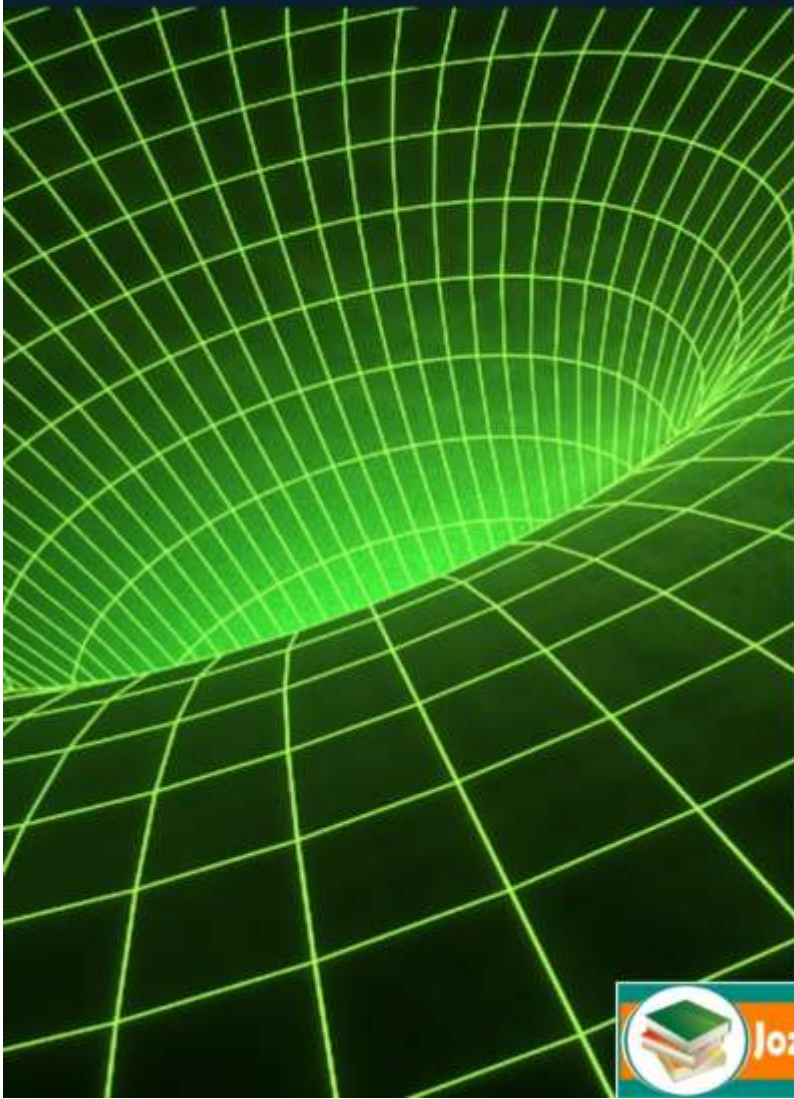# 2nd International Conference on Emerging Technology and Interdisciplinary Sciences (ICETIS 2022)

Social application of technology in the digital age

29 October 2022

Virtual

Jozac Publishers

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Declaration of the peer review process

The 21st century is changing as a result of ideas and research publications powered by emerging technologies. The International Conference on Emerging Technology and Interdisciplinary Sciences (ICETIS 2022) with **ISBN: 978-0-6397-4554-1 (print)** and **978-0-6397-4555-8 (e-book)** titled "Social application of technology in the digital age" with the aim to bring together professional experts, scholars, and students around the globe to share innovative ideas and knowledge on emerging technologies in the society and research disciplines. The proceedings consist of research findings from experts, with the purpose of knowledge improvement and building a better society that is centered on technology.

The peer-review process was applied to ICETIS 2022 manuscripts with the purpose to improve the quality of all the manuscripts received and published. ICETIS 2022 received a good number of research manuscripts that were first screened, then evaluated for suitability by the editorial team. Only the best and most suitable manuscripts were selected, and, the authors were invited for presentation at the conference and publication. Secondly, the selected manuscripts were subjected for plagiarism check using Turnitin Plagiarism Check (TPC). Thirdly, the manuscripts with acceptable plagiarism rate were sent a for peer-review process by two or more experts in the subject area. The peer-review report was captured, and the outcome sent to the corresponding author to address the concerns and recommendation from the experts.

The peer-review process contributed to sharpening each manuscript and improving the overall conference proceedings' quality. Through this conference proceedings, readers will be informed on new knowledge and information on the social application of technology in the advance of digital age research contributions and academic knowledge.

Preface

The second virtual International Conference on Emerging Technology and Interdisciplinary Sciences (ICETIS 2022), held on 29th October 2022 themed "**Social Application of Technology in the Digital Age**" gave scholars, professionals, students, and industry professionals working in diverse interdisciplinary and intradisciplinary disciplines, an international platform to engage in an academically intelligent and rigorous discussions, on how technology use should give credence to the social aspects of life. The research areas that were expertly espoused during the conference were AI, IoT, machine learning, blockchain technology, social media, digital technologies and transformation, mathematics, aeronautics, physics, chemistry, engineering science, health, and social sciences, amongst others. The international keynote address exemplified the need for technologists to consider the human aspect of technological innovations and their impact on the sociocultural life of users.

ICETIS 2022 was well attended by several scholars in diverse regions of the world with almost 300 participants. Though lots of papers were submitted for consideration to be orally presented at the conference, less than 50 papers were considered academically robust to be presented at the conference. After the authors revised their submissions following the subject expert review reports in the second round review, the editorial team made their recommendations to the publishing chair for the conference to make the final decision of acceptance or rejection. The rigorous processes in review and editorial processes for this conference proceedings have enhanced the academic integrity of the published papers.

These conference proceedings for the ICETIS 2022, offer readers the recent and newest research findings and conceptual ideas in the social dimensions of technology in this digital age. The great success chalked at the conference, is a result of the dint of hard work by members of the organizing committee who devoted quality time, efforts, experiences, and knowledge in promoting and guiding every activity of the conference. The researchers who submitted the papers which have been included in this conference proceedings deserve a great deal of appreciation for their resilience and hard work, the conduct of their original studies and for choosing this conference as an academic outlet for presenting their research findings.

It is our fervent hope that readers would find these conference proceedings and the featured research papers, worthy of consideration in their studies, teaching, research, and industrial practice.

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29th October, 2022

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Igor Jurcic - The Split University, Republic of Croatia.

Alvanh Alem G. Pido - Mindanao State University - Main Campus, 9700 Marawi City, Philippines.

Mr. Bongisizwe Erasmus Buthelezi - Department of Applied Information Systems, Tshwane University of Technology, South Africa.

Table of Contents

Theme 1:
Basic Sciences, Engineering, and Technologies (BSET)

E-accreditation management information system (EAMIS): An effective tool for accreditation support system for Negros Oriental State University

Van Roger Balneg Gutib*

1Department of Information Technology and Computer Science, Negros Oriental State University, Philippines. vodz911vodil21@gmail.com https://orcid.org/0000-0001-8366-4328

*Corresponding author

Abstract: The purpose of the study was to develop and test the effectiveness of an Accreditation Management Information System that provides an efficient, secure, a user-friendly design and effective support system. E-Accreditation Management Information System (EAMIS) controls and manages the records that would be used as supporting documents in the Accreditation of programs which serves as essential in ensuring that the institution is working effectively and efficiently which accountable to its employee and the community that it serves. The objectives of EAMIS are to manage and organize records, request documents, and support the university in many cases during a period of accreditation of the program. The researcher adopted the Waterfall Model procedure under Software Development Life Cycle (SDLC) in proving and verifying that the developed system is successful. The testing of the effectiveness of EAMIS from the respondents was separated into two (2) different survey questionnaires. A survey questionnaire was used to find out the effectiveness and usability of the developed platform. It was conducted during the NORSU Graduate School Accreditation of their programs where EAMIS was utilized. The respondents found that the platform was effective, very useful, and very easy to use during the accreditation period. The researcher found out that the respondents wanted to implement a platform that is fast, efficient, and effective in providing needed documents for accreditation of programs in the institution.

Keywords: Record Management, Accreditation, Management Information System, Effectiveness

Introduction

Accreditation of school programs deals with a huge amount of data. These data were kept, maintained, and managed properly because they provide vital information on the status of a particular institution. The most efficient way of keeping the records of an institution was through Management Information System (MIS). The MIS was adopted by large companies, business organizations, hospitals, hotels, schools, and universities in managing and optimizing the use of their resources. It can also be used for planning and assessment which could be the best tool for improvement and development. However, there are organizations today that are still using a manual process in keeping pertinent records in their offices during accreditation periods. Batoon (2022) explained that the ten areas of the accreditation process that focus on the vision, mission, goals, and objective of the university, faculty, curriculum and instruction, support to students, research, extension and community involvement, library, physical plant and facilities, and laboratories and administration will improve the quality and efficiency of a university's operation. Negros Oriental State University (NORSU) was striving to face accreditation in every program to have the best quality of education. There are problems encountered by the university with the use of the manual process of keeping and retrieving the pertinent

records for accreditation of their program. The faculty and staff faced difficulties in keeping and retrieving supporting documents needed for accreditation. Gathering data for supporting documents in every program to be accredited is not an easy task. The faculty and staff who are working in every area of the Accredited programs have tasks to collect documents and store them in the data man, steel cabinets, folders, and even the stock rooms in the office used as storage for the documents. However, the State University of the Philippines has yearly activities in accrediting the programs offered. Accreditation is a complicated, expensive, and time-consuming process of gathering the documents to support what the accreditor needs (Burke & Butler, 2012). The accreditation process was for improving the quality of education in higher institutions in the Philippines. Corpus (2003) stated that the process of accreditation is a system of evaluation based on the standards of accreditation bodies which assures an institution of upgrading the quality of education. The procedure of accreditation will give benefit an institution with accredited status by accreditation bodies which lead to public recognition for having an excellent and quality of education based on the Commission of Higher Education (CHED) Memorandum Order 1. A school with accredited programs will exhibit a good quality of education which give the public, potential employers, and other institutions that students who finish their degree from an accredited school were well-trained and educated. However, some institutions or companies were cynical when a student came from fewer accreditation programs. The proposed platform would provide the faculty and staff with effortless in searching files, storing, and retrieving documents needed during accreditation. The purpose of the project was to analyze, design, develop, test, and implement an E-Accreditation Management Information System (EAMIS) for NORSU Programs in keeping and managing relevant documents for accreditation of programs. The study was to address the question(s) on the present system used by faculty and staff in keeping the pertinent records for accreditation of their programs; the problems encountered by the faculty and staff with the current system of keeping the pertinent records for accreditation, and the effective E-Accreditation Management Information System (EAMIS) as tested by both IT experts and End users.

Literature review

The literature review includes the synthesizing of a particular subject matter and justifies future research. That is, looking at past research to develop the path and hence build the future research direction. As explained in the introductory section, this research aims at the importance of Management Information System and Record management System in an organization and maps a path for future research. Kopp (2022) stated that process modeling ensures Information Technology (IT) and business alignment by making easier communication between business users, such as chief officers, managers, and other stakeholders on the one side, and IT engineers who design and maintain enterprise information system(s). Anticipating the forthcoming significance of automated technology applications for the people and work areas, the amazing stride of revolution is integrating ICT demand with increased computing and storage, data transmission speed, and network connectivity, while costs have fallen rapidly. There is a sharp increase in the demand for more skilled labor, requiring retraining of the existing people to prosper out of the emerging technologies. This up-gradation in technology supports the workforce's education and training in the pre-entry stage and continuous learning. Web-based ICT possibly allows access and always uses the learning content from anywhere (Krishnan, 2021).

Masana (2022) stated that the EMR systems for the improvement of healthcare services by providing real-time access to patient data, the sharing of medical information, monitoring a patient's health progress, and access to medical data to conduct research. Mahmudova (2022) explains that the efficiency characteristics of software are Functionality, Productivity, Compliance, Ease of use, Reliability, Security, Accompanying, and Mobility. Reliability is one of the key performance characteristics of software. Reliability of software (SR) is the features of the features to accomplish certain functions, and they are kept within certain boundaries under definite circumstances. The implemented web-based real estate service application was developed as both a mobile and web application with responsiveness as a primary component of the design to create an easy-to-use, real-time, adaptive management and service tool to enhance the quality of decision-making, data management, and monitoring the continuous improvement of online services in real estate organizations (Obinna & Udo, 2022).

Other advantages of computerized recording are reduced errors, higher quality, easier communication with the patient, automatic documentation and recording, and easier access to information. Despite these advantages, expensiveness of equipment, launching, and support of the system, as well as the need for continuous additional education, endless changes in technology, and lack of interest and motivation of personnel can impede the implementation of electronic information systems in hospitals (Farshi et al., 2015). Mnjama and Wamukoya (2007) in Record Management System Journal "E-government and records management: an assessment tool for e-records readiness in government" stated that various e-records readiness tools are available in the West City of Africa, none of them addresses e-records readiness issues in Africa where systems and procedures for managing records both paper and electronic are inadequate. The article provides a simple tool for assessing a country's e-readiness for the adoption of e-records in an e-government environment.

DeBie and Brown (2006) describe a records management system and method that includes a file plan that has one or more segments associated with compliance data. Data stored in these segments of the file plan have a mandatory minimum retention period during which they cannot be modified or deleted. Additionally, the information about the mandatory minimum retention period may not be altered or removed. Maass and Eriksson (2006) stated that there has been consensus about the necessity to ensure the simultaneous availability of all patient data to benefit from the full potential of telemedicine. As a consequence, the idea of an Electronic Patient Record (EPR) has emerged, in which all data from various departmental databases are available timely when needed. This implies that interoperability between different systems is required. Functional EPRs embrace all departmental sources of patient information. In this scenario, the EPR is a similar system to the analog patient record. Johnson and McElroy (1995) stated in their invention "Computer Based Records Management System Method" comprises an information filter for assuring that record data units offered to the system for storage are complete and not redundant. These record data units may be electronic in nature, scanned from paper, digitally formed from audio, video or otherwise formed as digital data information media, an objective of the disclosed system being to eliminate paper or microform record keeping. If record data units comprising documents are incomplete or redundant, the data units may be queued for special handling, returned or otherwise disposed of. Record data units accepted for system entry are acknowledged and preferably tagged to enable tracking and forwarded for unit verification and certification. Verification and certification includes examination of units for compliance with preset criteria. Once a unit is found to meet the criteria, the unit is stored in permanent storage along with a disposal schedule determined for that unit. Only users meeting predetermined security levels may alter or dispose of a stored unit prior to scheduled disposal. Moreover, reasons for such alteration or destruction are required from the cleared user, and an associated data field must be completed. Consequently, the present system provides for record data unit tracking and audit trails in the event of any requirement for regulatory or legal compliance with discovery or other record unit requests.

The study of Abdullah (2000) resolved the dissatisfaction with the existing manual patient's record system expressed by both doctors and nurses who referred to many defects of the present paper based system that caused irritation and potential exposure to reducing Patient's safety. Such obstacles can affect the improvement of patient care and delay important treatment. From the findings the major problem of the traditional paper Based record system appears to be misfiling of records causing difficulties in obtaining Information quickly in emergencies. Thus the new Electronic Patient's Record System benefited the Hamad medical in terms of accuracy, legibility, confidentiality and time saving in the patient's records. Beaumont (1999) noted the advantage of electronic records in the UK, including simultaneous access from multiple locations, legibility, ease of exchange of data, and confidentiality. He compares the advantages with those of paper records which are: easily transported; easy to read; require no training and are never "out of order". According to Beaumont's personal experience, electronic records are an improvement on medical handwriting which is often illegible. In addition, he noted a need for training in the details of categories which the manual records should contain, just as computers may be "down", so misfiled patient's records can be equally frustrating.

Furthermore, the gathered information helps researchers to have a better understanding in the information needed to implement E-Accreditation Management Information System. It helps the researchers an idea to have a successful implementation of Management Information System that can be very beneficial to all university in working program accreditation.

Methodology

The survey research method was used in conducting the study to analyze the existing process of keeping the pertinent records of the NORSU for Accreditation purposes. In a large-scale population in the conduct of research, the survey method was designed to analyze a phenomenon and problem (Atmowardoyo, 2018). It was supplemented by an interview with the deans, faculty, and staff of the university, observation of their tasks, and assessment of user acceptance of the developed platform through dry-run tests. The testing of the effectiveness of EAMIS from the respondents was separated into two (2) different survey questionnaires. One was for the respondents who utilized the EAMIS during the accreditation and the other was for the IT experts who validate the effectiveness and efficiency of the platform. These methods provided valuable insight into how to improve the design of the system.

