Design and Users' Acceptance Testing of a Computer-Based Research Data Management System in Federal Universities of Technology in Nigeria

Fatimah Jibril Abduldayan[1*], Fasola Petunola Abifarin[2], Georgina Uchey Oyedum[3], Jibril Attahiru Alhassan [4]

[1,2,3,4] *Department of Library Information Technology, Federal University of Technology, Minna, Nigeria,* *fj.dayan@futminna.edu.ng

*Corresponding author

Abstract

Management of research data is becoming increasingly important especially as it is being required as a core requirement by journal publishers and funding agencies. Users' experience, as gathered from researchers in five federal universities of technology in Nigeria, showed that knowing the actual data to manage, how to manage, when, and where to manage it is quite difficult. This study developed and conducted users' acceptance testing of a computer-based Research Data Management System (RDMS) that would guide researchers, who are actual data producers, on proper data management through their research life cycle so that they could come up with a product (datasets) that repositories (libraries) can accept and manage for future reuse. Chemistry was purposively selected as the discipline in focus. Interview method was used to understand the existing research data workflow of chemists while questionnaire was used to conduct the users acceptance testing. Evolutionary prototyping technique was used for software development while constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT) was adapted for acceptance testing. Findings revealed that performance expectancy, effort expectancy, facilitating conditions had no significant effects on the behavioural intentions to use the system. However, research experience and social influence had significant effects. Hence, libraries in the federal universities of technology in Nigeria should roll out research data services and intensify efforts on advocacy and training on use of the RDMS by chemists.

Keywords: research data management system, unified theory of acceptance and use of technology UTAUT, evolutionary software development model.

1. Introduction

Research experiments are characterised by enormous data generation which must be carefully managed for future reference and reuse. Research data, according to (Ball, 2013) "means data in the form of facts, observations, images, computer program results, recordings, measurements or experiences on which an argument, theory, test or hypothesis, or another research output is based. Data may be numerical, descriptive, visual or tactile. It may be raw, cleaned or processed, and may be held in any format or media". They can also be in the form of physical collections (animal and plant specimens), software codes, algorithms, geospatial data, databases, experimental observations, survey results, interview transcripts, instrument measurements, and laboratory notebooks. Research data are valuable products of the scientific enterprise that historically have not been well preserved or archived (Abduldayan, Abifarin, Oyedum, & Alhassan, 2019). Research Data Management (RDM) concerns the organisation of data, from its entry to the research cycle through to the dissemination and archiving of valuable results. It aims to ensure reliable verification of results and permits new and innovative research built on existing information (Abduldayan, Dang, Karemani, & Obadia, 2016).

Research data management is becoming necessary and challenging especially now that it is being required to be submitted alongside articles for publication in impact factor journals and is also a requirement for applying for international research grants and funding (Ball, 2013). The need for effective research data management practice by researchers cannot be overemphasized. This is because the loss of research data will make it practically impossible to replicate a study or support the findings in a study. It was observed in (Mcgill, 2015) that "information is lost when researchers fail to store, archive, or share their data, this could be a result of ageing technology or corruption of data-storage devices. A culture of systematic data curation is needed to stem this loss, but it is not yet in place across research fields".

In order to prevent loss of research data, universities, research institutes, libraries and data archiving centres in developed countries are rolling out various research data services and programs aimed at assisting and guiding researchers in managing their research data for preservation and future reuse. Some of these ways were by offering training on research data management, providing advisory services on data management, development of data management plan toolkits (Ball, 2013), and funding studies on data management practice of researchers in their universities (Gunjal & Gaitanou, 2017). Effective research data management practice ensures that limited financial resources, time, and efforts involved in conducting researches are saved and can be repurposed into other areas of need. This is very important especially in developing countries like Nigeria where access to research funds are limited. Research data management also ensures that researches are novel without reinventing the wheel, hence, datasets can be re-analysed and new insights and results generated without conducting the research from the beginning.

Libraries are now leveraging on Information and Communication Technologies (ICTs) tools to roll out systems and services that can be embedded in researchers' workflow and support the effective management and sharing of research data (Abduldayan et al., 2016). Chemistry as a scientific discipline is offered in most federal universities in Nigeria. There are five specialised universities of technology in Nigeria where chemistry as a scientific discipline is offered. In addition, chemistry is offered in the five specialised federal universities of technology in Nigeria. These universities are: Abubakar Tafawa Balewa University, Bauchi (ATBU), Federal University of Technology Akure (FUTA), Federal University of Technology Minna (FUTMIN), Federal University of Technology Owerri (FUTO), Modibbo Adama University of Technology Yola (MAUTECH). (Chen, X., Wu, 2017) categorised chemists' research data management needs into five areas: data generation and collection, data recording and processing, data preservation and backup, data publication and sharing, needs for data management and sharing services. These areas can form the basis for libraries to develop an intervention support program and services in other to satisfy chemists' needs (Corrall, Kennan, & Afzal, 2013). A laboratory notebook is what some researchers use in keeping their research data, because it is in hardcopy, it becomes challenging to effectively define the data items and manage the book and its contents for long term.

