanchan as a case study. Below are the research questions considered:

1. What is the level of recommender system literacy amongst teachers in Kaduna state college of education, Gidan waya?
2. How does recommender system usage affect research in Kaduna state college of education, Gidan waya?

A null hypothesis was also considered as :

There is no significant effect of the use of Recommender Systems (RS) as a tool in research in Kaduna state college of education, Gidan waya.

Tables, simple percentages were the instrument used for the study and Chi Square for paired samples and also LIKERT scale was used for the work.

90 teachers were used as the sample size and data were collected using a teacher's questionnaire which was enhanced by more verbal clarifications by the researcher.

However, the research questions were analysed using tables and simple percentages based on responses obtained during the research and hypothesis was tested using Chi Square.

Conclusion and Recommendations

Researchers spend considerable time searching for relevant papers on the topic in which they are currently interested. Today technology innovations in education primed a great promise in research, Recommender systems provides the users with more personalize information. With the introduction of recommender systems, internet users and online shoppers waste time sifting through things they don't like .Recommender systems are a great way for any business to personalize their offers..

In view of the findings of this study, the following conclusions were drawn: Recommender Systems is a major tool in carrying out research in order for researchers to cope with the increase quest for knowledge. The need for teachers and researcher to engage the use of Recommender Systems as a tool effectively will yield positive result. However, regarding the roles of a conventional teacher and researchers, an effective use of Recommender Systems in research will increase job satisfaction and produce highly effective and efficient teachers.

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Finally, based on the findings of this study, we recommended that teachers, student and people that love to research should employ the use of recommender systems as a tool in searching for information online. Research paper recommender systems can help the researcher avoid such time-consuming searches by allowing each researcher to automatically take advantage of previous searches performed by others in order to cope with the 21st century research.

References

Agrawal, R., Gehrke, J., Gunopulos, D., and Raghavan, P., (1998). Automatic Subspace Clustering of High Dimensional Data for Data mining Applications. *In Proceedings of the 1998 ACM SIGMOD International Conference on Management of Data*, pp 94{105. ACM Press.

Alejandro B.K,(2012). Recommender System Performance Evaluation and Prediction: An Information Retrieval Perspective. *Departamento de Ingeniería Informática, Universidad Autónoma de Madrid*.

Carpaz S., (2016). A Content Based Hybrid Recommender System. *Graduate School of Natural and Applied Science of Middle East Technical University.*

Data Min. Knowl. Discov., 9(2):147{170.

Demiriz, A., (2004). Enhancing product recommender systems on sparse binary data.

Habu S., (2017). Non Malleable Privacy Recommender System. *Faculty of Physical Science, Computer Science Department, Ahamadu Bello Universiyt, Zaria-Nigeria*.

Juliet D. S., &Yabuwat, P. N., (2018). An Examination of Teacher Education and the Role of ICT in the 21st century in Kaduna State College of Education, Gidan Waya Kafanchan, *20th annual Conference of Association of Educational Researchers and Evaluators of Nigeria (ASSEREN), New Multipurpose Hall, FCT College of Education , Zuba-Abuja,* 9th - 13th july, 2018.

Mobasher, B., Cooley, R., and Srivastava, J., (2000). *Automatic personalization based on web usage mining. Commun.* ACM, 43(8):142{151.

Mortensen M., (2007). Design and Evaluation of Recommendation System. *Faculty of Science, Department of Computer Science, University of Tromso.*

Resnick, P. and Varian, H. R., (1997). Recommender systems. Commun. ACM, 40(3):56{58

ISSN: 1334-4977

Sarwar, B., Karypis, G., Konstan, J., and Reidl, J., (2001). Item-based Collaborative Filtering Recommendation Algorithms. *In Proceedings of the Tenth International Conference on World Wide Web,* pp 285{295. ACM Press.

Ungar, L. H. and Foster, D. P., (1998). Clustering methods for collaborative Filtering. *In*

Viljanac V., (2012). Ranking of Facebook friends based on user profiles, *Faculty of Electrical Engineering and Computing, Zagreb.*

Viljanac V., (2014). Recommender system for Mobile Application. *Faculty of Engineering and Computing.University of Zagreb,*

Workshop on Recommendation Systems at the 15th National Conference on Artificial Intelligence.

Xin Y., (2015). Challenges in Recommender System: Scalability, Privacy & Structured Recommendations. *Department of Electrical Engineering & Computer Science Massachusettes Institute of Technology.*

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