The development method used in this study was anchored on the Waterfall Model (Royce, 1970) of System Development Life Cycle (SDLC). Waterfall Model has five phases which are requirements, design, Implementation, verification and maintenance. Each phase of development has specific goal that must be completed before moving to the next phase which no turning back. Waterfall model is used where the duration of project is very less, and it is best suited for small projects. Also, Waterfall model is suitable when the specification and requirements are clearly stated for the software project. The waterfall approach was the first process model introduced to software development and is widely used to ensure project success. Waterfall model is used where the duration of project is very less, and it is best suited for small projects. Also, Waterfall model is suitable when the specification and requirements are clearly stated for the software project (Tuteja & Dubey, 2012).
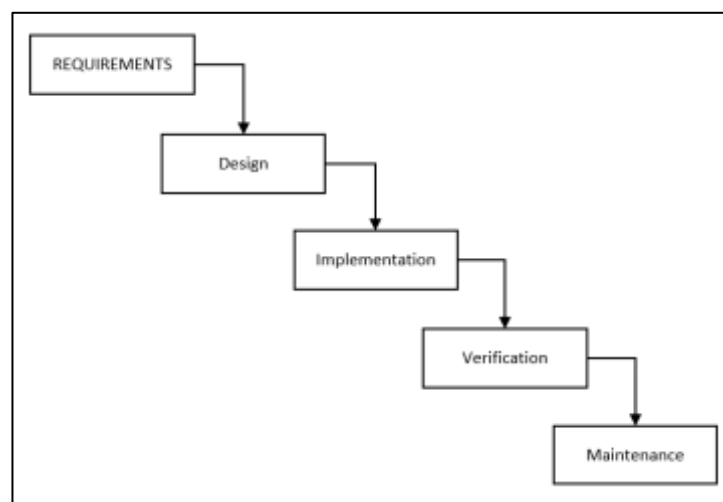
Figure 1. System Development Life Cycle – Waterfall Model (Royce, 1970)

Requirement phase

The requirement phase made which assumed that all requirements could be gathered up and checked during the interview period to make sure that the research project was suitable for the present technology. This phase is setting the stage for the rest of the phases of the software application development that identifies the process and problems in keeping and retrieving the pertinent records for accreditation of the program the college. After analyzing the problems, the next step was to gather all the data to be used as variables need in the development of the system. The variables must be specified in order have come up with a good UI design.

Design phase

The context diagram shown in figure 2 points out the flow of information and also shows the relationship between the system and external components. A context diagram shows the users the clarity of how data flow

runs in the system (Tanabe & Kobayashi, 2020). The context diagram of the study displays no confusion about the flow of information.
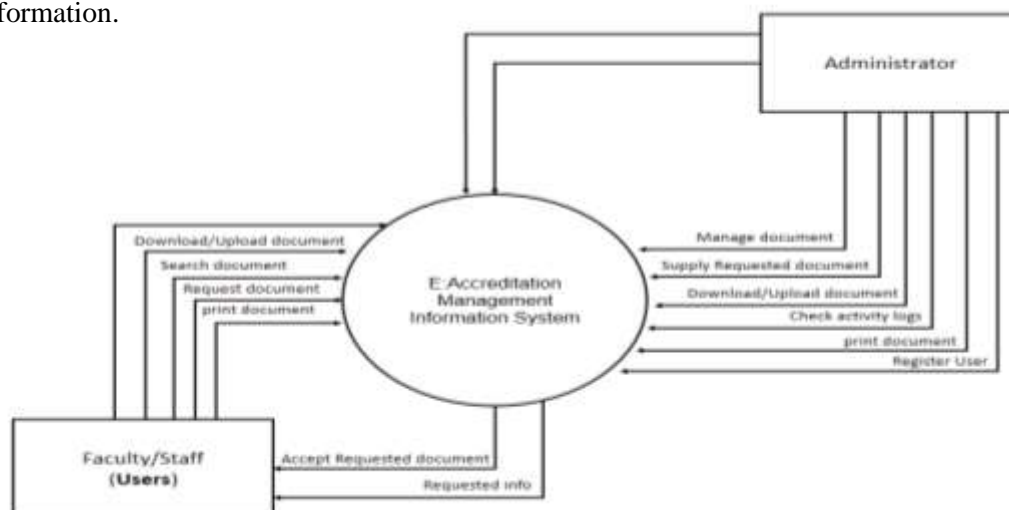
Figure 2. Context Diagram of the system (Tanabe & Kobayashi, 2020)

Data Flow Diagram Level 1

The Data Flow Diagram (DFD)in figure 3 shows the representation of the data flow of the system. Olayan & Yamamoto (2014) stated thatDFDs must be crafted in detail because it plays an important role in tracing the data flow in a system. DFD shows the data flow between the inputs and outputs of the system. It gives a straight forward procedure of how the process of the system runs. The diagram also shows how users could communicate with each other and also were they can search, upload, download, and request files from the platform (Kopp, 2022). These files were being stored with specific file information.
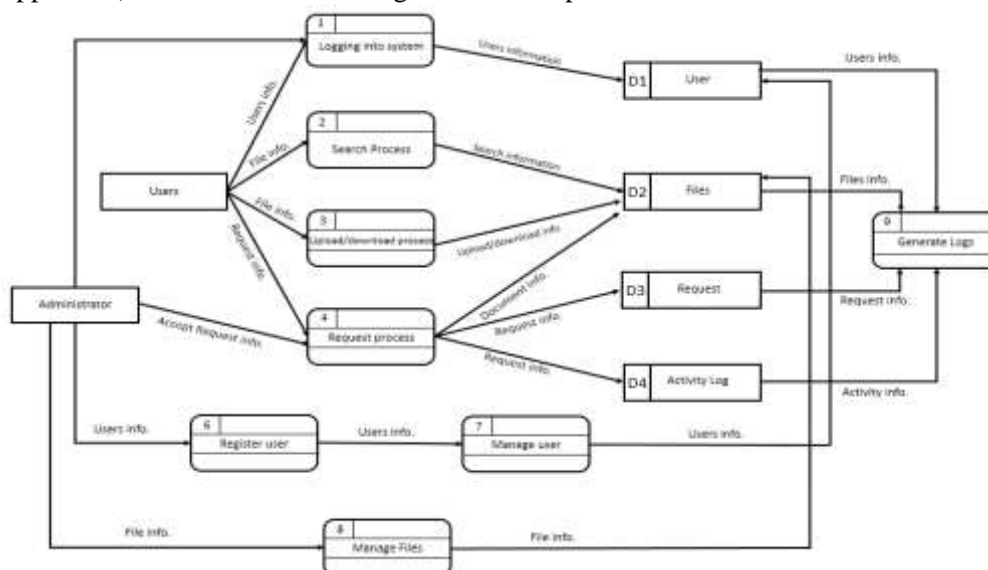
Figure 3. Data Flow Diagram of the system

Development

The requirements needed in the development of the EIMIS are both logical design and physical design. Most modern systems nowadays consist of both hardware and software components (King et al., 2015). It includes the minimum requirements and the recommended hardware requirements needed for the system to perform its function properly. They were used to develop and implement an effective Accreditation Management System. Tables 1,2, and 3 exhibits the minimum and recommended software and hardware specification for the development of EAMIS.

Table 1. Hardware Requirements of Server

Hardware Components	Minimum Requirements	Recommended Requirements
Processor	Processor intel Core i5	Processor intel 2.15.2 Core i7 or Higher Version
Screen Resolution	Screen Resolution HD 1080x720 (16:9) with 24 bit color	Screen Resolution 2560 x 1440 Quad High Definition (16:9) with 32 bit color
Graphics Processing Unit	Any GPU brand with 4Gb DDR2 64 Bit	Any GPU brand with 8Gb DDR5 512-bit or Higher Version
Hard Drive	Hard Disk Space 500TB	Hard Disk Space 1TB to higher Space Capacity
Memory Card (RAM)	Memory 4 GB RAM	Memory 8GB RAM or Higher Capacity
Keyboard	Keyboard	Keyboard
Mouse	Mouse	Mouse
Printer Optional	Ink Jet/ Laser Printer	Ink Jet/ Laser Printer
Ethernet Card	Ethernet – LAN Gigabit	Ethernet – LAN Gigabit or Fast Ethernet
Audio Card	Audio – DirectX 44.1 kHz compatible sound card	Audio – DirectX 96 kHz or higher compatible sound card

Table 2. Hardware requirements for Terminals

Hardware Components	Minimum Requirements	Recommended Requirements
Processor	Processor 2.10.12 Dual-Core	Processor 2.15.2 Core i3 or Higher Version
Screen Resolution	Screen Resolution HD 1280 x 1024 (16:9) with 24 bit color	Screen Resolution HD 1920x1080 (16:9) with 24 bit color
Graphics Processing Unit	Any GPU brand with 1Gb DDR2 64 Bit	Any GPU brand with 4Gb DDR5 512-bit or Higher Version
Hard Drive	Hard Disk Space 500+ TB	Hard Disk Space 500+ TB
Memory Card (RAM)	Memory 1GB RAM	Memory 4GB RAM or Higher Capacity
Keyboard	Keyboard	Keyboard
Mouse	Mouse	Mouse
Printer Optional	Ink Jet/ Laser Printer	Ink Jet/ Laser Printer
Ethernet Card	Ethernet – LAN Gigabit	Ethernet – LAN Gigabit or Fast Ethernet
Audio Card	Audio – DirectX 44.1 kHz compatible sound card	Audio – DirectX 96 kHz or higher compatible sound card

Table 3. Software requirements

SoftwareComponents	Minimum Requirements	Recommended Requirements
Sublime Text Editor	Sublime Text Editor Build 3126	V3.2.2 Build 3211
Xampp Database Server	Xampp Database Server 5.6.15	Xampp Database Server V 8.1.4
Web Browser	Google Chrome V49.0.2623.75	Google Chrome 48.0.2564.109 or Latest Version
Composer	Composer v1.0.0-Alpha9	V 1.5.2 or Latest Version
Laravel	Laravel v4.2	Laravel v5.8 or Latest Version
Operating System	Windows 7 and 8	Windows 10 or Higher version

Result and Discussion

This chapter presents the analysis and interprets the result from the gathered data during the system testing based on the primary instrument used in the study. It discusses how the respondents accept the experience of using the EAMIS and their assessment of the performance of the platform. The EAMIS testing was conducted duting the NORSU Graduate School accreditation of programs. The data from the questionnaires were statistically analyzed by the researcher. The findings were discussed according to the sections of the questionnaire. The data gathering was through an interview of the respondents and a survey questionnaire. The respondents of the study were the faculty, the assistant dean, and the dean of the NORSU Graduate School who was working during the accreditation period. Graduate School was coordinated by twenty-two (22) program coordinators in their respective specializations. Every Accreditation area was coordinated by a program coordinator and assisted by four (4) faculty members. There were forty (40) faculties who helps the program coordinators in their respective areas and three (3) staff who assists the faculty during the accreditation. Therefore, there were sixty-five (65) selected respondents who tested the platform through Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology for the faculty and staff (Davis, 1989). The platform is tested by selected ten (10) IT experts who will verify, validate, and assist its the performance of the application. The IT experts were required to test the system and rate it based on two (2) evaluation criteria: The Software Evaluation: Criteria-based Assessment involving the usability, sustainability, and maintainability of the platform (Jackson et al., 2011).

Table 4. Population of the Research Respondents

Respondent	Population	
	Frequency	**Percent**
Program Coordinator	22	33.84
Faculty	40	61.54
Staff	3	4.62
Total	**65**	**100.00**

Table 5. Population of the Information Technology Experts

Respondent	Population	
	Frequency	**Percent**
IT Expert	10	100

The researcher used the Likert Scale in the questionnaire to enable the respondents to answer the survey easily and to seek a greater result. In addition, this research instrument allowed the researcher to carry out the quantitative approach effectively with the use of statistics for data interpretation. To test the validity of the questionnaire used for the study, the researcher pilot-tested the questionnaire on five respondents. These respondents as well as their answers were not part of the actual study process and were only used for testing purposes. After the questions have been answered, the researcher asked the respondents for any suggestions or any necessary corrections to ensure further improvement and validity of the instrument. The researcher revised the survey questionnaire incorporating the important suggestions of the respondents. The researcher then excluded irrelevant questions and changed vague or difficult terminologies into simpler ones to ensure good comprehension.

Table 6. Likert Scale for the respondent's assessment on their problems encountered with the used of manual process of keeping and retrieving pertinent records in different Areas for accreditation of programs

Rating		Mean Ranges	Verbal Description
5	Strongly Agree	1.00 – 1.80	Very serious and poses a total obstacle in managing pertinent accreditation records.
4	Agree	1.81 – 2.60	Serious and poses to alarge extent of obstacle in managing pertinent accreditation records.
3	Moderately Agree	2.61 – 3.25	Moderately serious and poses some extent of obstacle in managing pertinent accreditation records.
2	Slightly Agree	3.41 – 4.00	Slightly serious and poses few obstacle in managing pertinent records.
1	Disagree	4.21 – 5.00	Not serious and does not pose an obstacle in managing pertinent accreditation records.

Table 7. Likert Scale for Software Likert Scale for Software Usefulness and Ease-of-Use

Range of Scale (1-4)	Verbal Description	
	Perceived Usefulness	**Perceived Ease-of-Use**
1.00 – 1.75	Not Useful	Not Easy to Use
1.76 – 2.50	Partially Useful	Not So Easy to Use
2.51 – 3.25	Useful	Easy to Use
3.26 – 4.00	Very Useful	Very Easy to Use

Table 8: Likert Scale for Software Usability as tested from the IT Expert

Range of Scale (1-4)	Verbal Description
1.00 - 1.75	Not Usable (NU)
1.76 - 2.50	Slightly Usable (SU)
2.51 - 3.25	Moderately Usable (MU)
3.26 - 4.00	Very Usable (VU)

Table 9. Likert Scale for Sustainability and Maintainability as tested from the IT Expert

Range of Scale (1-4)	Verbal Description
1.00 - 1.75	Not Sustainable and Maintainable (NSM)
1.76 - 2.50	Slightly Sustainable and Maintainable (SSM)
2.51 - 3.25	Moderately Sustainable and Maintainable (MSM)
3.26 - 4.00	Very Sustainable and Maintainable (VSM)

Problems encountered by the respondents with the used of manual process of keeping and retrieving pertinent records for Accreditation

Table 10. Problems encountered with current system of keeping and retrieving pertinent records in different Areas for accreditation of programs

Problems in:	Weighted Mean	Verbal Description
1. Collecting needed documents from concerned faculty and staff.	4.02	Agree
2. Time in collecting, searching, and preparation manually.	4.38	Strongly Agree
3. Keeping and sorting the records.	3.91	Agree
4. Identifying if the records on hand are the updated ones.	3.93	Agree
5. Back-up of the collected documents stored in the filing cabinets. Thus, documents are easily lost or misplaced.	3.98	Agree
6. Manual management of the records is not efficient and fast.	4.62	Strongly Agree
7. Manual management of the records is tiresome.	4.13	Agree
8. Necessary documents are not available when accreditors needed them.	4.11	Agree
Overall Mean	**4.13**	**Agree**

Table 10 shows the different problems encountered by the faculty and staff in using the current system of keeping and retrieving pertinent records for accreditation of programs in the Graduate School. As presented in the table, the respondents agreed that there were difficulties in collecting needed documents from concerned faculty and staff, difficulty in keeping and sorting the records, identifying if the records on hand were the updated ones, there was no backup of the collected documents stored in the filing cabinets and thus, documents were easily lost or misplaced. Manual management of the records was tiresome and necessary documents were not available when accreditors needed them. Moreover, the respondents strongly agreed that the current system management of records is time-consuming in collecting, searching, and preparing manually and manual management of the records was not efficient and fast. In addition, the overall mean indicates that the respondents agreed that using the current system has lots of difficulties faced by the faculty and staff.

Software Criteria-based assessment: Perceived Usefulness as tested by the respondents

Table 11. Perceived usefulness as tested by the respondents

Perceived Usefulness Criteria	Weighted Mean	Verbal Description
1. Using the system in my job would enable me to accomplish tasks more quickly.	3.71	Very Useful
2. Using the system in my job would increase my productivity.	3.71	Very Useful
3. Using the system would enhance my effectiveness on the job.	3.73	Very Useful
4. Using the system would make it easier to do my job.	3.78	Very Useful
5. I would find the system useful in my job.	3.80	Very Useful
Overall Mean	**3.75**	**Very Useful**

Presented in table 11, is the perceived usefulness of EAMIS. The respondents found themselves that the system is very useful in using system in their job would enable them to accomplish tasks more quickly, using the system in their job would increase their productivity, using the system would enhance their effectiveness on the job, using the system would make it easier to do their job and they would find the system useful in their job. Overall, the respondent's found the software very useful.

Software Criteria-based assessment: Perceived ease of use by the respondents as tested by the respondents

Table 12. Software Criteria-based assessment: Perceived ease of use as tested by the respondents

Perceived Ease-of-Use Criteria	Weighted Mean	Verbal Description
1. Learning to operate the system would be easy for me	3.88	Very Easy to Use
2. I would find it easy to get the system to do what I want it to do	3.92	Very Easy to Use
3. My interaction with the system would be clear and understandable	4.06	Very Easy to Use
4. I would find the system to be flexible to interact with	3.94	Very Easy to Use
5. I would find the system easy to use	4.02	Very Easy to Use
Overall Mean	**3.75**	**Very Easy to Use**

The perceived ease of use and user acceptance of the system was presented in table 12. The respondents find the EAMIS very easy to use in terms of learning to operate system would be easy for them, they would find it easy to get the system to do what they want it to do, their interaction with the system would be clear and

understandable, they find the system to be flexible to interact with, and they found the system easy to use. Generally, the respondent's perceived the EAMIS as very easy to use.

Software Evaluation Criteria: Usability as tested by the IT Experts

Table 13. Software Evaluation Criteria: Usability as tested by the IT Experts

Usability Criteria	Weighted Mean	Verbal Description
Understandablity	3.80	Very Usable
Documentation	3.60	Very Usable
Buildability	3.80	Very Usable
Installability	3.70	Very Usable
Learnability	3.70	Very Usable
Overall Mean	**3.72**	**Very Usable**

Table 13 shows the result of the survey on the IT experts in testing the system based on software criteria in terms of usability. There are ten (10) IT experts who are requested to evaluate the system. In addition, the grand mean of the Accreditation management system on usability is 3.72 which results in a very usable system.