Furthermore, a related study conducted by (Rafizan, 2017) focused on the design of information systems for research data management that align with business processes in ICT Research and HR Development Agency of the Ministry of Communication and Information Technology (MCIT). The system was designed to "facilitate the activities of storage, preserve and sharing access of the research data", an area of focus in our current study. Similarly, (Abduldayan, Abifarin, Oyedum, & Alhassan, 2020) presented the research data management practices of chemistry researchers and recommended the need for libraries to roll out research data management services to assist in managing and curating research data of chemistry researchers. This study developed a Research Data Management System (RDMS) in order to satisfy chemists' research information needs by developing a system that is relevant and can readily fit into their research workflow. The study further conducted an acceptance testing of the RDMS using the Unified Theory of Acceptance and Use of Technology (UTAUT) model.

The remaining part of this paper was organized as follows: Section 1 Introduction, Section 2 Literature Review. Section 3 Methodology, Section 4 Technology Description, Section 5 Results of Technology Acceptance Testing, Section 6 Discussions Section 7 Conclusion, and Section 8 Recommendations.

2. Literature Review

Scientific researches generate specific research data; effectively managing the research data for reuse and long-term preservation is a challenge especially to chemists (Dallmeier-Tiessen et al., 2017). (Chen, X., Wu, 2017) categorised chemists' research data management needs into five areas: data generation and collection, data recording and processing, data preservation and backup, data publication and sharing, needs for data management and sharing services. These areas can form the basis for libraries to develop an intervention support program and services in other to satisfy chemists' needs (Corrall et al., 2013). A laboratory notebook is what some researchers use in keeping their research data, because it is in hardcopy, it becomes challenging to effectively define the data items and manage the book and its contents for long term. Lack of effective research data management results in loss of data and information that would have been used for future researches. Poor data management has also led to irrecoverable loss of data and information as observed by (Mcgill, 2015). This situation can be salvaged by incorporating effective data management practices throughout the research (Whyte & Jonathan, 2011).

Libraries, in their efforts to support RDM services, roll out different programs in their host institutions. (Yoon & Schultz, 2018) conducted a content analysis of 185 academic libraries' websites in the USA that offers RDM services. The study observed the wide variation among library data management services and programs according to their web presence. The University of Queensland Library in Australia offers RDM services that supports researchers in the planning and preparing, conducting, archiving, publishing and disseminating stages, using a research lifecycle model (Yu, Deuble, & Morgan, 2017). Similarly, (Chiware & Mathe, 2016) presented a South

African perspective as regards academic libraries' role in research data management services. The study recognized the fact that RDM services are being implemented by academic and research libraries globally in support of university research activities. In South Africa, some libraries are beginning to provide frameworks for these services with some degree of successes as policies are being formulated, infrastructure set up, library staff trained, and awareness and advocacy campaigns held with academic staff and researchers. Based on users' requirements, research support tools such as data management plans are being developed and implemented into the institutional research workflow. The study concluded that there is a need for further skills development within the library as they strive to support research data services.

There are two major online Data Management Plan (DMP) tools that guides researchers on the requirements of various international funders. These tools are the DMPTool and DMPOnline. According to (Sallans & Donnelly, 2012), " they can serve as a single portfolio to go to identify funder data management plan requirements, institutional or community resources to support data management practices, and even as a means of connecting researchers with experts in the area(s)". Unlike the UK's DMP Online, the DMP tool identified a need for localized guidance and branding by allowing each user community to indicate important characteristics for their work area. Although these tools assist researchers in developing a data management plan, the challenge with using a general tool is that it may not capture the specificity and uniqueness of varying research ecosystems especially in developing countries. As noted by (Philip & Similo, 2011), libraries should be aware of current research data practices in order to provide needed data services to researchers. Development of effective data management services requires that domain-specific researchers and librarians find a mature understanding of data curation requirements, practices and procedures. Without this understanding, data services offered by the library may not resonate with the needs of the intended audiences and may go unused. In this regard, this study developed a computer-based Research Data Management System (RDMS) for chemists that reflects their existing research process and help in managing and curating research data. The study also conducted a users' acceptance testing using the UTAUT model of Venkatesh et al. (2003). The RDMS hoped to fill the gap for the need of a domain-specific research data management system ((Sewerin, Sewerin, Dearborn, Henshilwood, & Spence, 2015), (D'Ignazio & Qin, 2008)) and that is relevant to Nigerian peculiar research environment.

3. Methodology

The evolutionary prototyping model of the Software Development Life Cycle (SDLC) was used to develop the RDMS. The evolutionary prototype model works best in scenarios where not all of the project requirements were known in detail ahead of time. It is an iterative, trial-and-error process that takes place between the developers and the users. This study adopted this model because first, there was a need to understand the existing workflow of chemists (as shown in Figure 2). Second, an initial prototype was presented to the users for feedback and suggestions for improvements. The suggestions and feedbacks were incorporated and the new prototype re-presented to users until they were satisfied. Forty (40) chemists from the five federal universities of technology in Nigeria were sampled across all available options in chemistry- analytical, physical, organic, inorganic, computational, nano, environmental, food, geochemistry, petroleum, polymer, industrial, and across all ranks (only chemists with a doctorate degree or currently undergoing the doctoral program). The RDMS was presented three times to users and each time, feedbacks were received from the users until the final prototype was achieved. The evolutionary prototype model is depicted in Figure 1:

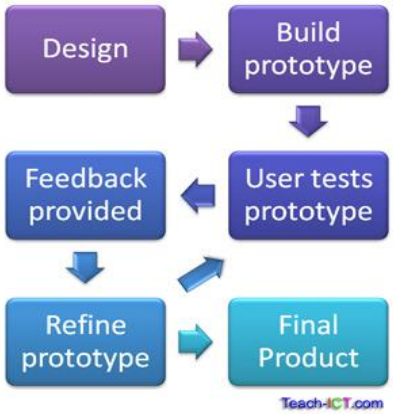

Figure 1: Evolutionary Prototype Model
Source: teach-ict.com (2021)

The generic research process of chemists as shown in Figure 2 represents the workflow of chemists through their research lifecycle. Research data are generated right from the beginning of the research process till the end when the study is finally concluded. Specific data elements are also generated and stored at each of the research stage and process. A data element is an attribute of a data entity. In a research, data elements help hold value or meaning of an activity conducted during the research process. Examples of data elements are: 'author', 'title', 'sample name', and so on. This study used this research process to develop the computer-based RDMS.

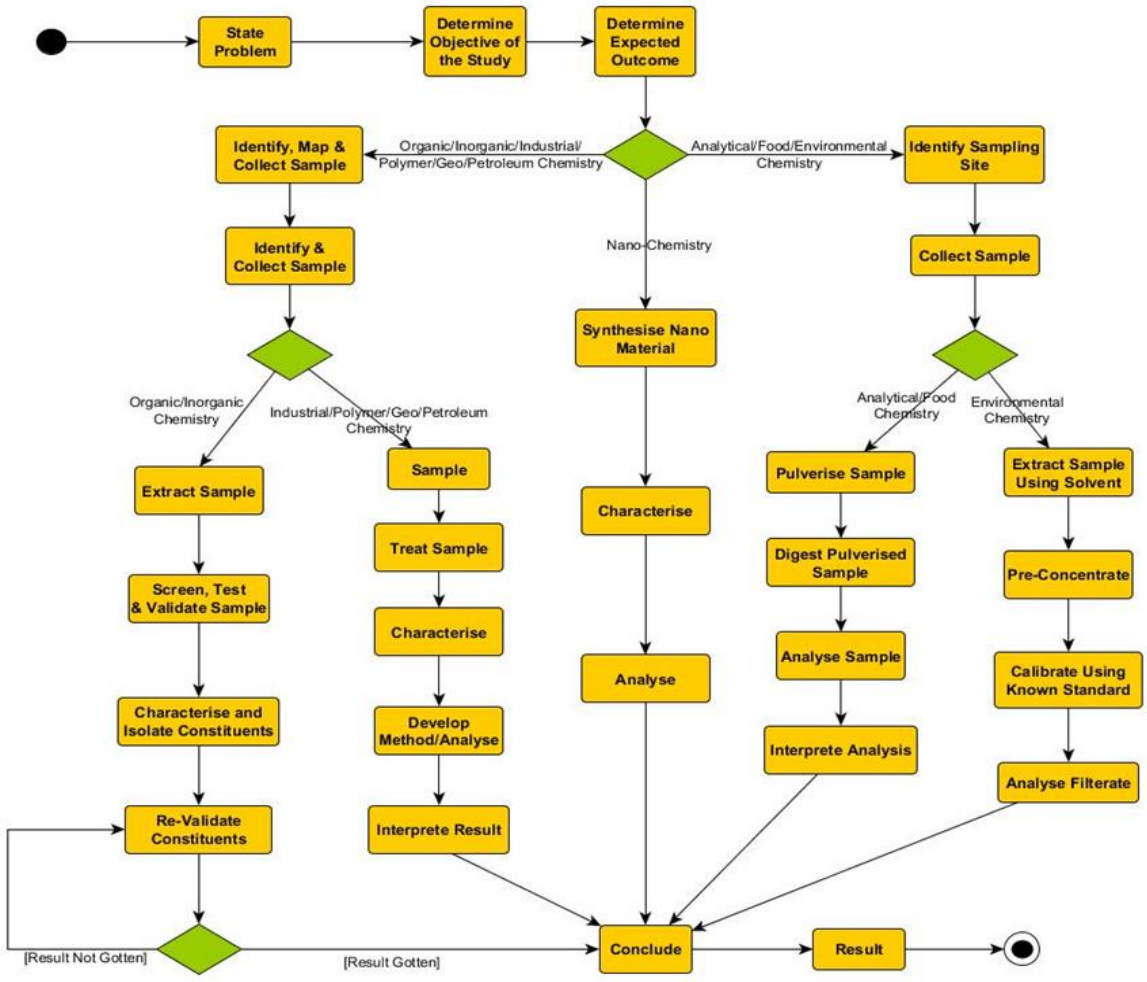

Figure 2: The Generic Research Process of Chemists
Source: (Abduldayan et al., 2020)

3.1 Hypotheses Testing

The RDMS formulated five research hypotheses that guided the users acceptance testing. Kendall's Tau-b correlation coefficient was used for the testing on a 0.05 level of significance and questionnaire items was based on a 5-point Likert scale of 'Strongly Agree(5) - Strongly Disagree(1)'. The results was used to determine whether to accept or reject the formulated null hypotheses. The null hypotheses were as follows:

H_{01}: Chemists' behavioural intention to use the data management model is not significantly affected by their "performance expectancy";

H_{02}: Chemists' behavioural intention to use the RDMS is not significantly affected by their "effort expectancy";

H_{03}: Chemists' behavioural intention to use the RDMS is not significantly affected by "social influence";

H_{04}: Chemists' behavioural intention to use the RDMS is not significantly affected by "facilitating conditions";

H_{05}: Chemists' actual use of the RDMS is not significantly affected by their behavioural intentions.