Software Evaluation Criteria: Sustainability and Maintainability as tested by the IT Experts

Table 14. Software Evaluation Criteria: Sustainability and Maintainability as tested by the IT Experts

Sustainability and Maintainability Criteria	Weighted Mean	Verbal Description
Identity	3.50	Very Sustainable and Maintainable
Copyright	3.60	Very Sustainable and Maintainable
Licensing	3.60	Very Sustainable and Maintainable
Governance	3.40	Very Sustainable and Maintainable
Community	3.60	Very Sustainable and Maintainable
Accessibility	3.80	Very Sustainable and Maintainable
Testability	3.80	Very Sustainable and Maintainable
Portability	3.90	Very Sustainable and Maintainable
Supportability	3.80	Very Sustainable and Maintainable
Analyzability	3.60	Very Sustainable and Maintainable
Changeability	3.50	Very Sustainable and Maintainable
Evolvability	3.50	Very Sustainable and Maintainable
Interoperability	3.40	Very Sustainable and Maintainable
Average:	**3.62**	**Very Sustainable and Maintainable**

Table 14 shows the assessment of IT experts' rating of the EAMIS in terms of sustainability and maintainability. The researcher uses Software Evaluation: Criteria-based Assessment involving the usability of the software Sustainability and Maintainability of the system. The result shows that the ten (10) IT experts tested and evaluates the system as very sustainable and maintainable in terms of Identity, Copyright, Licensing, Governance, Community, Accessibility, Testability, Portability, Supportability, Analyzability, Changeability, Evolvability, and Interoperability. As a result, the IT experts found out that the system was very sustainable and maintainable.

Discussion

Based on the gathered data during the preliminary investigation, 27% of the program coordinators, 67.27% of the faculties, and 5.45% of staff agreed that there was a need to improve the current accreditation record management system, and they all in favor of implementing an EAMIS that will help improve the current accreditation record management system using a web application. The problems encountered by the NORSU faculty and staff with the manual process of keeping and retrieving pertinent records for accreditation of program offering in terms of the following ten Criteria (Areas) are: difficulty in collecting needed documents from concerned faculty and staff, time-consuming in collecting, searching, and preparation manually, difficulty in keeping and sorting the records, difficulty in identifying if the records on hand are the updated ones, there is no back-up of the collected documents stored in the filing cabinets and thus, documents are easily lost or misplaced, manual management of the records is not efficient and fast, manual management of the records is tiresome and necessary documents are not available when accreditors needed them (Abdullah, 2000). The EAMIS was effective as rated by both IT experts and respondents who participated in the accreditation. The respondents found the EAMIS was very useful and very easy to use (Mahmudova, 2022).

Lastly, the selected IT experts rated the EAMIS as very usable, very sustainable, and maintainable. Therefore, the develop system was effective as rated by both respondents and IT experts.

Conclusion

The implementation of EAMIS would be useful to the faculty and staff of Negros Oriental State University to help them manage their pertinent records for accreditation. The developed platform allows the faculty and staff to easily identify, sort, backup, and search the records since it is stored in the database that can provide the faculty with a better service without having a hard time gathering the information and performing other tasks (Farshi et al., 2015). Universities needed a platform to manage their accreditation records. Without a management information system in working with the accreditation of their programs, the faculty and staff will always face difficulties in keeping and retrieving the pertinent record for accreditation.

Recommendation

The researcher recommended that the implementation of EAMIS must be supported by all responsible persons at Negros Oriental State University. The University must conduct proper training for the faculty and staff in the use of the functionality of the system when it is implemented in the college. The EAMIS must be deployed to fix the necessary troubles and drawbacks during the deployment of the system. The system must have maintenance to have better services. All the users who utilized the proposed system must willing to adopt the changes of the environment, especially in the fast emerging technology so that they will learn the functionalities of the system efficiently provided with proper training. Lastly, EAMIS will be helpful to all the State University of the Philippines during Program Accreditation.

ORCID

Van Roger Gutib ⓘ https://orcid.org/0000-0001-8366-4328

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Scenario of additive manufacturing - Scan for scope

Krishnan Umachandran[1*]

[1]*Department Organization Dev, Nelcast Ltd., India.* umachandran_k@hotmail.com
https://orcid.org/0000-0003-4934-4368

*Corresponding author

Abstract: Additive Manufacturing is a form of Powder metallurgy but with vast difference in approach, operations and applications. Customisation drives these techniques to acquire greater importance, as they inherit more advantages then conventional manufacturing setups. The information era pips in new requirement which reaches the innovation and development functions of the organizations to respond at a greater reflex and grab the market, irrespective of the common way of order capture, which still continues to live through. Every latent and explicit data is construed to an information node and the whole manufacturing process springs to reorient itself to the tunes of the market demand. Greater strides of development in these emerging technologies is sure to change the scenario and landscape of future manufacturing machines, process and quality levels that are unheard of as now. Of course there is bound to have backlash in employment levels compared to the current intakes, but the future needs to be met with upgrades at all positions with improved skilling and newer orientation for employability requirements in the manufacturing industry. This is a review paper on the process, data, people and sophisticated assurance of 3D printing technology evolving to reach the customer, who is an end-user, nearer to the places of production.

Keywords: Industry 4.0, Additive Manufacturing, 3D Printing, Laser Sintering, Cloud Manufacturing

Introduction

The stimuli to the evolution of such micro managed production setup have been long awaited by the consumers. The COVID-19 disaster has caused a reduction of global trade disrupting the value chains, dwindling demand for manufactures, glitches in industrial supplies through the quarantine periods at various locations, interruptions in shipping etc., were dramatically affected (United Nations, 2020). Global trade recovered in spite of the inhibited unstable manufacturing activity affected by COVID-19. The recovery is stronger than what was initially envisaged, but now on a invigorated demand in the consumption of goods (World Bank, 2021). Manufacturing provides high-wage employments, lucrative advances to professional deployments, and an exceptionally high impact to economical sustainability to maintain social demands or expand employment (Susan et al., 2012). Consumers perform a key role in developing and strengthening manufacturing industries, expecting them to offer better and cost-effective products and services over time (Umachandran, 2021).

Developing countries exports are classified into three, the fuel dependent, non-fuel goods or service and manufacturing distributor. Accordingly their development and integrated supply chains are associated to supply of human resources, material, commodities, and industrial metals (OCED, 2012). During the COVID-19, while lingering to be commodity-dependent, selected energy-export needed countries achieved to rise the segment of their non-commodity shipping's by accumulating value in other sectors (UNCTAD, 2019).

Productivity and wages affect industries, hence to improve performance by adopting emerging technologies in production, shall open up space for development in skilled resources to make advanced products that add value for customers and revenues for industries (Susan et al., 2012). The engineering sector is dependent on its end-consuming sectors such as power, infrastructure, and manufacturing. A new range of productive waves affects the technological advances in manufacturing technology with advanced robots, enhanced sensors, ambidexterity, and intelligence enviable to humans in manufacturing (Umachandran, 2021). Substantial bearing on industrial automation appeared in the manufacturing sector, later the advancement make way in agriculture and healthcare, taking a giant leap with every innovation following the start. As the economy and job markets evolve, a wide variety of new roles emerge across the businesses. Industry 4.0 brings artificial intelligence in content creation of various fields, setting human tasks to revalidate or retain their competitive advantage in decision-making on jobs that demand human resources that can be filled with newer roles at the forefront of the data. AI economy is diffusing for new roles in manufacturing, cloud computing and product development (Amanda, 2020). Manufacturing industries have gone through an automated process in their core functions during the recession, eliminating non value added and low-middle skilled activities. It involves skilled technicians to operate the machinery or technology that had replaced the jobs. These new roles need varied and hypothetically additional technical proficiencies compared to the past (Umachandran, 2021). Digital manufacturing is being established at a enormous speed, even though their genuine adoption is more dispersed, strenuous and patchy (United Nations, 2020).

Manufacturing Goals

Manufacturing goals should discover options for assembling structural fluctuations, annotate the total and per capita physical footprints endure to grow, stress on the need for intelligible policies and considerate of how diverse goals, and processes that interact to achieve cost and environmental impact reductions, become integrated and complex and offer Cloud intelligent decisions. As per figure 1 the sustainability of manufacturing goals has made a remarkable flexibility covering both the discrete manufacturing and the process manufacturing. The discrete is connected to Collaborative design and Automation for Sustainability while the process manufacturing includes additionally the process resilience, waste reduction, reuse and recovery.
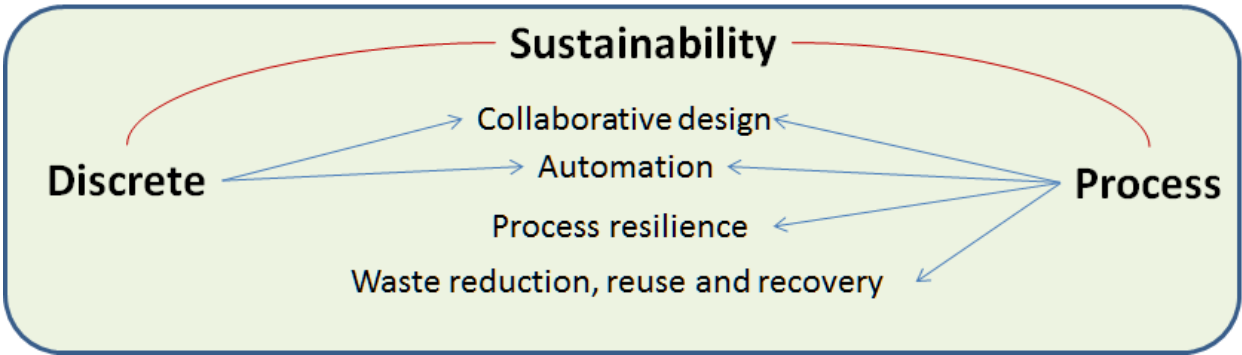
Figure 1. Sustainability factors.
Source: Krishnan (2022b), Cloud enabled Additive Manufacturing

Cloud manufacturing is a service adapted to virtualise resources and abilities into an on-demand service that can be accessed through the cloud, transforming supply lines to become temporary, provide greater flexibility, scalability resulting in increased resilience and sustainability throughout the process. Cloud manufacturing is a multi-tenant, knowledge centred platform, intelligent to deliver viable solutions during the life cycle of the product and process (Fisher et al., 2018).

As per figure 2 the Scenario has changed in Production Technology and Process Similarity to the evolved Laser sintering or 3D printing (Umachandran, 2015). 3D Printers are presenting a prospect in industries. Also called as rapid prototyping they have severely reduced the time and cost of the development of new industrial items (Savaliya et al., 2020). A shorter distance for products or parts saves time, distance and money (Richard, 2015). Additive manufacturing expertise opens up novel prospects for the economy and civilization. It simplifies, adapts production processes that allows designs that were not possible with previous manufacturing

techniques, challenging to impede and slow the adoption of this technology is defeated over many instances, such as higher cost of producing compared to traditional methods. The costs of additive manufacturing strive for recognizing numerous instances that can be cost nominal and detect potential means towards achieving it (Douglas et al., 2014). Additive manufacturing (3D printing) and robotics have the prospective to contribute to developing and developed countries, by refining productivity, easing out work limitations, and reducing the need for outsourcing, specifically as the length of supply chains reduction brings clear paybacks. Outsourcing intensifies domestic inequalities in the expanding global economy, rapidly growing through widespread exploitation of new communications and manufacturing technologies. Additive manufacturing creates rapid prototyping in the automotive and aerospace industries, substitute's traditional mass production with high value products which augers for material quality and balances cost that can benefit through the flexibility, speed, and customization levels (NIC, 2012).
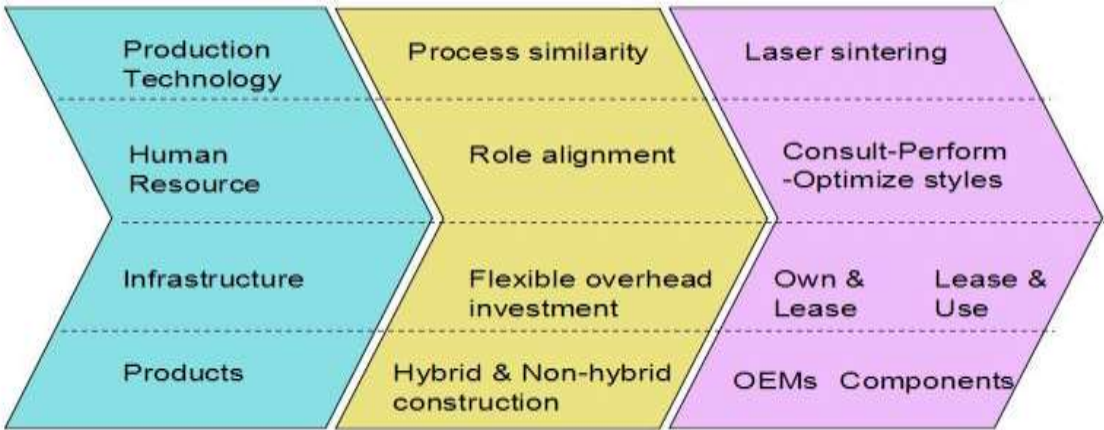
Figure 2. Scenario Change
Source: Umachandran (2015). 3D Printing Landscape and Technology

As per figure 3 the basement for additive manufacturing lies on two pillars, namely the Data visualization and Digitalization. High quality statistics with integrated access to information and assistance at levels with easier access to information tools and problem solving services and imposes an obligation for full online access can be obtained using multiple data sources, advanced data analytics methods and digital technologies to support the design, monitoring and evaluation of Market policies to empower businesses and to take informed decisions beyond (European Commission, 2018). Data is visualized through the resources that are having the tuning ability to get tuned with the digital and physical front. All the human visual systems can be connected to arrive manufacturing and business solutions, while taking care of the constraints in the data spaces that are parametric and heterogeneric. The criticality for advancement is the digitalization's where the knowledge and the actions are carried out through the computing that has an element of intelligence integrated which progresses through the horizontal and vertical agile data that is processed into information which is seamlessly connecting the physical and digital spaces to execute tasks which has a cognitive support for both operational and business expectations.
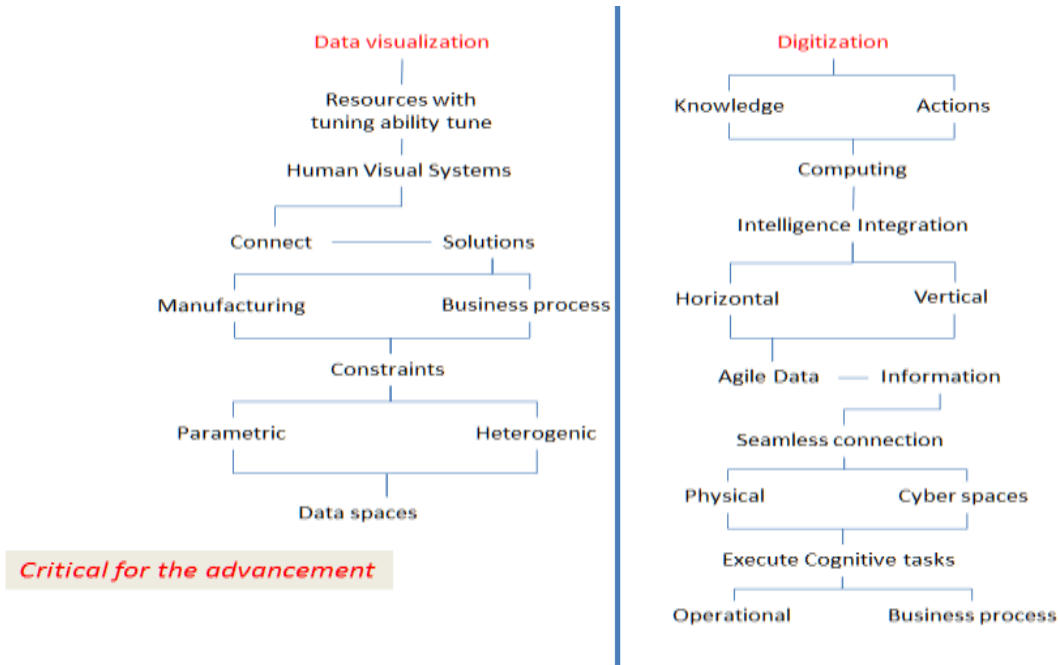
Figure 3. Basement
Source: Krishnan (2022b), Cloud enabled Additive Manufacturing