Cronbach Alpha (α) was used to test the reliability of the questionnaire items and Table 1 presents the results:

Cronbach Alpha Reliability Testing of Questionnaire Item

	Questionnaire Item	Cronbach Alpha
Facilitating Conditions (FC)	4	0.820
Social Influence (SI)	4	0.831
Effort Expectancy (EE)	4	0.683
Performance Expectancy (PE)	4	0.740
Actual Use of Technology (AT)	4	0.737
Behavioral Intention to Use the System (BI)	3	0.944
Average Cronbach Alpha		**4.755/6 = 0.79**

Table 1: Cronbach Alpha Reliability Testing

The Cronbach Alpha of 0.79 shows that the research instrument is strong and reliable.

3.2 The UTAUT Model

The Unified Theory of Acceptance and Use of Technology (UTAUT) model of (Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, 2003) was used to determine the behavioural intention of chemists to use the RDMS. This process required chemists to use and interact with the software, comment, criticise, and determine whether the software fits into their existing research workflow. An adapted questionnaire, based on the constructs of the UTAUT and using the 5-point Likert scale, was distributed to chemists which was filled and returned. The filled questionnaire was analysed to be able to determine the degree of association between "external variables" which are performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), and "control variables" such as research experience, work experience, gender and age, and their influence on "behavioural intention" (BI) to use the developed prototype. Figure 6 shows adapted UTAUT for the study:

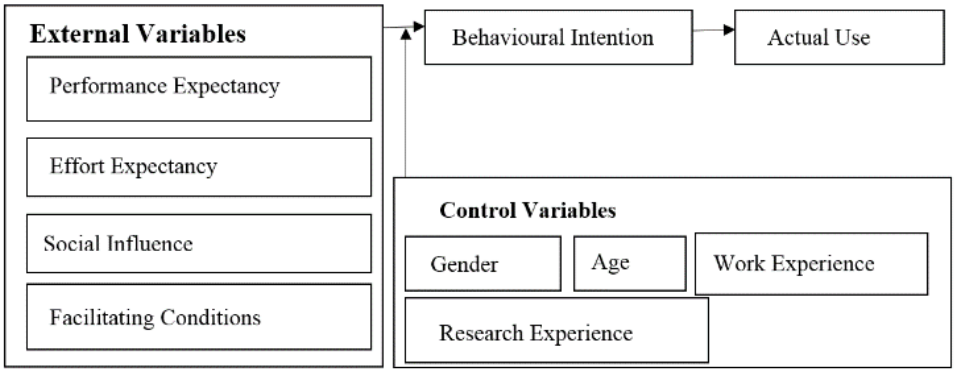

Figure 3: Adapted UTAUT Model for the Study

The four core constructs of UTUAT model are explained as used in this study:

i. Performance expectancy: the degree to which chemists believes that using a particular system would improve his or her research performance;

ii. Effort expectancy: the degree of simplicity associated with the use of the RDMS software;

iii. Social influence: the degree to which chemists perceives that others believe he or she should use the RDMS software;

iv. Facilitating conditions: the degree to which chemists believes that an organizational and technical infrastructure exists to support the use of RDMS software.

Gender, age, experience and voluntariness of use are moderators which directly or indirectly affects the core constructs depending on their relevance to the technology under study. Experience is an important factor in the acceptance of a data management prototype. This is because understanding the data lifecycle requires a certain level of research experience and the aim of this study was to ensure that the prototype reflects the existing research process of chemists in FUTs in Nigeria. Research experience is measured by number of projects supervised, conference attendance and paper presentations, journal publications, book publications and patented items or ideas. Work experience, on the other hand, is simply the number of years spent as an academic staff of the university.

4. Results

The Research Data Management System (RDMS) is domain-specific and was developed using the existing research workflow of researchers in chemistry. The data management prototype was developed using JAVA and MySQL. The system is novel because it concentrated on the peculiar research environment in Nigeria that is plagued with problem of power supply, poor internet access, and poorly equipped laboratories. The system helped researchers to curate and manage data generated during their research workflow. Data items can be easily represented using terms that researchers are already familiar with. For example: 'author', 'title'. 'funder', 'Hypotheses', 'Sample Table', 'Constituent Table', 'Results', 'Conclusion'. There is also provision for attaching sample data pictures and location. The system allows chemists to choose an option that best describes their research area in chemistry, for example- analytical, organic, inorganic, nano, physical, or computational chemistry. The dataset generated can either be stored on the researcher's local storage system or uploaded to the Institutional Repository of the library, or to a public repository based on some copyright arrangements. The RDMS also provides links to external funding agencies and their data management plan requirements. The following figures shows screenshots from the RDMS:

The Main Menu

This is the main interface of the application where users can access all the other functions of the application like create new research data, connect to libraries, search research database, settings. Figure 1 shows main menu of RDMS:

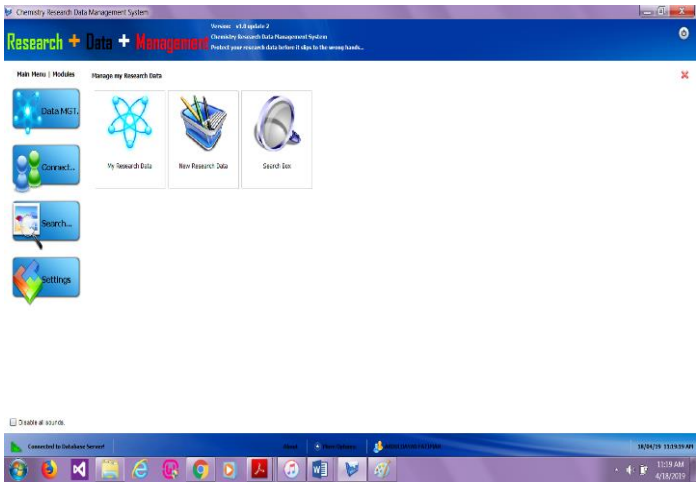

Figure 4: Main Menu

The New Research Data Interface

The first step in creating a new research is to select the chemistry options/categories from the drop-down menu, then fill the forms from step 1 to the end.

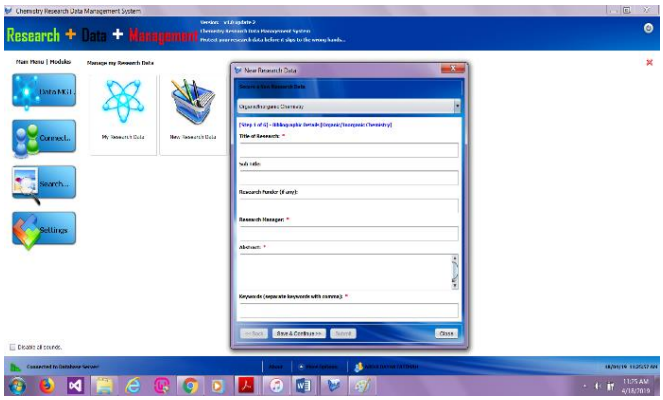

Figure 5: New Research Data Interface

The Research Data Database

This is a list of all the researches stored on the system. From this interface, the researcher can edit, view, export and print the research data. It also incorporate a search box to facilitate easy accessibility.

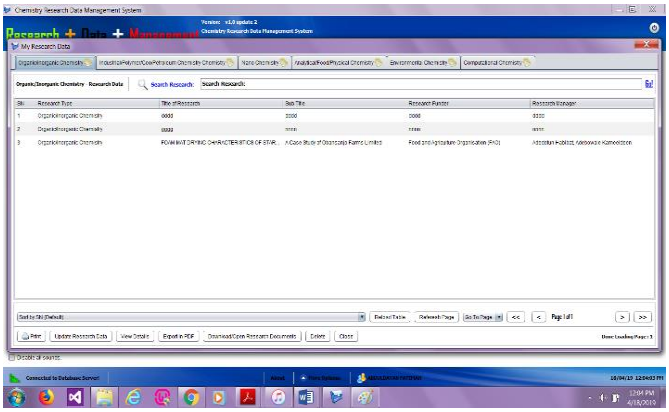

Figure 6: Research Data Database

Connections to Library

This interface links to library websites/home page or the institutional repositories of federal universities of technology in Nigeria, where it is available. Researchers can also archive their research data as the need arises.

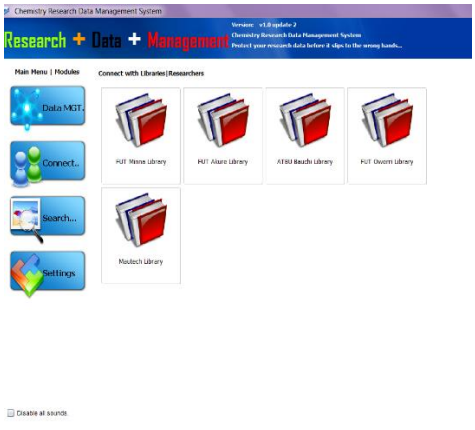

Figure 7: Connections to Library

A Complete Dataset

Figure 5 shows a sample of a completed research dataset. The dataset can be exported as PDF file and saved on researchers' local system or uploaded to the library repositories or other repositories of choice such as Mendeley Data, Fig Share, Github etc.