As in reference to the figure 4, the value drivers that are hyper connected collaborate across data boundaries legally binding requirement from legislation that uses information to support the analysis of data, regulatory activities and communication (European Medicines Agency, 2021). This can be due to globalization, digitalization and quick technological transformation calls for more agility to better capture of data, so that the manufacturing and Supply systems are connected to deliver better management of production and distribution through Data applications, concerning timeliness and analysis of new data for evolving needs, online intercessors, and cloud computing and the collaborative economy offer more agility for electronic reporting tools and data comparability by taking advantage of emerging technologies. Incessant investment in enhancing the quality, the conspicuousness and the transparency of these data tools and a sole digital gateway as an admittance point to information, measures, support and problem-solving facilities are obligatory to keep efficient use of proprietary rights (European Commission, 2018).
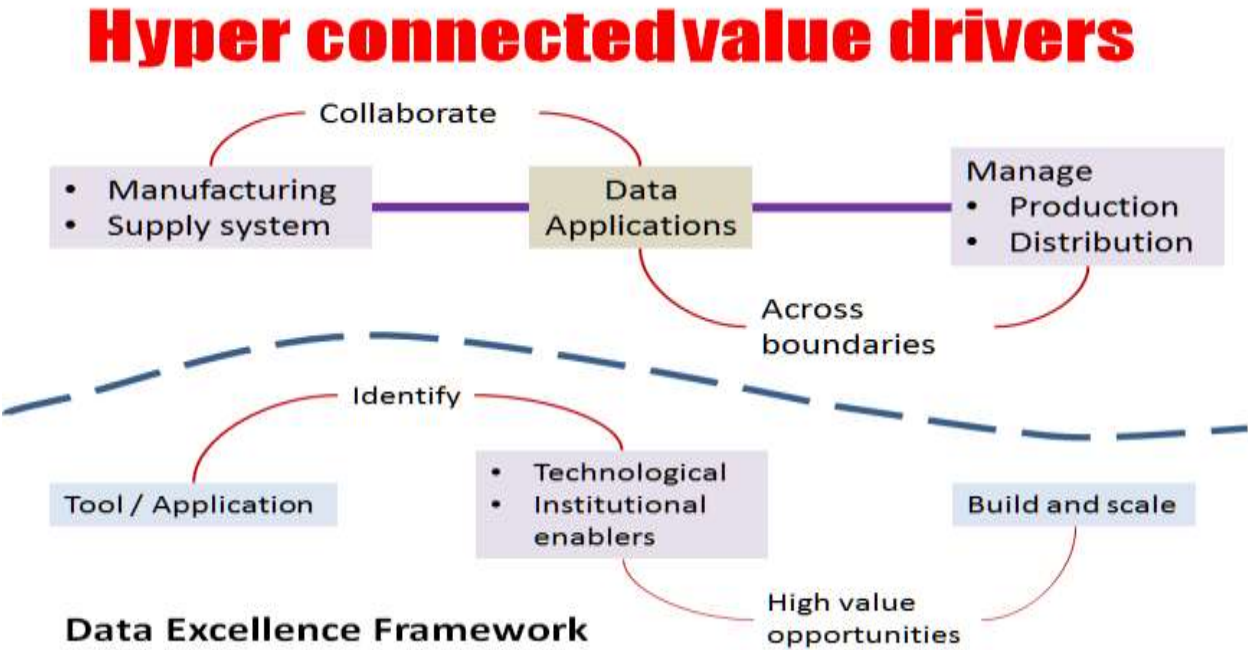
Figure 4. Hyper connected Value drivers
Source: Krishnan (2022b), Cloud enabled Additive Manufacturing

Industry 4.0 offers to provide greater benefits than conventional manufacturing process, such as reduce the need for workers, support mass customization, flexible for consumers demand and deliver non-standard product. Data in computing systems has more of data from customers, sales, shipping, supply chain, financial, production planning data, BOM, inventory, and maintenance data managed by CRM, MES, ERP, SCM, PLM, etc. that is effortlessly swapped between diverse divisions which is efficiently analyzed, significantly improved through computational replicas of manufacturers leveraging data to promote progressive manufacturing though massive customization, sustainable -flexible - intelligent - cloud manufacturing (Fei Taoa., et al., 2018). Thereby the bottom line delivers to take care of the reduced labor cost, improved asset use and reimbursement of depreciation. The additional benefits are approach for more innovation in product's improvement, value generation, quality up gradation and flexibility for customization. Ultimately the organizations operational goals are now streamlined to offer enhanced changeover time, reduced Downtime, increased reliability and reduced inventory. This covers all ages of manufacturing setups whether they are fully automated or even those who are uninterested to change. Most automated systems are still semi-automatic involving of blends of automated and manual tasks, ostensible in assembly operations, mostly challenging to automate at a reasonable cost (Frohm et al, 2008). The change impetus comes only when they are gauged on the evaluation of impact. The change impacting parameters are virtualization, value chain, disruption, resources efficiency and policy regulation. As in Figure 5, the industry 4.0 transforms the organizational process, enhances the output through industrial technologies, and connects on real time with digital twins, suiting with the environment and resources (Krishnan 2022).
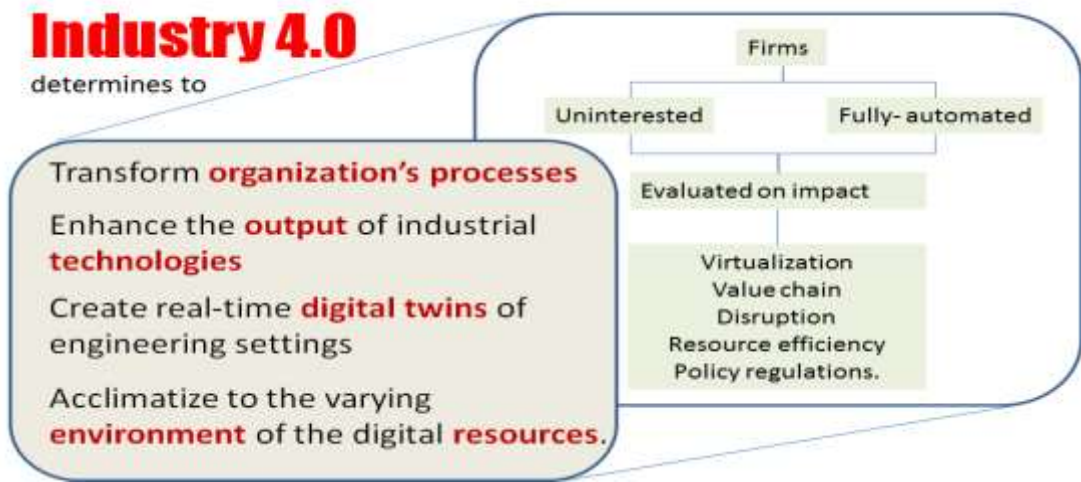
Figure 5. Industry Transformation
Source: Krishnan (2022a), Industry 4.0 digital educational technologies (Instructional canvas with techniques)

The level of automation (LoA) in areas as aviation, tele-robotics are finding place in the industries. The figure 6 of the Landscape which the industry 4.0 is built in covers the manufacturing of production and quality built units accommodates relatively small numbers, and even flexible quantities. The inputs to these are CAD program, availing the design data set through object scanned using a 3D scanner, so that the details are captured directly the end part that is being evolved for production. Conventional manufacturing has progressed to a multidisciplinary activity with the ability to design and manufacture variety of products using human resources from various disciplines (Witherell et al, 2017). The human resources that are deployed in this arena are multi-disciplinary new-gen-hobbyists for production that can include the core production engineers as well. These personnel apply radical thinking to improve speed of production, and dramatic rate of production by interpolating volumetric data from images so as to cut the cost of manufacturing, personalizing designs and process, so as to obtain the user visualized design model (Umachandran, 2015)
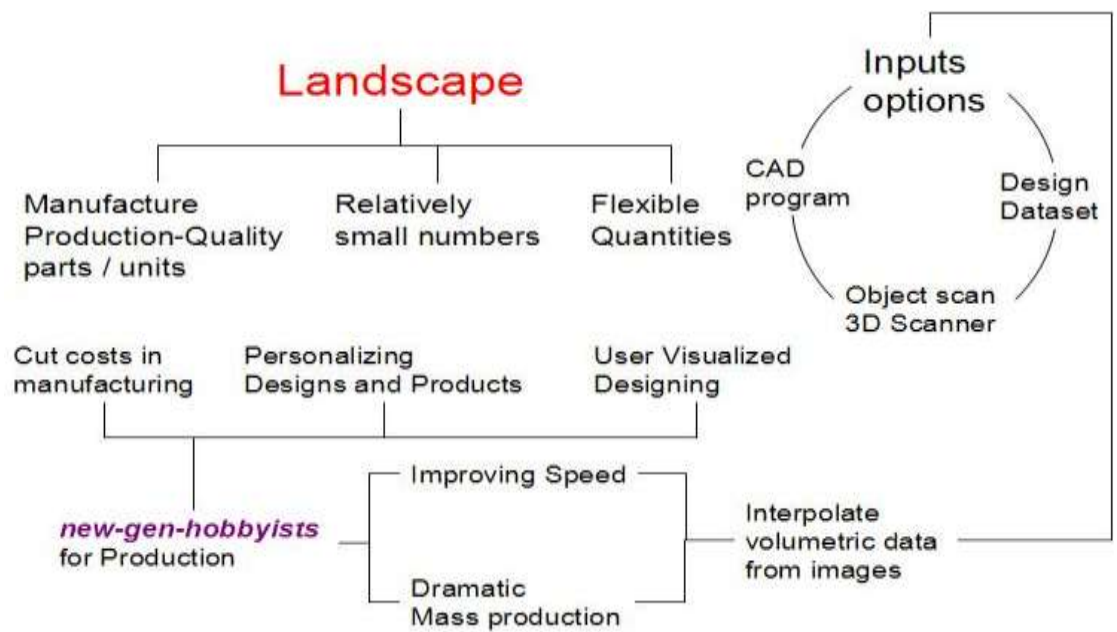
Figure 6. Landscape of Industry 4.0
Source: Umachandran (2015). 3D Printing Landscape and Technology

The figure 7 reflects the advantages of in process outcomes, by balancing the availability of the system and optimal utilization. Ability to hypothesis a prototypical that will authorize to take ideal or near optimal choices for the arrangement of scheduling epochs (ICAI., 2016). Choose to create products that are time consuming to be produced through traditional process. Then have design imaginations along with expensive tools, tested for dimensional adherence. Forthcoming work comprises activities fluctuating from a manufacturing point of view to a customer's user requirement (Alves et al, 2013). The three pillars of sustainability are encompassing economic, environmental, and social sustainability towards a firm's performance (Hami et al., 2016). Finally these technologies engage for sustainable resource management, conserved through individuals and communities (Umachandran, 2015).
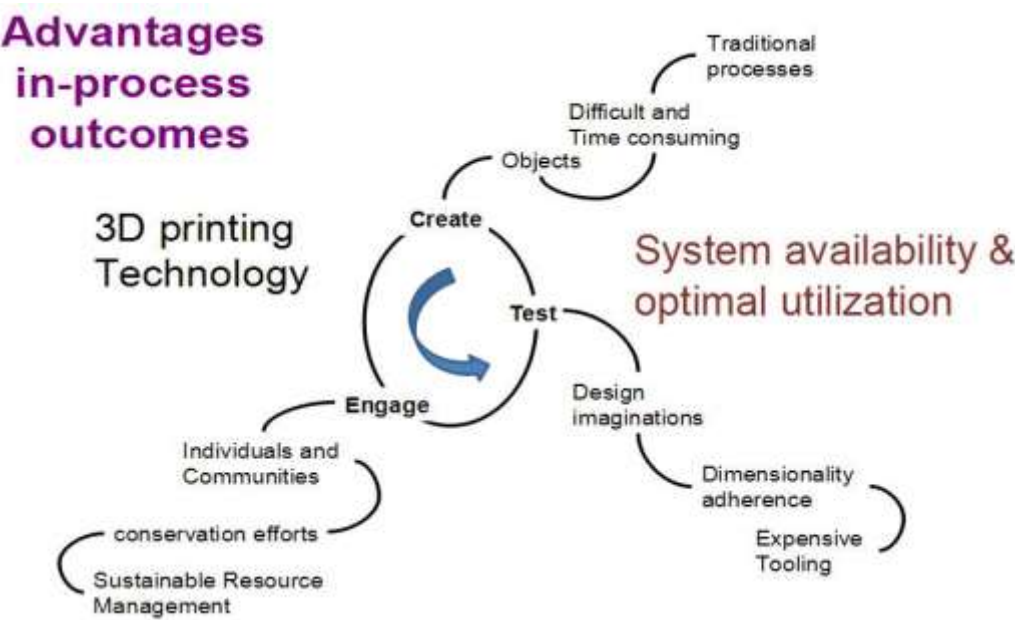
Figure 7. Advantages (3D system availability and Utilization)
Source: Umachandran (2015). 3D Printing Landscape and Technology

Cloud – Fog - Edge Computing
Informational free enterprise impacts societies through transitioning information and software program; planning and executing tactics; and finally by various locations, and storing identities. Therefore the data

driven information and operations generates Cyber Physical setting leading to connect internet of Things (IoT), Big Data (BD), and Cloud based computing, to Reality scenarios for Augmented and Virtual supports. To enable this Data visualization techniques use spreadsheets in various web-based tools for data creation, and displays through cloud from a variety of sources (Amuthalakshmi et al., 2021). IoT with RFID sensors can track, manage, software integrated machines and process systems, collecting real-time data on machine condition and performance facilitating customized manufacturing with visual controls through robots carrying out many human tasks. Thus offering mature mega systems of safe, simple, secure, scalable, flexible, affordable, and innovative nature. Cloud is thus a pathway to connect various Servers, storages, DB, Networks, Software's, Applications, and analytics. Fog is a virtualization facilitated by a web server, bringing the computation and data storage near to the user. While Edge is for reduced bandwidth, improved response time; as the data from sensor is processed on the device itself. Summarily Cloud operates on big data, edge operates on instant data, real-time data generated by sensors or users. Applications of cloud are Software's (SaaS), Platform (PaaS), and Infrastructure (IaaS).

Additive manufacturing
Development in Traditional or conventional manufacturing process are short and long term innovation processes which impacts full value chain of marketing - manufacturing flow through extensive changes in their core through Processes, Products, New technologies and Services. The general statement here is that Rapid prototyping or 3D Printing produces physical object from a 3D CAD representation. Where the digital object is built through various and successive layering of materials, and applications. There are various techniques in 3D printing such as Optical fabrication, Photo solidification, Fused deposition, Material extrusion, Photo polymerization, Powder bed fusion, Material - Binder jetting, Sheet lamination and Directed energy deposition. Geometrically complex designs and shapes are possible only through Additive Manufacturing with greater dimensional accuracy and shorter production time for prototyping and cost-effective in mass production of finished product in one single manufacturing step (Kohlhuber et al., 2017).

Detailed view of photo solidification
This is a 3D model where the layered material is sent to the machine in a liquid form. There is perforated base, through which the Liquid pre-polymer comes out through. There is an Iterative exposure of Laser beam strikes as per the model layered through CAD design. The Laser light solidifies the polymer, when it is above critical exposure of light, altering the exposure thickness, and depth of solidification is thus adjusted. There is always a vulnerability to these new techniques as they are affected by quick and new modern technologies, which makes a reduction in shelf-life of the technology itself. Though the Digital transformation understands the complexity, more innovativeness lures the Industry 4.0 for future smart products and services. Therefore the critical element for marketing to manufacturing flow which requires seamless collection of manufacturing data and rapid feed of information to management for effective decision-making is gets arrived. Industry 4.0 interlink data and communication technologies for collecting data from physical things of IIoT through Cloud Computing and data analytics to build smart products. Internet of Things creates cyber-physical systems, influencing smart manufacturing using advanced robotics and AI. Interdisciplinary combination of data technologies in manufacturing, exploits various techniques by using 3D printing with Virtual and Augmented Reality, providing customization and need satisfactions for customers (Igor et al., 2018). The flexible control is through virtualizations, where the proxy monitoring can manage highly complex dimensions, of unimaginable design realizations captured into high quality production. These require less space requirements, lesser inventory of materials, and automated process flow in a new age factory. Thus the research and development as a systems upgrades itself to offer customization to the core as well as bring systemically the auto self-diagnostic and regenerate options (Umachandran, 2015).

New role of employees
Core skills like critical thinking, resilience, stress tolerance, flexibility, investigation and problem-solving are constantly in the top of the list for reskilling in manufacturing and businesses (Amanda, 2020). The figure 8, on the demand generation for Knowledge workers, requires identification of the inherent difficulty in traditional manufacturing, then to test the the design imaginations for dimensional and tooling requirements.

Finally the connection with the individual and communities that should enable for sustainable positioning of resource utilization (Umachandran, 2015).
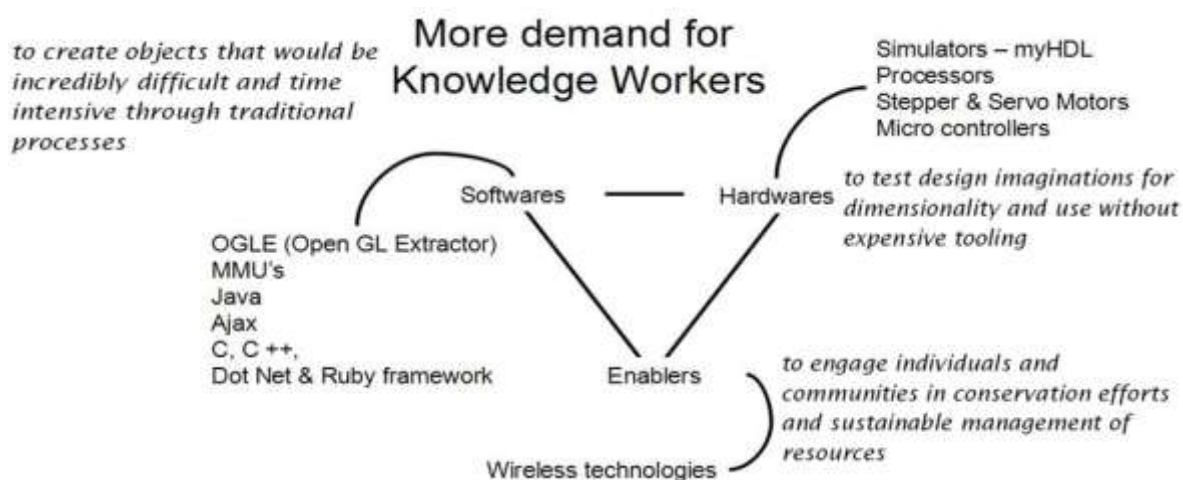
Figure 8. Demand on Human Resources
Source: Krishnan (2022b), Cloud enabled Additive Manufacturing

The notable to be explained here are the OGLE, MMU and myHDL connections, which have more demand from human contribution towards Additive Manufacturing. Software's such as OGLE (OpenGLExtractor) allows for the capture and re-use of 3D geometry data from 3D graphics applications running on Microsoft Windows, observes the data flowing between 3D applications and the system's OpenGL library, and recording that data in a standard 3D file format as a screen grab or view source operation for 3D data. These software's are akin to be motivated by Video game characters; animators reuse environments or objects from other applications or animations which don't provide data-level access; architects bring 3D forms into their proposals and renderings; and digital fabrication technologies use automatically instantiate 3D objects in the real world. Memory management unit (MMU) handles all memory and caching operations associated with the processor, covering all aspects of memory management, integrated into the processor, as a separate IC chip. MyHDL uses hardware verification language (HVL), to write test benches and verification environments, and to control simulations. MyHDL is enabled for co-simulation with any HDL simulator that has a procedural language interface (PLI), designed to be independent of a particular simulator with specific PLI module written in C.