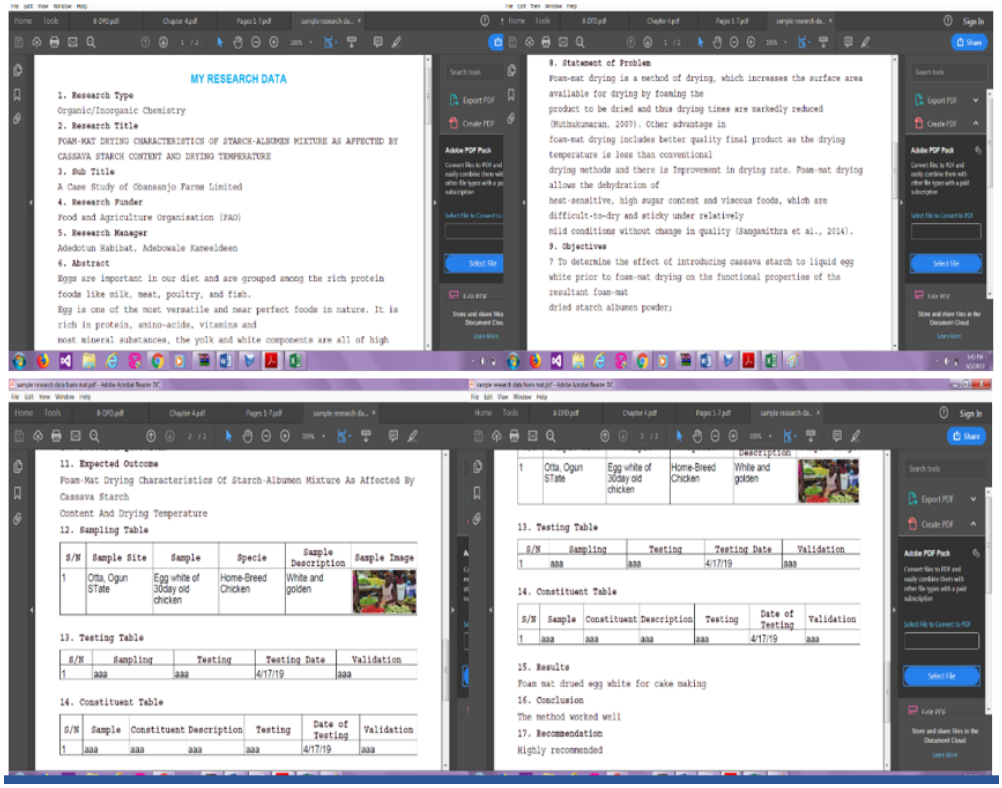

Figure 8: A complete dataset

4.1 Users Acceptance Testing using Kendall's Tau-b Correlation Coefficient

Kendall's Tau-b correlation coefficient was used to measure the association that exists between two ranked variables which is the focus of this study. The study measured the association between "external variables" and "behavioural intention" to use the RDMS. Statistical Package for Social Sciences (SPSS) statistical software was used to calculate the correlation coefficient and the result presented in Table 3:

External Variable	Dependent Variable	Correlation Coefficient (Tb)	Significance (P-Value)	Decision
Performance Expectancy	Behavioural Intention	1.000	0.000	Not significant, null hypothesis not rejected
Effort Expectancy	Behavioural Intention	1.000	0.000	Not significant, null hypothesis not rejected
Social Influence	**Behavioural Intention**	**0.816**	**0.110**	**Significant, null hypothesis rejected**
Facilitating Condition	Behavioural Intention	1.000	0.000	Not significant, null hypothesis not rejected
Actual Use	Behavioural Intention	1.000	0.000	Not significant, null hypothesis not rejected

Table 2: Kendall's Tau-b Correlation Coefficient

5. Discussion

The results revealed that the system was found relevant and usable provided performance expectancy, effort expectancy, and facilitating conditions remain favourable. However, social influence had a significant effect on the researchers' behavioural intention to use the RDMS. This might be because researchers are usually influenced by what their colleagues are doing or saying about a particular system or product. Research data management (RDM) is an emerging area of research best practice hence the knowledge of RDM among researchers in Nigeria is still very low (Abduldayan et al., 2020). Research experience also had an effect on the behavioural intention to use the system. Most chemists has had some unforgettable experiences of data loss, software and hardware incompatibility issues and bad storage devices. Hence, a computer-based data management solution is a readily acceptable option due to their previous research experiences. In this case, research experiences can therefore be said to be a strong predictor of behavioural intentions contrary to previous studies. This position is supported by Chirara (2018) which revealed that: "The correlation between experience and usage behaviour was relatively strong and positive contrary to studies by Venkatesh, Thong and Xu (2012) that suggested that BI was the strongest predictor". The findings also supports the studies by (Chao, 2019), and (Salim, 2012). Libraries should encourage chemists to use this RDMS right from the beginning of their research process till the end when they would have datasets to upload on the institutional repository. There should be synergy between the Information Technology Service (ITS), Research and Development (R&D) units, and the Library to keep the university research community updated on emerging research best practices around the world.

6. Conclusion

The RDMS was developed using chemistry research process. The system was developed as a local, computer-based system because of the challenge of internet connectivity and fear of research data theft by unauthorised parties. The system was tested and accepted for use by chemists because it was simple, relevant to their existing workflow, and they were carried along all through the developmental processes. The study concluded that chemists' behavioural intention to use the RDMS is significant. Performance, and effort expectancy, as well as facilitating conditions does not have a significant effect on their behavioural intentions to use the system. However, social influence, as a result of what other chemists think about the use of software, is significant to use of the RDMS. Also, chemists' unforgettable experiences of data loss, software and hardware incompatibility issues and bad storage devices made the computer-based data management solution a readily acceptable option due to their previous research experiences. In this case, research experiences can be said to be the strongest predictor of behavioural intentions. Further studies can focus on the long term impact of the RDMS on research data management practice and productivity.