Conclusion

Significant development in Additive Manufacturing is facilitated through digitalization, prompting new commercial models and facilities through online platforms to establish market access reaching 3D CAD models, physical formulations and procedure considerations obtainable through just as easy as a download and procurement through streaming payment as per requirement. Thus Additive manufacturing technology unlocks up innovative occasions for the economy and humanity, enabling tailored manufacture of robust light-weight goods and it permits enterprises that were difficult in conventional production processes. Therefore to influence the technology's prospective necessary intensive actions researches, operation, training and funding are required this effect to move far and wide.

ORCID

Krishnan Umachandran https://orcid.org/0000-0003-4934-4368

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The pros and cons of the rapid reviews in information systems and computing research: A mini-review

Joshua Ebere Chukwuere[1*] ![orcid]

1_Department of Information Systems, North-West University, South Africa, joshchukwuere@gmail.com,_
![orcid]_https://orcid.org/0000-0001-8366-4328_

Chinelo Edith Ude-Akpeh[2] ![orcid]

2_Department of Journalism, NTA Television College, Rayfield, Jos, Plateau State, Nigeria. neloudeakpeh@yahoo.com_

*Corresponding author

Abstract: Information systems (IS) and computing discipline, and research continues to provide innovative and progressive research ideas, concepts, and findings for immediate and long-time solutions. The research findings and solutions are conducted using various methods, which include rapid reviews. Rapid reviews are the shorter version of a systematic literature review (SLR) to assist IS and computing researchers to provide quick and effective research findings to aid the decision-making process. This study provided the pros and cons of rapid reviews in IS and computing research using the mini-review method. Mini-reviews search, evaluate, and synthesizes academic literature in understanding the use and application of rapid reviews in IS and computing discipline and research. The study revealed that rapid reviews shorten the process, and the duration of conducting IS and computing research. It allows IS and computing researchers to produce quick, accessible, and relevant research findings to aid development and decision-making. The researchers recommend the adoption of rapid review methods in conducting IS and computing research to aid quick and relevant research findings in promoting decision-making.

Keywords: Academic, Information systems, Computing research, Rapid review, Mini-review

Introduction

The popularity of systematic review methods is rapidly gaining attention across disciplines (Wollscheid & Tripney, 2021), and information systems (IS) and computing are not exempted. Systematic reviews provide the methods to synthesis academic research evidence. A systematic review is regarded as the best secondary data method to produce findings for decision-making (Tapia-Benavente, Vergara-Merino, Garegnani, Ortiz-Muñoz, Loézar Hernández & Vargas-Peirano, 2021). The systematic review provides the components that simplify and synthesis research evidence but takes a longer time to be conducted and completed. Rapid reviews emerge in order to provide shorter review processes than systematic reviews (Garritty, Gartlehner, Nussbaumer-Streit, King, Hamel, Kamel & Stevens, 2021). Rapid reviews are among systematic reviews, but there is no accepted definition and procedure. Rapid reviews provide a quick process of producing academic evidence to aid decision-making. To this study, rapid reviews are mini-systematic reviews that produce quick research evidence. This study aims to describe the roles of rapid reviews in IS and computing research; also to identify the pros and cons of rapid reviews in IS and computing research. The paper advocates for the frequent use of rapid reviews in IS discipline and generally computing research based on their roles in

producing quick, rigorous, and relevant research evidence (findings), and recommendations that aid decision-making.

An overview of rapid reviews

Rapid reviews have been in existence for decades, but their relevance grew with the emergence of the COVID-19 pandemic. The COVID-19 pandemic made rapid reviews an important research method, and, the IS discipline should adopt this method into its research methods. Because the method fast-tracks the review process increasing decision-making (Garritty et al., 2021). The relevance of rapid reviews is a result of systematic review failure to produce quick research evidence. According to Moons, Goossens and Thompson (2021), systematic review as a research method takes a long time and even years to be conducted, and completed before publication. The rigour and process of conducting evidence-based research using systematic reviews can take two years to complete (Garritty et al., 2021) while rapid reviews shorten the process and time. Moons et al. (2021) and Beecher, Toomey, Maeso, Whiting, Stewart, Worrall and Devane (2021) stated that rapid reviews are a kind of 'knowledge synthesis that speeds up the process of conducting systematic reviews by omitting or combining some core components in producing evidence-based findings to aid decision-making promptly. The amount of time it takes to conduct and complete systematic reviews research is worrisome, hence this ever-changing knowledge age necessitates rapid reviews. As the name suggests and noted above, rapid reviews promote a quick way to produce evidence-based academic research findings. The rapid reviews research process can be conducted, completed, and published within five to eight weeks without missing out on the rigour and relevance of its findings. To Moons et al. (2021), rapid reviews provide a quick summary of academic literature by following some of the principles of the conventional systematic review approach. It provides a synthesised process that may omit or modify some components of systematic review for lack of time (Tapia-Benavente et al., 2021; O'Leary, Casey, O'Connor, Stokes, Fealy, O'Brien & Egan, 2017; Kelly, Moher & Clifford, 2016).

Moons et al. (2021) suggested that in an ever-changing discipline and situation, rapid reviews are needed to respond to the changes. This kind of systematic review can be suitable in political situations, health, and a few others. Information systems (IS) and computing disciplines at large are changing rapidly and trending, which makes rapid reviews necessary to be used in carrying out research. According to Moons et al. (2021), rapid reviews have grown to have an audience such as policymakers, healthcare institutions, professionals, managers, patient associations, investors, technologists, and others. The audience can be extended to the IS and computing discipline, researchers, and practitioners, in order to continue to breed change and innovation.

Though, the quality of rapid reviews cannot be less than systematic reviews but must abide by the major components of systematic reviews (Moons et al., 2021) so, as to avoid the questions of relevance, bias, and reliability. The questioning can occur in the inclusion criteria, analysis, and synthesis of the research. Rapid reviews have the attribute that allows IS and computer researchers to provide and produce a piece of summary information and detailed recommendations for decision-making.

Problem statement and objectives/questions of the study

IS and computing discipline and research continue to provide innovative solutions to solve everyday issues and challenges but the duration to conduct the research is long. Researchers in the discipline uses different research methods like systematic literature review and many other to discover new ideas and solutions. Moons, Goossens and Thompson (2021), are of the opinion that a systematic review can produce a research evidence-based research but it takes time to complete. The longer period it takes to produce academic research evidence makes rapid reviews an important aspect of academic research methods. According to Garritty et al. (2021), rapid reviews shorten the research process from start to finish. In IS and computing research/discipline, rapid reviews are underused or relatively new in carrying out research. Then, the objectives of this study are:

    a) To determine how rapid reviews can be applied in IS and computing research and discipline.

b) To explore the pros and cons of rapid reviews in IS and computing research.

The application of the mini-review method in this study

Over time, the academic research process always follows a standard or traditional literature review process, with the purpose of synthesizing existing literature in discovering new research gaps and topics. According to Donaldson, Aday and Cooke (2011), a traditional literature review is systematic in nature and often uses replicable methods to identify, analyse, synthesize and deeply review existing literature, and also, present current knowledge gap/s within a study. However, the mini-review method can be categorized as a traditional literature review but is more focused on specific topics or subject matters in providing an overview point of underdeveloped, emerging, or developing subjects or topics (Donaldson et al., 2011). Mini-review method looks into salient aspects of disciplines or topics as in the case of this study and provides current and important findings for easy reading and comprehension of literature by academicians and practitioners for decision-making (Elfar, 2014). Mini-reviews are less in content and mostly within 3000 to 4000 words than traditional literature reviews which can exceed 25000 words in providing a broader literature viewpoint within a subject matter.

The traditional and mini-reviews can be used for various reasons to discover new research areas, insights, and interests, discover emerging information sources, identify and deeply (critically) review research methods, also, synthesize existing knowledge to provide an argument, advice, and research direction, research findings or use for scientific inquiry (Donaldson et al., 2011). Mini-reviews can be similar to a standard or traditional literature review, mini-review is concise and focus on a specific or single question (Griffiths, 2002). Mini-reviews continue to be used in different disciplines like fisheries, health sciences, and many more but less in information systems and generally in the computing discipline. Mini-review is a new literature review method that allows researchers to conduct studies and make the findings quickly and easily available to the audience (Collins, 2014). According to the researchers, a mini-review is a literature review method that provides a summary of literature to assist readers with concise and current research gap/s and new research or emerging topics and concepts for future development and expansion.

The researchers applied a mini-review in the study to identify and review critical existing literature on the pros and cons of rapid reviews in IS and computing disciplines, also, identifying new research knowledge and research gap in the literature for advice and direction. The application of mini-reviews in this study provided the researcher the opportunity to present a concise, summarized, and current literature viewpoint on the use of rapid reviews in IS and computing discipline and research, for the benefit of academicians and practitioners. The method also allowed the researcher to discover the pros and cons of rapid review in IS and computing discipline and research. It permitted the researcher to produce a concise and easy-to-read literature study to guide and direct researchers in the future in conducting IS and computing research. Mini-review is suitable for researchers who intend to contribute knowledge in their research area but have no time to conduct a full standard or traditional literature review (Donaldson et al., 2011). To conduct a mini-review study, researchers can limit their literature search to specific years without referencing existing literature (Griffiths, 2002). Through the mini-reviews, the researchers were able to understand the role, importance, and application of rapid reviews in IS and computing discipline and research. The application of rapid reviews in IS and computing research and discipline fast-tracks knowledge discovery to improve decision-making.

The role of rapid reviews in IS and computing research

Individuals, organizations, and other industries rely on IS and computing to make decisions in a crisis like in the time of the COVID-19 pandemic saw the rise of fake news and misleading information. The COVID-19 era demands quick research outputs that improve decision-making about the virus. Though IS and computing research takes time and even years to be conducted and completed. Such delays hamper development and decision-making. IS and computing research findings and recommendations continue to shape society and

decision-making. For example, globally, fake news is problematic for individuals, organizations, and government institutions. It harms individuals and organizations of all kinds negatively. The COVID-19 pandemic shows the critical consequences of fake news or infodemic in society, as well as the implications. A great deal of information has been spread on social media or other media platforms about the COVID-19 pandemic including misinformation or infodemic (Brindha, Jayaseelan & Kadeswaran, 2020).

In the COVID-19 pandemic situation, there was an urgent need to clarify fake news or infodemic on social media; in this case, rapid reviews became useful to quickly carry out studies on the harmful consequences of fake news or infodemic on society. To carry out such quick studies, research methods that can accommodate quick evidence are necessary, and, rapid reviews became a suitable method to use. Furthermore, the changing industry of IS and computing needs quick studies on different trending and happenings incidents within IS and computing in society and organizations. The changing nature of IS and computing in society and organizations cannot continue to wait for a study conducted for years before reporting or publication, because decisions need to be made quickly. Rapid reviews present the process for immediate or quick execution of studies on ever-changing issues or trends as in the case of the IS and computing discipline, and research to aid decision-making.

To achieve rapid review in the IS and computing discipline and research, stages are followed. Stages in rapid reviews are provided in Table 1 with accelerated strategies. These stages provide the procedures to be followed when conducting rapid reviews in information systems and computing disciplines/research, also in other disciplines.

Table 1: Stages in rapid reviews

Review initiation	Organised team	a. Focus on an experienced team. b. Use a big number of the research team. c. Review process involves limited stakeholders.
	Review scope	a. Review of existing literature within the study. b. Focus on discipline. c. Use commonly known and used definitions for terminologies and core concepts. d. Define the potential evidence to be discovered. e. Define the publication year, date, format, and language.
Review question	Develop research question	a. Focus on a single research question. b. Let the question/s be well-defined.
	Develop a conceptual framework for the study	a. Choose a theoretical framework/s suitable for the study. b. Develop a conceptual framework from the chosen theoretical framework.
Identification of relevant studies	Targeted searching	a. Select recognised academic databases. b. Use the question/s to form the search keywords. c. Use well-indexed databases. d. Use publication year, date, format, or language.
	Shortcuts of screening	a. The use of the screening process in text-mining technologies is encouraged. b. Prioritise the items to be screened using text mining methods. c. Define inclusion. d. Let one team of reviewers perform the screening and let another double-check the screening.
Description of study attributes (characteristics) – mapping	a. Define the number of study attributes to be used (coded). b. Group (map) the studies according to titles and abstract information (the process saves time by omitting documents that cannot be used). c. Group (map) the presentative sample of the studies used (it assists in providing enough information to aid discussion to inform decision-making).	
Detailed coding (quality assessment and data extraction)	Data extraction	a. Use standardised data extraction to assist in data piloting. b. Focus on certain data extractions with a set of items. c. Apply automated data extraction methods. d. A single reviewer can do the data extraction. e. The quality appraisal of the studies included should be omitted. f. Quality appraisal should be performed by a reviewer.
	Quality assessment	a. Deeper examination of context and findings.

	b.	Use a hierarchy of study designs to rank and compare single (individual) studies.
	c.	Using key elements, adopt an existing quality assessment.
Synthesis of findings	**a.**	Minimise the number of studies for synthesis.
	b.	Focus on narrative synthesis evidence.
	c.	Use synthesis evidence that involves conceptual framework innovation (for instance, a thematic synthesis that produces a predetermined concept).
	d.	Adopt a pragmatic method (for instance, framework synthesis that involves the synthesis of a number of single (individual) studies).
	e.	When a meta-analysis is suitable, focus only on the important outcomes.
Using the review	**a.**	Engage stakeholders.
	b.	Communicate the evidence (findings).
	c.	Review, modify and update the findings.

Table 1. Adopted from Wollscheid and Tripney (2021) and Thomas, Newman and Oliver (2013)

To accelerate the deployment of Table 1 components, the following processes must be followed in applying for rapid reviews in IS and computing research: inclusion criteria, screening process, data items, abstraction process, and synthesis process. According to this study, the four processes are useful in conducting rapid reviews studies.

a) **Inclusion criteria:** The kinds of articles, books, and documents to be included must be such that they discuss the research topic under investigation. An IS and computer researcher must set out criteria for publications and other materials to be included in the literature or review.

b) **Screening process:** Screening criteria must be established. The criteria are evaluated within a publication in a certain period.

c) **Data items and abstraction process:** The necessary keywords associated with the study must be established. Through abstracting, the skills and knowledge must be examined.

d) **Synthesis process:** The process includes an in-depth analysis of the academic database with the relevant materials within the study and timeframe. The topic that shares the keywords must be profiled from the topic, abstract, and introduction.

The pros and cons of rapid reviews in IS and computing research

The advent of the COVID-19 pandemic demanded a quick and immediate response to questions, which made rapid reviews an ideal research method to provide speedy answers to questions. The pandemic promoted rapid reviews and their significance in the changing and evolving world. However, rapid review processes, findings, recommendations, and conclusions don't meet the golden standard of Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) criteria, but the rigour and relevance are standard and quality. The pros and cons of rapid reviews in IS and computing research show the areas where rapid reviews are necessary for IS and computing research and the areas where they are not suitable.

Pros of rapid reviews in IS and computing research

As rapid reviews promote quick research evidence with core or combined components of systematic review in conducting research as timely as possible, it is suitable in IS and computing research to provide relevant findings in a discipline that is forever changing. IS and computing discipline, by its nature, is trending and forever changing. IS and computer researchers focus on a topic that demands urgent answers and solutions. Also, its topics are trending issues in society and organisations with immediate answers and solutions. Then, the application of rapid reviews in IS and computer research, and the computing discipline at large makes it possible to research topics that need urgent interventions or quick answers. Rapid reviews help IS and computing research and its researchers to:

a) understand and address the changing disciplines' needs and expectations as quickly as possible.

b) provide quick answers to questions on issues affecting IS and computing discipline and research.

c) provide quick answers, solutions, and recommendations for decision-making (decision-makers).

Cons of rapid review in IS research

There are several cons associated with rapid reviews in health studies and other disciplines. The methodological quality of rapid reviews.

  a) no standardised process followed to the conclusion.
  b) has no approved guidelines or rules for conducting and reporting rapid reviews research.
  c) has no comprehensive search.
  d) has no standardised or approved definition.
  e) needs experience and experts with systematic reviews.
  f) makes it difficult to access restricted literature and non-English literature.

Implications for future research

IS and computing discipline and research, in general, is the main source of support for human and organisational activities. Its research relevance cannot be underrated or undermined. This study advocated for the application of rapid reviews in IS and computing discipline and research in order to speed up research and production to aid decision-making. The pros attached to rapid reviews make it worth applying in practice. The rapid reviews implications are applied to all IS and computing disciplines from students to lecturers and professionals. To students, the rapid reviews will assist students to quickly understanding IS and computing research and its processes. Rapid reviews will help lecturers to conduct research and draw a conclusion to aid decision-making in practice. While rapid reviews will help professionals quickly see and understand the recent research in IS and computing research and discipline. Also, the research methods will assist professionals to understand current IS and computing research to make a decision.

Recommendations

In the future, the application of rapid reviews in IS and computing discipline and research is expected to increase across different topics and issues. The researchers recommend rapid reviews to be applied in carrying out IS and computing research and discipline to discover quick and recent research findings. Academic scholars should adopt rapid reviews in their current and future research to deeply discover issues in the discipline in contributing to quick research findings, conclusions, and decision-making.

Conclusion

Rapid reviews promote the shortest process to carry out a systematic review. IS research needs an approach that quickly produces research findings and recommendations for decision-makers. Rapid reviews make it easy for IS and computer researchers to produce quick rigour and relevant findings and recommendations to aid decision-making. This study provides the place for rapid reviews in IS and computing research, and, going forward IS and computer researchers should use more rapid reviews in their research in producing quick answers to worrying and ever-changing issues in IS and computing disciplines. On the advantage, rapid reviews provide a better understanding of addressing IS and computing changing disciplines, its needs, and expectations as quickly as possible. It provides quick answers to issues affecting concerns to IS and computing discipline and research and makes solutions and recommendations available to decision-makers (decision-making).

ORCID

Joshua Ebere Chukwuere ⓘ https://orcid.org/0000-0001-8366-4328

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Modification and testing of an automated grain beverages processing machine

Ibrahim Mohammed Gana[1]*

[1]*Department of Agricultural & Bioenvironmental Engineering, The Federal Polytechnic, Bida, Niger State, Nigeria.* ganaibro74@yahoo.com, https://orcid.org/0000-0003-4555-6494

Agidi Gbabo[2]

[2]*Department of Agricultural & Bioresources Engineering, Federal University of Technology Minna, Niger State, Nigeria.* agidides@yahoo.com

*Corresponding author

Abstract: Grain beverages such as kunu, ogi, and soya milk are becoming more popular due to their numerous socio-economic and health benefits. Presently, in most developing countries, food is mostly processed locally. This method exposes the product to contamination as a result of the equipment used and also human interaction with the product. A grain beverage processing machine that blends soaked grains, mixes the slurry, extracts the aqueous liquid and expels the paste has been developed. The machine was observed to have some shortcomings, such as; high-power requirements; sudden stopping while in operation due to power sag; and lower output. The main objectives of this research were to modify the developed machine by redesigning the centrifugal basket, adding a conveyor, and installing a heating unit. The tests' findings showed that the conveyor's throughput capacity was 65 kg/h, and the machine's efficiency was 99.7%. The integrated unit can now process 500 liters of concentrated milk per day at a throughput capacity of 9.95 liters per minute, up from 8.46 liters. In addition to lowering excessive water use, nutrient losses, contamination, and the beverage production time-cycle, this change enables the production of high-quality, hygienic grain drinks. The new innovation is a locally developed technology that has the potential to promote entrepreneurship, advance business, and ensure long-term national development. This new technology should be adopted by the government, and it should participate in its commercialization.

Keywords: Automated, Conveyor, Drink, Grain, Modification

Introduction

In 2030, the world population is expected to exceed 8.6 billion people, and half of this population will be concentrated mostly in eight developing countries between 2017 and 2050, with Nigeria coming in second only behind India United Nations Conference on Trade and Development (UNCTD, 2017). To achieve food security, developing countries' food production would have to double. Access to safe, nutritious, and acceptable food with minimum food loss or waste is defined as food security Food and Agriculture Organization of the United Nations (FAO 2014). Food processing and value-adding can help achieve this. In Nigerian households, processed grain beverages such as ogi, kunu, and soya milk are staples. Due to their low cost and nutrient benefits, they are frequently preferred to soft drinks. The process of making these beverages entails a series of unit operations involving various machinery, making it difficult, time-consuming, and prone

to contamination. The majority of commercial wet milling machines are made of mild steel, resulting in product contamination. This contaminates products and makes cleaning difficult due to the machine's design. At least 600 million people globally are at risk from contaminated food. Each year, one out of every ten people becomes ill as a result of contaminated food. Medical costs related to contaminated food total $110 billion per year in developing countries World Health Organisation (2020). Many studies have found significant amounts of bacteria, coliforms, and fungi, as well as sand, stones, plastics, and metals including iron, lead, and chromium in locally produced beverages that are beyond WHO recommended levels. The public's health is threatened as a result of this. The processes of this beverage's production have posed a significant problem for processors since they have an impact on the end product's quantity and quality (Ansah, Amodio, De Chiara & Colelli, 2018). Another key problem for processors is finding the correct equipment for these activities, which has an impact on the hygiene and quality of the finished product. Generally, wet grinding of grains into paste is traditionally done with grinding stones or commercial plate mills, while sieving is typically done by hand, stirring grain paste on a chiffon cloth tied tightly over a large bowl. Water is added periodically to wash the starch content of the paste into the bowl, leaving the chaff behind on the chiffon surface. The filtrate is then given time to settle before the supernatant is decanted in order to boost its concentration.

The mechanization of the sieving and milling processes as unit activities has received a lot of attention. An adaptable sieving device was developed by Simolowo (2011), Fayose (2008) and Simolowo and Ndukwe (2002) for the extraction of slurry food from grain. A maize slurry sifting device based on the suction concept was developed by the author (Simolowo, 2011). The low sifting rate of this machine and the interference of the filtrate flow stream with the suction line at the exit both hindered its widespread adoption. A multi-purpose sieving device for wet agricultural goods was also created (Fayose, 2008). However, it uses a lot of water while in use because its performance coefficient and sieving capacity rise with the concentration of solid particles in the paste. A better prototype food slurry processing machine that used the idea of vibration for the sieving process was developed (Simolowo & Adeniji, 2011), but because its extraction effectiveness depends on the particle size of the ground grain paste, it performs poorly. Additionally, like the conventional method and other mechanical slurry food sieving systems before it, this machine processes slurry food in batches. An integrated system for grinding and sieving food slurry was developed by the researcher (Simolowo, 2011). This system requires a sieving system whose slurry extraction efficiency will be less dependent on the milling process. A single-flow process equipment for grinding and sieving slurry foods from grains was developed by Nwankwojike, Onwuka, Nkemakolam (Nwankwojike, Onwuka, Nkemakolam, 2015). The major shortcomings with all these machines is the separation of the grinding and sieving compartments. A machine for processing grain beverages was developed by Gana (Gana, 2011). The machine was developed with the goal of integrating the three basic processes of blending of soaked grains, mixing of the slurry, and drink extraction. The machine's primary drawback is that it operates in batches. An automated grain drink processing machine was developed by Gana, Agidi, Idah and Anuonye (2017) that can combine and complete a number of tasks (blending of soaked grains, mixing the slurry, extracting the aqueous liquid, and discharging of the paste out of the machine) in a single step. Due to power sag and excessive power consumption, one of its drawbacks is that it can stop operating suddenly. All of the earlier designs, including the automated grain drink processing machine and the batch-operated type, did not account for the preservation or boiling of the milk. Therefore, this research into modification of the machine is therefore set out to address the afore mention flaws.

Methodology
The equipment
The existing automated grain drink processing machine was designed by Gana, Agidi, Idah and Anuonye (Gana, Agidi, Idah & Anuonye, 2017). The problems associated with its operation due to the shortcomings in its design were identified as the machine was properly examined and tested. The necessary procedures were carried out to eliminate the causes of the shortcomings observed vividly.

The existing machine's components

It is made up of the following component parts (Plate I and Figure 1); hopper, blending chamber (retaining cylinder), delivery pipe, blade, and programmable timer.

Figure 1. Plate I: The existing automated grain drinks processing machine

Problems identified with the existing design of the machine

The problem identified with the exiting design of the automated grain drink processing machine are as follow; batch nature of operation, high power required by the machine (5 hp, 2 hp and 0.5 hp electric motors), the machine stops due to a power droop while in operations, and lower output.

LEGEND		
1– WATER TANK	10– BLENDING CHAMBER	19– LOWER ARM
2– VALVE	11– BLENDING BLADE	20– GEAR
3– GRAIN RESERVOUR	12– CONICAL BASKET	21– PASTE COLLECTOR
4– ELECTRIC MOTOR	13– EXTERNAL CASING	22– ELECTRIC MOTOR
5– FRAME	14– CONTROL SYSTEM	23– NUT
6– HOPPER	15– VALVE	24– GEAR BOX
7– DELIVERY TUBE	16– DRINK TANK	25– ELECTRIC MOTOR
8– EXTERNAL CASING COVER	17– PULLY	26– UPPER ARM
9– SCRAPPER	18– V–BELT	27–ESERVOIR GATE COVER

(ALL DIMENSIONS IN MM)

Figure 2. A The exploded view of the automated grain drinks processing machine

The modification on the existing machine

The existing machine was improved based on the issues reported during its initial performance evaluation. A grain conveyor (dispenser) which discharges a certain quantity of grains at a specific time was incorporated. This keeps the machine in a continuous condition of operation and increases production. The machine's power consumption was lowered by reducing the quantity of materials used in construction of the basket. This lowered the machine's power consumption and addressed the issue of power sag. A cooking unit was also incorporated in the machine. Figure 3 shows an isometric projection of the new version of the machine
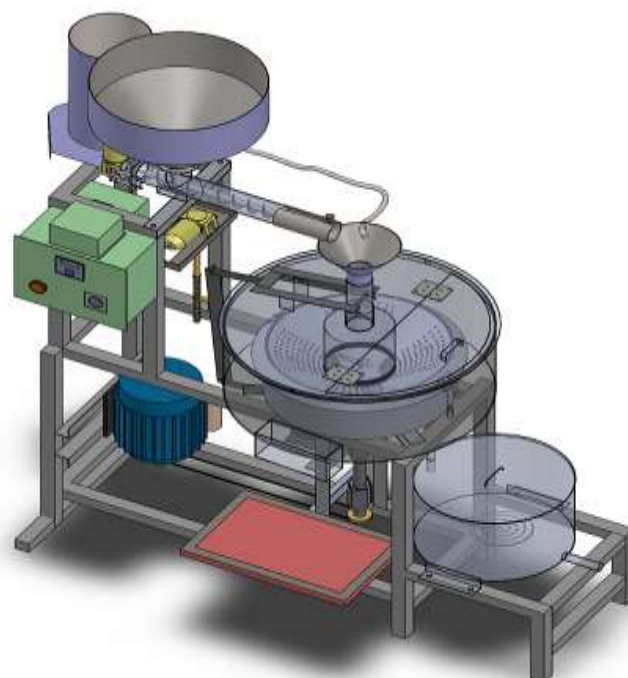
Figure 3. Isometric projection of the improved machine

Design considerations for the improved machine

In order to increase the machine's performance, some factors were considered in the design modification of the improved automated grain drink processing machine. The following factors are taken into account: the availability and cost of required materials, ease of operation, automation, continuous mode of operation, machine weight, ease of maintenance, ability to process various types of grains, safety, hygienic of product, and the machine's ability to cook the product instantly.

Materials selection

The materials utilized to develop the improved machine were chosen to make it easy to maintain, repair, and obtain at a lower cost. Stainless steel was selected for the machine's inner parts for its resistance to corrosion. The machine frame was built using angular iron measuring 50 x 50 mm to give robust support and ensure the machine's stability while in use (Gbabo, Gana & Dauda, 2012).

Component parts of the improved machine

As shown in Figures 2 and Plate II, the new machine includes the following components: reservour, disengaging joint, milk outlet, coveyor barrel, hopper, water tank, auger/coyeyor, blending chamber, DC motor, external covering, control box, blending blade, conical basket, 1phs motor, scraper, linkage arms, inner casing, linkage control, heating chamber, milk outlet, heater, frame, paste discharging outlet

Figure 4. Plate II: The developed improved automated grain drinks processing machine

Design analysis of machine components
Basic design analysis and computational methods were used to evaluate and select materials of adequate sizes and strengths.

The conveyor designs
The shaft's design focuses on calculating its diameter in order to ensure sufficient strength and rigidity while it transmits torque in operations.

i. Bending control
The shaft's bending stress " σb" was evaluated using a formula published by Khurmi and Gupta (2005).

$$\sigma_B = \frac{32BMd}{\pi(d^4)} \qquad (1)$$

where σ_B is bending stress (Nm-2), BM is bending moment (Nm); d is shaft diameter (mm), π is constant.

ii. Bending moment
The The bending moment was calculated as reported by Hibler (2002), and is given as

$$BM = \frac{ql^2}{8} \qquad (2)$$

Where, BM is the bending moment, q is weight of the shaft and l is shaft length (m)

iii. Torsional control
The following expression was used to compute the twist angle Khurumi and Gupta (2005).

$$A_{tw} = \frac{T \times L}{G \times T} \qquad (3)$$

$$T = \frac{2T \times J}{D} \qquad (4)$$

$$J = \frac{\pi(d^4)}{32} \qquad (5)$$

$$T = \pi \times J \times \frac{(d^4)}{\sigma \times D} \qquad (6)$$

Where, A_{tw} is twist angle, T is Torque (N m), L is shaft length (m), G is shaft modulus of rigidity (N m-2), T is torsional moment, J is the polar moment of inertia (Nm-2), J is maximum shear stress, π is consant, d is shaft diameter (m)

iv. Driving power of the motor
The driving power of the motor was calculated as reported by Hibler (2002), and is given as

$$P = Q \times g(L_v \times K_i \pm H)K \qquad (7)$$

Where P is the motor's driving power (watts), Q is the auger's capacity (kg s-1), K_i is the grain's coefficient of friction, K is the overloading coefficient, and L_v is the conveyor's length (m), the perpendicular height (m) is H, and the gravity acceleration is g (ms-2).

v. Driving force of conveyor

The The angular force was determined using a formular stated by Ruina and Pratap (2010), and is given as

$$F_W = \frac{2M_W}{d_i tan(a+b)} \qquad (8)$$

where, F_W is the actual angular force, the angular moment is Mw, d_i is screw diameter (m), Q is the angle pitch (°), and B is screw angle of friction (°)

From

$$F = tanB \qquad (9)$$

$$B = tan^{-1}F \qquad (10)$$

Where F is the coefficient of friction

vi. Angular momentum

The This is how the shaft's angular momentum was calculated (Olanrewaju, Jeremiah & Onyeanula, 2017),

$$M_W = \frac{q_m}{2\pi n} \qquad (11)$$

$$q_m = \frac{Qs}{V} \qquad (12)$$

$$V_{aug} = S_{ap} \times \pi \qquad (13)$$

where, M_W is shaft's angular momentum, q_m is material's weight to be transported (kg/m), n is the number of screw rotations, V_{aug} is the auger's velocity (m s-1), and S_{ap} is the auger's pitch (m s-1)

vii. Magnitude of the driving force

The The magnitude of the driving force "F₀" was calculated as described by Olanrewaju, Jeremiah and Onyeanula (2017),

$$F_0^l = q_m(L_v \pm H)f \times g \qquad (14)$$

where, the magnitude of the driving force is F_0^l, the conveyor length is L_v, the vertical height is H, the coefficient of friction is f, and the acceleration due to gravity is g (m s-2)

Summary of the design of the integrated system

The summary of design analysis of this system is depicts in Table 1.

Table 1: Some of design calculations of the integrated unit

S/N	Parameters	Formula	Calculated value
1	The maximum quantity of grains that can be processed in a given period of time.	$M_b = \rho_g \left(\frac{V_d x T_b}{T_T}\right)$	1 kg
2	The blending blade's mass	$M_B = \rho_B x\ V_B$	0.05 kg.
3	The central shaft's diameter.	$d^3 = 16/\pi S_s \sqrt{(K_b M_b)^2 + (K_t M_t)^2}$	0.02 m
4	The blade thickness to be expected	$\delta_b d_b/2S_s$	0.002m
5	Twisting Moments	$M_t = \frac{60W}{2\pi N}$	23 Nm
6	Mass of the Central Shaft	$M_{CS} = \rho_{CS} V_{CS}$	2.5 kg
7	Second Polar Moment Area the Shaft	$J = \pi ds^4/32$	$1.55 \times 10^{-8} m^4$
8	Angular velocity (ω)	$2 \times \pi \times N /60$	15.64 rev/min
9	Torque (τ)	$F \times r_d$	8.4Nm

10	total force (N)	$M \times r_d \times \omega^2$	83.3N
11	Power Required by the Machine	$2 \times \pi \times N \times \tau /60$	1.3 KW
12	Selected of Electric Motor Capacity		2hp

Source: Gana, Agidi, Idah and Anuonye (2017)

The technique for working with the machine

Two containers were placed at the drink outlet and the paste outlet for the collection of extracted liquid and expelled paste. The soaked grain was fed into the conveyor, which serves as both a reserve and a dispenser for the machine. The dispensing or discharge time was set after the blending time. After that, an engagement switch was turned on to allow the blending chamber to move downward and the basket to disengage from the central shaft. The hopper assembly is held and lowered by the upper arm until it meets the basket's base, whereas the basket is released from the central shaft by the lower arm. After receiving a signal from a sensor, the dispenser starts dispensing the grains. This continues until the discharging timer runs out, at which point the dispenser's DC motor turns off and the blending process begins. Water goes into the system during the blending process to help with the blending and milk washing. The disengagement switch was depressed and the bottom pressed as soon as the blending time was up, reactivating the D.C motor, which now turned clockwise. The hopper assembly is lifted from the basket's base by lifting the upper arm. Simultaneously, the central shaft was elevated by the lower arm until the gear connected to it engages with the basket's gear. As a result, the central shaft rotates the basket in order to remove aqueous liquid and discharge paste from the basket. The fluid traveled up the basket wall due to the centrifugal pressure created. Draining via the pore gaps in between the coarse material and perforations in the basket separates the milk from the paste. It is collected at the filtrate outlet. A scrapper and a brush scrape, convey, and discharge the paste via its outlet once it has been ejected from the basket. In same order, the operation's next step begins. For the production of instant drinks, the temperature controller of the heater was set at 100 degrees Celsius. When the liquid temperature reaches the pre-set temperature, the heater turns off, and when the temperature drops by one degree, it turns on again. This step is repeated until the material is thoroughly cooked.