7. Recommendations

1. The libraries in federal universities of technology in Nigeria should immediately roll out research data management services to guide researchers in effective research data management;
2. The library and ITS unit should ensure the computer-based data management model developed by this study is available for use and that the necessary support is accessible at all times;
3. The university management should formulate and implement a policy that will encourage appropriate data management practise by researchers;

References

Abduldayan, F. J., Abifarin, F. P., Oyedum, G. U., & Alhassan, J. A. (2019). Research Data Management and Information Security: Role of Library and Information Technology Service (Its) Units in Federal Universities of Technology in Nigeria. *I-Manager's Journal on Information Technology*, *8*(1), 20. https://doi.org/10.26634/jit.8.1.15712

Abduldayan, F. J., Abifarin, F. P., Oyedum, G. U., & Alhassan, J. A. (2020). Research Data Management Practices of Chemistry Researchers in Federal Universities of Technology in Nigeria. *Digital Library Perspectives*.

Abduldayan, F. J., Dang, T. L., Karemani, A., & Obadia, S. B. (2016). The role of academic libraries in enhancing workflow in African universities. In *CEUR Workshop Proceedings* (Vol. 1830).

Ball, J. (2013). Research data management for libraries: Getting started. *Insights: The UKSG Journal*, *26*(3), 256–260. https://doi.org/10.1629/2048-7754.70

Chao, C. M. (2019). Factors determining the behavioral intention to use mobile learning: An application and extension of the UTAUT model. *Frontiers in Psychology*, *10*(JULY), 1–14. https://doi.org/10.3389/fpsyg.2019.01652

Chen, X., Wu, M. (2017). Survey on the needs for chemistry research data management and sharing. *The Journal of Academic Librarianship*, *43*, 346–353. Retrieved from http://dx.doi.org/10.1016/j.acalib.2017.06.006

Chiware, E., & Mathe, Z. (2016). Academic libraries ' role in Research Data Management Services : a South African perspective, *81*(2), 1–10. https://doi.org/10.7553/81-2-1563

Corrall, S., Kennan, M. A., & Afzal, W. (2013). Bibliometrics and research data management services: Emerging trends in library support for research. *Library Trends*, *61*(3), 636–674. https://doi.org/10.1353/lib.2013.0005

D'Ignazio, J., & Qin, J. (2008). Faculty data management practices: A campus-wide census of STEM departments. *Proceedings of the ASIST Annual Meeting*, *45*. https://doi.org/10.1002/meet.2008.14504503139

Dallmeier-Tiessen, S., Khodiyar, V., Murphy, F., Nurnberger, A., Raymond, L., & Whyte, A. (2017). Connecting Data Publication to the Research Workflow: A Preliminary Analysis. *International Journal of Digital Curation*, *12*(1), 88–105. https://doi.org/10.2218/ijdc.v12i1.533

Mcgill, A. G. (2015). Music inspired Newton's rainbow, 2015.

Philip, N., & Similo, N. (2011). National University of Science and Technology Faculty of Communication and Information Science (Vol. 2009, pp. 2–3).

Rafizan, O. (2017). Research Data Management System Design (Case Ict Research and Human Resources Development Agency Mcit). *Journal Penelitian Pos Dan Informatika*, *7*(2), 143. https://doi.org/10.17933/jppi.2017.070206

Salim, B. (2012). An Application of UTAUT Model for Acceptance of Social Media in Egypt: A Statistical Study. *International Journal of Information Science*, *2*(6), 92–105. https://doi.org/10.5923/j.ijis.20120206.05

Sallans, A., & Donnelly, M. (2012). DMP Online and DMPTool: Different Strategies Towards a Shared Goal. *International Journal of Digital Curation*. https://doi.org/10.2218/ijdc.v7i2.235

Sewerin, C., Sewerin, C., Dearborn, D., Henshilwood, A., & Spence, M. (2015). Research data management faculty practices : A Canadian perspective Research Data Management Faculty Practices : a Canadian Perspective.

Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, F. D. D. (2003). User Acceptance of Information Technology : Toward a Unified View. *MIS Quarterly*, *27*(3), 425–478.

Whyte, A., & Jonathan, T. (2011). Making the Case for Research Data Management. *A Digital Curation Centre Briefing Paper*, (September), 1–8.

Yoon, A., & Schultz, T. (2018). Research Data Management Services in Academic Libraries in the US : A Content Analysis of Libraries ' Websites, (January). https://doi.org/10.5860/crl.78.7.920

Yu, F., Deuble, R., & Morgan, H. (2017). Designing research data management services based on the research lifecycle – a consultative leadership approach. *Journal of the Australian Library and Information Association*, *66*(3), 287–298. https://doi.org/10.1080/24750158.2017.1364835

APPENDIX

QUESTIONNAIRE FOR CHEMISTS IN FEDERAL UNIVERSITIES OF TECHNOLOGY IN NIGERIA

The questions below is aimed at determining your behavioural intention to accept and use the developed research data management system prototype. Kindly tick as appropriate. Thank you.