Testing of the machine

After a no-load test, the conveyor was loaded with 1 to 5 kg of soaked soya bean samples. The auger was used to move the samples out. Table 2 shows the average quantity released at the outlet after replication. The performance of the machine's integrated unit was tested using methodologies published by Gbabo, Gana and Dauda (Gbabo, Gana & Dauda, 2012). Soya beans (TGX 1954-IFXTGX 1835-10E) were purchased and washed and sifted to remove any unwanted objects before soaking for 12 hours at room temperature (Gaffa, Jideani & Nkama, 2003). An experiment was conducted to assess the modified machine's performance and compare it to that of the existing machine. Tables 3 and 4 show the outcomes.

Determination of machine performance

The conveying efficiency and throughput of the machine were used to determine the machine's performance

i. Conveyor

The efficiency of the conveyor was determined as reported Gana (2016),

$$E_{CD} = \frac{W_O}{W_{ic}} \text{ x } 100 \tag{15}$$

where, E_{CD} is conveyor discharge efficiency (%), W_O is quantity of grains discharge from conveyor (kg), W_{ic} is weight of material feed into coveyor (kg)

ii. The machine throughput

The expected throughput of the machine is crucial in the design since the number of beverages to be produced in a day can be quantified. The following equation, as given by Gana (2016), was used to calculate it.

$$L_E = L_K M_T \frac{T_{Dp}}{T_{TP}} \tag{16}$$

$$M_T = \frac{\frac{V_C}{6}R_g}{V_f}M_i \tag{17}$$

$$L_E = L_K(\frac{\frac{V_C}{6}R_g}{V_f}M_i)\frac{T_{Dp}}{T_{TP}} \tag{18}$$

Where, L_E is the projected number of litres of drink produced in a day (8 hours/day), L_K is the number of litres of drink generated from 1 kg of grains (before steeping), TDP is the day's operation time (480 minutes), TTP is the processing time of a batch time, and MT is the mass of grains to be processed at a time (before steeping) (sec), The volume of the retaining cylinder is VC (m3), Rg is the grain-to-water ratio to be employed in blending. Vf is the volume of grain, M_i is the initial mass of the grain utilized in determining grain density.

Results and discussion

The conveyor

The conveyor was developed and built, and the performance testing results are shown in Table 2. The discharge efficiency ranges from 55.0 % to 99.7%, and the convey's output capacity is between 35.8 and 65 kg/h.

Table 2. The result of testing of the conveyor

S/N	Angle of inclination (°)	Quantity of material discharge (g)	Discharge Efficiency (%)
1	0	997	99.7
2	15	769.23	76.9
3	30	695.38	69.5
4	45	647.7	64.7
5	60	550.77	55.0

When the angle of inclination was increased, the quantity of material discharged and the discharge efficiency both decreased. This could be due to the fact that at zero angle of inclination, conveyance torque is lower than at greater angles of inclination. As a result, moving material horizontally requires less work than moving material at elevated heights. This was consistent with the findings of Olanrewaju Jeremiah and Onyeanula (2017), who reported a reduction in conveyor discharge as the angle increased and the discharge time increased at the same time. The conveyor takes less time to transmit grain at a horizontal level than at an elevated level because the conveyance torque is lower.

Table 3. Response of Effects of Speed, Blade Type and Basket Orientation on Machine Output

Std	Run	Blade type (No.)	Basket Orientation (Degree)	Speed (rpm)	Actual Output (Litres)	Predicted Output (Litres)
6	1	4	30	1450	9.63	9.64
4	2	4	50	1100	9.37	9.36
3	3	2	50	1100	9.53	9.53
5	4	2	30	1450	9.98	10
8	5	4	50	1450	9.65	9.65
10	6	5	40	1275	9.42	9.42
7	7	2	50	1450	9.95	9.95
1	8	2	30	1100	9.57	9.57
9	9	1	40	1275	9.87	9.86
16	10	3	40	1275	9.75	9.74
18	11	3	40	1275	9.69	9.74
19	12	3	40	1275	9.72	9.74
20	13	3	40	1275	9.71	9.74

2	14	4	30	1100	9.35	9.35
11	15	3	23	1275	9.71	9.69
15	16	3	40	1275	9.7	9.74
17	17	3	40	1275	9.88	9.74
14	18	3	40	1570	9.91	9.89
12	19	3	57	1275	9.66	9.67
13	20	3	40	980	9.29	9.3

The volume produced ranged from 9.29 to 9.98 litres. A combination of the 2-blade assembly, a basket angle of 30o, and a speed of 1450 rpm produced the highest output of 9.98 litres.

Statistical analysis

Table 4 shows the results of the ANOVA of the experimental design. The model has an F-value of 31.14, indicating that it is statistically significant. F-value of this size has a 0.01 percent chance of being caused by noise. Model terms with P-values below 0.0500 are significant. The model terms A, C, A2, and C2 are used in this scenario.. C (speed) had a larger impact on machine output, with a coefficient of estimate of 0.1781. If the P-value of a model term is less than 0.0500, it is considered significant. With P-values of 0.0001, 0.0001, 0.0235, and 0.0032, respectively, A, C, A2, and C2 are significant model terms in this scenario. With a coefficient of estimate of 0.1781, C (speed) had a greater impact on machine output. When the value exceeds 0.1000, the model terms become irrelevant. When compared to the pure error, the lack of fit has an F-value of 0.04. A large lack of fit F-value owing to noise has a 99.81 percent chance of occurring. A non-significant lack of fit is good (Aworanti, Agarry & Ajani, 2013). The coefficient of variation (C.V.) of 0.5295 % generated, according to Jayesh (2009), suggested that the difference between experimental and projected values was modest.

Table 4. Regresional Analysis of Response of Machine Output

Source	Coefficient Estimate	Df	F-value	p-value	
Model	9.74	1	31.14	< 0.0001	significant
A-Blade type	-0.1308	1	89.24	< 0.0001	
B-Basket orientation	-0.0084	1	0.3638	0.5598	
C-Speed	0.1781	1	165.42	< 0.0001	
AB	0.0137	1	0.5774	0.4649	
AC	-0.0338	1	3.48	0.0918	
BC	0.0012	1	0.0048	0.9463	
A²	-0.036	1	7.13	0.0235	
B²	-0.0219	1	2.63	0.1361	
C²	-0.0519	1	14.82	0.0032	
Lack of Fit		5	0.0444	0.9981	not significant
R²	0.9655				
Adjusted R²	0.9345				
Predicted R²	0.9414				
Adeq. Precision	19.3470				
C.V. %	0.5295				

Response Surface and Contour Plot for Machine Output

Effects of Basket angle and blade number on machine

Figures 3 and 4 illustrate, respectively, the response surface and contour plot for the impacts of basket angle and blade number on machine output. With a reduction in the number of blade assemblies from 4 to 2, the output of the machine rose from 9.55 to 9.78 litres. This could be due to a reduction in blade-to-grain contact as the design keeps increasing. The overall area of cutting surfaces on all of the blades was designed to be equal. This matched the findings of Rachel, Phillip, Hoenderkamp and Jonathan (2007) who revealed that blade design has an impact on material blending. As the basket angle changed from 30º to 50º, the output remained constant. This showed that the basket angle has no effect on the machine's output
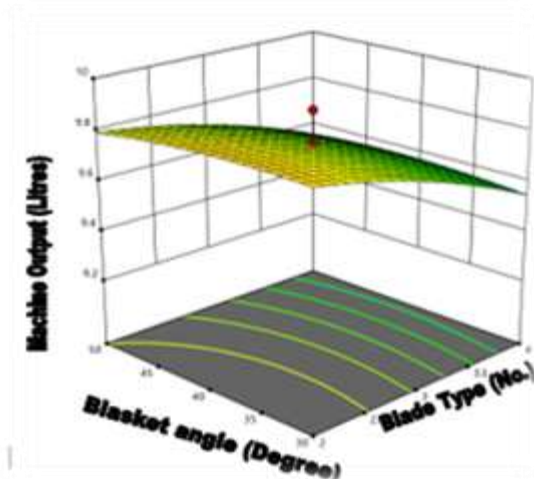
Figure 5. Response Surface for Effects of Basket Angle and Blade Type on Output
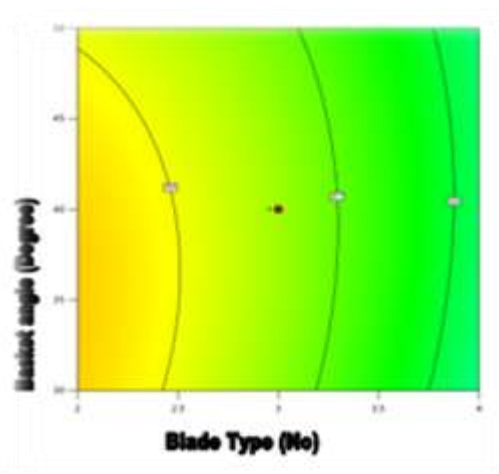
Figure 6. Contour Plot for Effects of Basket Angle and Blade Type on Output diameter

Effects of Basket angle and blade number on machine

The Response surface and contour plot for blending efficiency are presented in Figures 5 and 6 respectively. The output increased from 9.4 litres to 9.83 litres as the speed of blending increased from 1100 rpm to 1450 rpm. This could be due to increase in impact force, cutting and shearing actions of the blade with increased in rotational speed. Rotational speed as reported by Jayesh (2009) was found to be a key factor to size reduction of solid materials. Where higher speed of blending resulted to higher blending efficiency, while lower speed of blending resulted to low blending efficiency. It was obvious that the output remains constant as the basket angle increased from 30º to 50º. This indicated that the basket angle has no significant effects on the machine output.

Effects of Basket angle and speed on machine output

Figures 5 and 6 respectively show response surfaces and contour plots for blending efficiency. When the blending speed was increased from 1100 to 1450 rpm, the output increased from 9.4 to 9.83 litres. With an increase in rotational speed, the blade's impact energy, cutting and shearing actions may all increase.. According to Jayesh (2009), rotating speed is a critical component in solid material size reduction. A higher speed of blending resulted in more segregation, while less segregation was caused by a slower blending speed. Obviously, the output remained constant as the basket angle increased from 30º to 50º. This indicated that the machine output is unaffected by basket angle
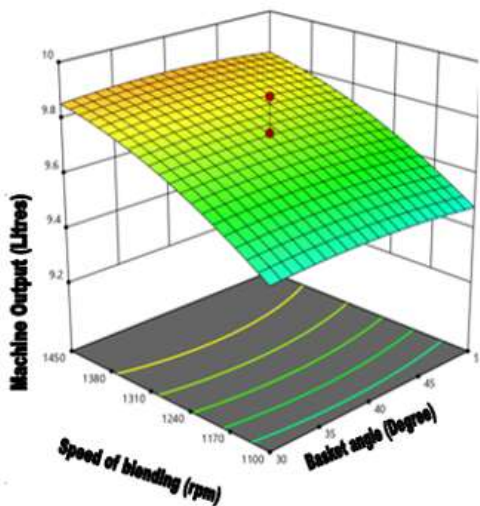
Figure 5: Response Surface for Effects of Speed and Basket Angle on Output
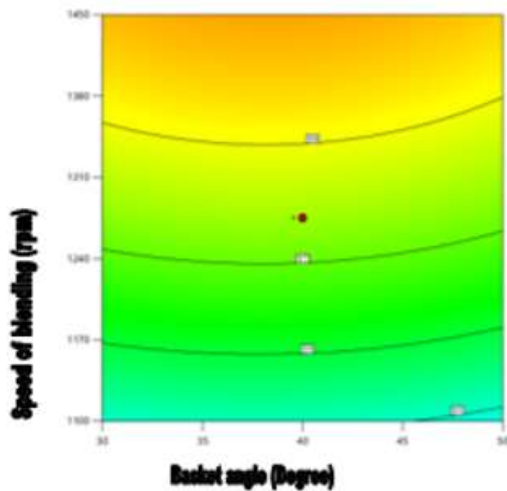
Figure 6: Contour Plot for Effects of Speed and Basket Angle on Output

Comparison of output and cost between the existing and modified machines

The production and cost of the existing and new modified automated grain drinks processing were compared. The output and production cost of the existing automated grain drink processing machine were reported (Gana, Agidi, Idah & Anuonye, 2017; Gana, 2016). Table 5 shows the outcome of the comparison.

Table 5. Comparison of capacity and cost between the existing and modified machines

S/N	Machine Type	Material	Mode Operation	Capacity (Ltrs/8hrs/Day)	Cost (₦)
1	Automated Grain Drinks Processing Machine	Stainless Steel	Automated	550 (Soya milk)	232,725
2	Continuous Automated Grain Drinks Processing Machine	Stainless Steel	Continuous Automated	800 (Soya milk)	250,500

Sources: Gana et al. (2017); Gana (2016)

In just 8 hours of daily operation, the modified machine produced 800 litres of concentrated soya milk and 2000 litres of diluted soya milk, respectively. The existing machine produced 550 litres of concentrated soya milk and 1,400 litres of diluted soya milk. The new machine increases output by 31.25% while decreasing costs by 73.7%.

Conclusion

The new machine increases productivity while lowering costs. It was clear that the new machine has the advantages of producing hygienic and high-quality drinks, as well as having a higher output capacity, an automated mode of operation, and a reasonable cost of production (N250,000). This machine's development will aid in the development of local content in agro-processing equipment as well as technological advances. The development of this machine is in line with the government's agricultural sector transformation agenda, which aims to provide food and nutritional security while also positioning Nigeria as a global food competitor. In addition, the machine will increase the production of grain beverages in order to meet the demand for nutritious foods and secure their commercialization by supplying a large quantity into the market.

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ORCID

Ibrahim Mohammed Gana https://orcid.org/0000-0003-4555-6494

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An intelligent fire management system to reduce wildfires in South Africa

Nomfundo Ngombane[1], Topside Mathonsi[2]* , Vusumuzi Malele[3]

[1,2&3]Information Technology, Tshwane University of Technology, South Africa. ngombanen@yahoo.com[1], MathonsiTE@tut.ac.za[2], ngombanen@yahoo.com[3], https://orcid.org/0000-0002-0439-7186[2]

*Corresponding author

Abstract: Remote sensing and satellite imaging have been widely used to detect wildfires, nevertheless, the technologies present some limitations in terms of early wildfire detection as the technologies are greatly influenced by weather conditions and can miss small fires. The fires need to have spread a few kilometers for the technologies to provide accurate detection. The South African Advanced Fire Information System (AFIS) uses a Moderate Resolution Imaging Spectroradiometer (MODIS) as satellite imaging. MODIS has limitations as it can exclude small fires and can fall short in validating fire vulnerability. Thus in the future, a Machine Learning algorithm will be designed and implemented for the early detection of wildfires. A simulator will be used to evaluate the effectiveness of the proposed solution and the results of the simulation will be presented.

Keywords: Wildfire, Advanced Fire Information System, Moderate Resolution Imaging Spectroradiometer, Machine Learning algorithm, Remote Sensing, Satellite Imaging

Introduction

Wildfires occur frequently in the South African landscape with dire consequences to humanity, wildlife, and the economy. Fire monitoring systems are of great importance for the early detection of wildfires. The South African Advanced Fire Information System predicts, detects, and monitors wildfires in real-time using remote sensing and Geographic Information System (GIS) technology. Advanced Fire Information System (AFIS) uses the earth observation satellite Moderate Resolution Imaging Spectroradiometer (MODIS) to detect wildfires but according to several researchers orbiting satellites and remote sensing have limitations in detecting wildfires.

According to Bushnaq, Chabaan and Al-Naffouri (2021), the quality of images with satellite imaging is dependent on weather conditions and it might not always be possible to obtain precise wildfire detection. Kganyago & Shikwambana (2020) mention that wildfires can spread very fast in the early stage thus, MODIS is inadequate as it captures images twice a day and can exclude small fires. Mawanza, Agee and Bhero (2022) indicate that satellite systems present enormous time delays and lower image resolution. Literature about the current state of wildfires shows a continuing increase in wildfires and the gaps herein are currently implemented systems. Forsyth, Le Maitre, van den Dool, Firesun, Walls, Pharoah and Fortune (2019) conducted a study on the Knysna fires of 2017 and concluded that the currently implemented solution is not appropriate for the different biomes that exist in South Africa and that an intelligent system is needed to reduce the spread of wildfires. Looking at the increasing number of wildfires, a few authors proposed solutions to reduce the spread of wildfires, however, the solutions have their own limitations. Lall and Mathibela (2016)

proposed Artificial Neural Networks for early wildfire detection to address the inadequacy of the currently implemented solutions, but their solution is only limited to the Cape Town biome.