Gender: Male ( ) Female ( )

Age: 25-35years ( ) 36-45years ( ) 46-55years ( ) 55years & above ( )

Years of work experience: 5-10years ( ) 11-15years ( ) 16-20years ( ) 20years & above ( )

Years of research experience: please state the number(s) of article published in the years stated below:

i. I have published _____article (s) within the year (2014-2019)

ii. I have supervised _____students projects, theses and dissertations within the year (2014-2019)

iii. I have _____ conference paper presentations within the year (2014-2019)

iv. I have _____ book publications within the year (2014-2019)

v.

vi. I have published_____ article (s) within the (2014-2019)

vii. I have _____ patented research findings.

After your initial use of the developed data management prototype, kindly tick the options that may influence your behavioural intention to continued use of the model:

Scales / Items	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Performance Expectancy (PE)					
PE1: I find the prototype useful to my research workflow.					
PE2: Using the prototype enables me to manage research data more quickly.					
PE3: Using the prototype increases my research productivity.					
PE4: Using the prototype increases my chances of publishing in impact factor journals.					
Effort Expectancy (EE)					
EE1: My interaction with the prototype is clear and understandable.					
EE2: It is easy for me to become skillful at using the prototype.					
EE3: I find the prototype easy to use.					

EE4: Learning to operate the prototype is easy for me.					
Social Influence (SI)					
SI1: People who influence my behavior think that I should use the prototype.					
SI2: People who are important to me think that I should use the prototype.					
SI3: Library will be helpful in the use of the prototype.					
SI4: In general, the university will support use of the prototype.					
Facilitating Conditions (FC)					
FC1: I have the resources necessary to use the prototype.					
FC2: I have the knowledge necessary to use the prototype.					
FC3: The prototype is compatible with other systems I use.					
FC4: A specific person (or group) is available for assistance with the prototype challenges					
Behavioural Intention to Use the System (BI)					
BI1: I intend to use the prototype in my subsequent researches.					
BI2: I predict I would use the prototype in my subsequent researches.					
BI3: I plan to use the prototype in my subsequent researches.					
Actual Use of Technology (AT)					
AT1: Using the prototype is a good idea.					
AT2: The prototype makes research more interesting.					
AT3: Using the prototype to manage my research data is fun.					
AT4: I like using the prototype for my data management plan (DMP)					

Authors Biography

Mrs. Abduldayan Fatimah Jibril is a Lecturer II at the department of Library Information Technology, Federal University of Technology, Minna, Nigeria. She is currently undergoing her doctorate program with focus on research data management practices of chemistry researchers in federal universities of technology in Nigeria. Her research interests are in the areas of national ICT policy, use of ICT in academic libraries, privacy and security issues in social media networks, United Nations SDGs in Nigeria, management information systems and research data management. She has published articles in reputable national and international journals covering various areas of her research interests. Her researches and awards can be found on her LinkedIn profile: *https://www.linkedin.com/in/fatimah-jibril-abduldayan-5bbb0b84/*

Dr Fasola P. Abifarin is currently Associate Professor of Library Information Technology in the Department of Library Information Technology, School of Information and Communication Technology, Federal University of Technology, Minna. He started his professional career as an academic librarian providing bibliographic support for teaching, learning, research and community services in academic and research libraries. He obtained his PhD from University of Ibadan in 2001. Dr Abifarin's academic and research interests are in Applied Information Technology and Library and Information Science metrics. Consequently, he teaches courses related to the application of IT in libraries and Bibliometric. In the course of his academic, research and practice experience, he has developed computer-based systems for acquisition, cataloguing and circulation functions, web-based circulation, staff rostering, CAS/SDI systems and frame working of decision support system in academic libraries. He is currently the Head of Department.

Georgina U. Oyedum is a Professor in the Department of Library Information Technology (LIT), Federal University of Technology, Minna, Nigeria. Her research interest covers a wide area of librarianship notably User Studies, Information Management, ICT effect to Library and Information Services, Knowledge Management as well as Information Services relationship to Health Management. She attended Ahmadu Bello University Zaria, Nigeria where she obtained a Bachelor of Library Science (BLS) as well as her Master of Library Science (MLS). She also attended University of Ibadan, Nigeria's Premier University where she obtained her (PhD) in Library and Information Studies. She has nineteen (19) years of working experience as a practicing librarian before joining the academics in 2011. She served as the Sub-Dean of School of Science and Technology Education (SSTE), Federal University of Technology, Minna from 2012 to 2014. She also served as the Head of the Department of Library and Information Technology, Federal University of Technology, Minna from 2014 to 2015. She has several academic publications to her credit within and outside Nigeria.

Prof Jibril Attahiru Alhassan holds a PhD in Library and Information Science from University of Nigeria, Nsukka. He started his library working career at Kwara State Public Library Board in 1995 as a Senior Librarian. He is a Professor with the Department of Library Information Technology, Federal University of Technology, Minna. He has served as Polytechnic Librarian of Federal Polytechnic, Bida, University Librarian of Federal University of Technology, Minna, and now the current University Librarian of Federal University Gombe, Gombe State, Nigeria. Prof Alhassan has published in both local and international journals with research interest in access to information and knowledge management.