The researcher, therefore, proposes a Machine Learning framework to detect wildfires at an early stage. The framework will feed on the course satellite imagery of the Geostationary Operational Environmental Satellite-R series as it has the capabilities of capturing images every 5 minutes. An experimental research method will be followed to achieve the main objectives and a simulator will be used for evaluation.

Motivation

A review of literature on wildfires has shown that to reduce the increasing number and the spread of wildfires, an intelligent solution that can detect wildfires in their early stages is needed. Looking at the currently implemented solutions and their limitations, I was then motivated to close the gap and develop an intelligent solution that can detect wildfires in real-time to reduce the spread and the increasing number of wildfires in South Africa. It has always been my interest to develop my research skills and contribute to the knowledge base.

Problem statement

After a review of literature on wildfires in South Africa, the author gathered that much of the work that exists focuses mostly on the causes and impacts and that there has been very little focus on the solutions. Currently, the AFIS together with the National Fire Danger Rating System is adopted in South Africa to detect wildfires. However, the existing solutions are not efficient in early wildfire detection as noted by several authors. Lall and Mathibela (2016) proposed Artificial Neural Networks for early wildfire detection to address the limitations of the currently implemented NFDRS, but their solution is only limited to the Cape Town biome. The AFIS utilizes MODIS satellite to detect wildfires however according to Bushnaq, Chabaan and Al-Naffouri (2021), MODIS neglects small fires and its accuracy is affected by weather conditions. As the wildfires keep increasing in number, our livelihood and economy are in danger.

Research questions

The main research question in this research is: How to develop an intelligent solution to detect wildfires in real time to reduce the spread of wildfires in South Africa?
Sub questions:
1. What is the current state of wildfires in South Africa?
2. What are the gaps in the solutions that are currently employed for the early detection of wildfires?
3. How to develop a solution to detect wildfires in real time to reduce the spread of wildfires in South Africa?
4. How to implement the developed solution to reduce the spread and increase the number of wildfires in South Africa?
5. What is the effectiveness of the developed solution in comparison to existing solutions?

Research objectives

The main research objective is to develop an intelligent solution to detect wildfires in real time to reduce the spread of wildfires in South Africa.

Sub objectives:
1. To analyse the current state of wildfires in South Africa.
2. To determine the gaps in the solutions that are currently employed for the early detection of wildfires.
3. To develop a solution to detect wildfires in real time to reduce the spread of wildfires in South Africa.
4. To implement the developed solution to reduce the spread and increase the number of wildfires in South Africa.

5. To measure the effectiveness of the developed solution in comparison to existing solutions.

Research methodology

The main research objectives will be achieved by following an experimental research methodology. A literature review will be used as a method to gather and review information from journals, technical reviews, peer-reviewed articles, websites, and conference papers to determine the current state of wildfires and the gaps with currently employed solutions. A mathematical model will be used to develop the proposed solution and a code written for implementation. A simulator will be used to evaluate the developed solution against existing solutions.

Related work

Lall and Mathibela (2016) designed an Artificial Neural Network for detecting wildfires in the City of Capetown. The aim of the authors was to develop an intelligent system for assessing wildfire risk for the city of Capetown to prevent and control wildfires. The model by the authors predicts fire risks for two types of vegetation using information about vegetation, climate, and location features. The solution proposed by the authors delivers satisfactory accuracy and precision for the two types of biomes found in Capetown. The solution by the authors has limitations as it addresses the fynbos and strandveld vegetation types found in Cape Town.

Amon, Edmore, Nobert and Riaan (2020) proposed a prototype for veldfire detection and monitoring using mobile phones for households in rural Africa to identify high fire danger areas and burning fires in near real-time. The authors addressed the gap that exists between rural and urban areas regarding managed and unmanaged wildfires. The prototype takes advantage of high mobile phone ownership and network coverage in rural areas. The prototype uses Information from the AFIS and is based on the Global Positioning Systems, Programmable Interfaces, Core Location, and SMS gateway technologies. The results show that the prototype provides acceptable veldfire detection and monitoring. However, the limitation with the prototype is the dependency on the network coverage which could be limited or not available at times.

Mawanza, Agee and Bhero (2022) developed an elliptical formation control framework to actively monitor the growth of a wildfire. The framework addresses the limitation of time delays and low image resolution presented by satellite systems and the unreliability of using a single UAV to detect and monitor large-scale wildfires. The framework uses a group of quadrotor Unscrewed Aerial Vehicles that utilize radial basis function neural network algorithm to estimate system uncertainties and an adaptive non-singular fast terminal sliding mode control algorithm to ensure dynamic monitoring of a wildfire. The numerical simulations show the effectiveness of the model. Aminifar and Rahmatian (2020), mention that flying vast numbers of UAVs can entail high safety risks as the UAVs can fall to the ground from high altitudes.

Mathieu, Main, Roy, Naidoo and Yang (2018) suggested a Time Series of C-band Sentinel-1 Data as a solution to detecting wildfires in Southern Africa Savannahs. The solution obtains burned area data from MODIS and uses Sentinel Application platform software to process Sentinel-1A images. Post and pre-fire images proved that burned areas can be detected from Sentinel-1A. The solution by the authors is only limited to the savannah biome.

Verma, Kaur, Rawat, Xi, Alex and Jhanjhi (2021) designed an intelligent framework for detecting wildfires using Internet of Things (IoT) based Wireless Sensor Networks. The authors aimed to address the limitation of limited energy resources of hostile Wildfire Detection Applications and the six minutes that the NFDRS requires to notify the relevant firefighters. The solution by the authors takes advantage of the energy efficiency of IoT and uses four data collecting sinks to deliver fire-related information with the least delay. According

to Avgeries, Spatharakis, Dechouniotis, Kalatzis, Roussaki and Papavassiliou (2019), IoT in wildfire detection suffers from limited computational energy resources.

Conclusion and future work

The paper presented a review of literature on wildfires in South Africa. Limitations such as enormous time delays and lower image resolution were identified from the existing solutions. These limitations affect the detection of wildfires in real-time in South Africa. In addition, the paper presented research questions, objectives, and research methodology that will be followed in order to address the identified problem. In the future, the proposed algorithm will be designed and a computer network simulator will be used to evaluate the effectiveness of the proposed solution.

Acknowledgments

ORCID

Topside Mathonsi https://orcid.org/0000-0002-0439-7186

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A systematic review on the evaluation of health information system

Nomabhongo Masana[1]

[1]*Department of Information Technology, Central University of Technology (FS), South Africa.* nnomabhongo@cut.ac.za, https://orcid.org/0000-0002-3333-001X

*Corresponding author

Abstract: South Africa and other African countries have attempted to implement EHR systems, however, they have not been successful. With technological advance in 4IR, cloud computing has led to notable products in the healthcare industry and plays a remarkable role in maintaining healthcare integration. This provides an opportunity to have a cloud based EHR system which integrates the scattered HISs in South Africa. However, before we can be able to successfully implement a cloud EHR system, we need to understand the current HISs used by evaluating them. The purpose of the paper is to provide HOT-fit factors/dimensions related to HIS evaluation by conducting a systematic review of studies that evaluated HISs in health. The study followed a systematic review approach as guded by the PRISMA(2020) recommendations. From 80 articles collected, 17 were included in the study. Results of the study showed that system quality, information quality and service quality impacts user satisfaction, system use and organizational structure. User satisfaction influenced system and net benefits, while organization structure influenced organization environment, and organization environment influence system use and net benefits. All the HOT-fit factors are deemed suitable and should be included for HIS evaluation. It is recommended that thorough evaluations of HIS be conducted in South Africa to increase the success of HIS implementation.

Keywords: Evaluation, Health Information Systems, Health, HOT-Fit

Introduction

The healthcare industry is faced with many challenges including shortage of healthcare workers/human resource, long waiting hours, poor infection control measures, unhygienic facilities, negative staff attitudes, lack of safety and security of staff and patients, medicine stock-outs, high costs, increased litigation and poor record keeping (Teshnizi et al., 2021; Maphumulo & Bhengu, 2019; Malakoane et al., 2020). In order for healthcare organizations to improve quality of healthcare services and costs, they have invested in information technology by implementing health information systems (HISs) (Ahmadian et al., 2015). An HIS is a system that handles the administration, operations, and finances of a healthcare organization (Alipour et al., 2017). Its implementation can help healthcare oragnizations improve patient care quality while lowering expenses and resource usage (Ahmadian et al., 2015). A collection of these HISs is referred to as Electronic Health Records (EHRs) (Zaied et al., 2016).

South Africa and other African countries have attempted to implement EHR systems, however, they have not been successful (Katurura & Cilliers, 2018). In South Africa, various vendors have implemented different EHR systems, with 42 HISs scattered due to no integration of the electronic health records, hindering

continuity of care and compromising the quality of healthcare services rendered to patients (Katurura & Cilliers, 2018; Summit, 2018).

The world has seen the emergence of the fourth industrial revolution (4IR) technologies which are utilized by industries to improve day-to-day business operations and lower operation costs while achieving more production. Given that the South African health system is under-resourced and overburdened, there is an opportunity to use 4IR technologies to improve health care delivery (Mangwanya & Uwizeyimana, 2021). These technologies include Artificial Intelligence (AI), Cloud Computing, Big Data Analytics, Internet of Things (IoT) and blockchain. With technological advance in 4IR, cloud computing has led to notable products in the healthcare industry and plays a remarkable role in maintaining healthcare integration (Paul et al., 2021). This provides an opportunity to have a cloud based EHR system which integrates the scattered HISs in South Africa.

However, before we can be able to successfully implement a cloud EHR system, we need to understand the current HISs used in SA's public health sector, and this requires evaluating these HISs. Most studies on HIS evaluation tend to concentrate on technical or clinical factors that don't fully explain why HIS performs well or poorly in a given situation (Yusof et al., 2008). The evaluation process of an HIS should not only focus on the technical or technological aspect of the system but should consider everything involved in the successful implementation of the system. This includes the people (patients & healthcare personnel) who use the system as well as the environment where the system is utilized.

"It has been noted that there is a need for more thorough evaluations of HISs to look at a wide range of factors that can affect the success or failure of these systems" (Aggelidis & Chatzoglou, 2008). In addition, it is important to continuously evaluate HISs to ensure that the system performs the way it is supposed to (Ahmadian et al., 2015). Therefore, this research aims to utilize the HOT-fit methodology to give a systematic review of HIS/IS evaluation studies in the field of health. The following sections of the paper provide the Methodology, Results and Discussion, and Conclusion.

Methodology

Based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendation (Harris, Quatman, Manring, Siston & Flanigan, 2013), the study used a systematic review methodology. The HOT-fit framework was adopted in this study as an evaluation model for HISs.

HOT-Fit Framework

The successful implementation of health information systems is dependant upon the inclusion of human, organization and technology (Erlirianto et al., 2015). Numerous frameworks and models for system evaluation have been developed for information systems (IS), including the End User Computing Satisfaction (EUCS), Human Organization Technology Fit (HOT-fit), Technology Task Fit (TTF), IS Success Model, Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). Among these, the HOT-FIT framework is considered to be the appropriate one to use in evaluating information systems (Ayuni et al., 2019). The framework was developed by Yusof et al. in 2006 combining the concepts of the ISSM and the IT-Organisation model (Erlirianto et al., 2015; Maita & Riski, 2019). It was developed in such a way that makes it useable for conducting a thorough evaluation research (Yusof et al., 2008). The framework could be used to evaluate the performance, efficacy, and impact of HIS or IT in healthcare settings based on its extensive aspects and outcome metrics (Yusof et al., 2008). For these reasons, the study adopted the HOT-fit framework as an anchor for the study.

Execution of the study

As per the aim of the study, these keywords were deemed suitable to use to search for articles: evaluate, human organization and technology-fit (HOT-fit), health information systems (HIS). We then searched for articles using a combination of the keywords. Google Scholar was used to search for articles. A total of 80 articles relevant to the study were found. A flowchart summarizing the exclusion and inclusion process based on the PRISMA guidelines (Harris et al., 2013) is presented in Figure 1.
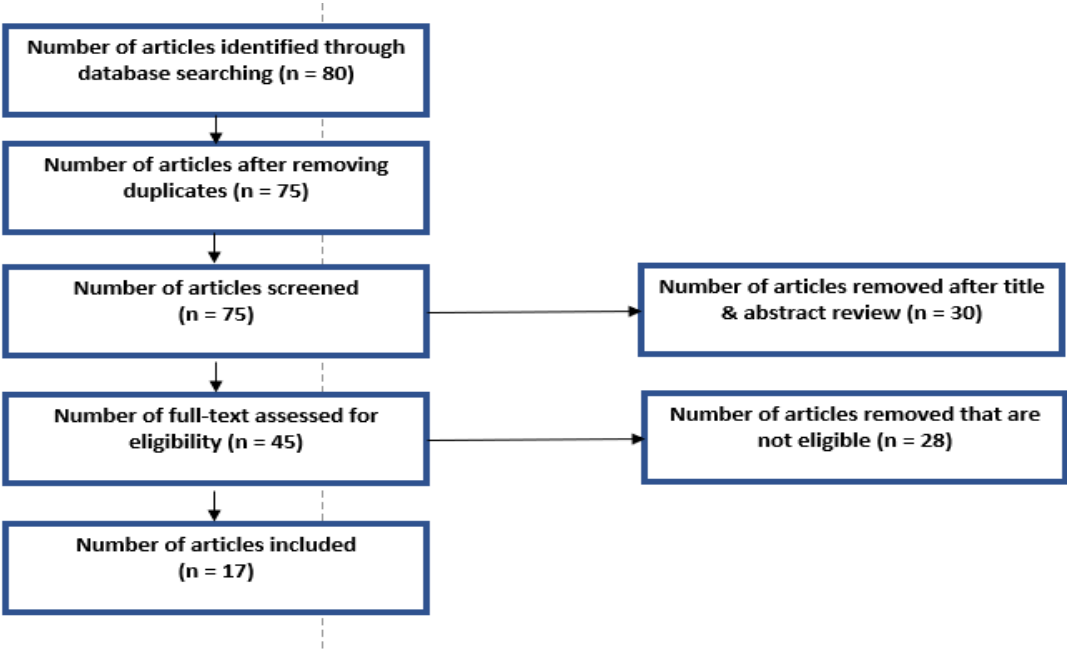
Figure 1. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis flow chart

Inclusion criteria

Studies were considered eligible based on the following:
1. If they were related/addressed health information systems/technology/information systems evaluation in the field of health.
2. If they addressed any of the HOT-fit constructs/factors associated with health information systems/technology/information systems evaluation in the field of health.
3. If they were based on relevant evaluation frameworks, theories, or models.

Exclusion criteria

Studies were considered ineligible based on the following:
1. If they were not related/ did not addressed health information systems/technology/information systems evaluation in the field of health.
2. If they did not addressed any of the HOT-fit constructs/factors associated with health information systems/technology/information systems evaluation in the field of health.
3. If they were not based on relevant evaluation frameworks, theories, or models.

Result and discussion

This sections provides the results of the reviewed studies and a discussion of the results.

Results

After searching for articles on Google Scholar using the keywords, a total of 80 articles that were deemed relevant to the study were retrieved. After removing 5 duplicates, a total of 75 articles remained. The next step was to screen the 75 articles for eligibility based on their title and abstract following the inclusion and exclusion criteria. The number of remaining articles was 45 after removing 30 articles which were not eligible.

The 45 remaining articles were screened in full and 28 ineligible articles were removed. 17 publications in all were used for the study.

Classification of studies included

A review of the 17 eligible articles was carried out. The results of the review were classified and categorised based on the HOT-fit framework in Table 1.

Table 1: Classification of eligible articles

Category	Dimension	Reference
Technology	System Quality	(Anugrawan & Rahadian, 2022); (Deharja & Santi, 2018); (Chirchir, et al., 2019); (Setiorini, et al., 2021); (Noviandi, 2020); (Puspita, et al., 2020); (Febrita, et al., 2021); (Stylianides, et al., 2018); (Erlirianto, et al., 2015); (Deharja, et al., 2020); (Nurhayati, et al., 2019); (Novita, et al., 2022); (Alfarraj & Abugabah, 2017); (Sari, et al., 2020); (TryWindy, et al., 2020); (Nilashi, et al., 2016); (Yusof, 2015)
	Information Quality	(Novita, et al., 2022); (Alfarraj & Abugabah, 2017); (Anugrawan & Rahadian, 2022); (Sari, et al., 2020); (TryWindy, et al., 2020); (Deharja & Santi, 2018); (Chirchir, et al., 2019); (Setiorini, et al., 2021); (Noviandi, 2020); (Puspita, et al., 2020); (Febrita, et al., 2021); (Yusof, 2015); (Erlirianto, et al., 2015); (Deharja, et al., 2020)
	Service Quality	(Novita, et al., 2022); (Anugrawan & Rahadian, 2022); (Sari, et al., 2020); (TryWindy, et al., 2020); (Deharja & Santi, 2018); (Setiorini, et al., 2021); (Yusof, 2015); (Noviandi, 2020); (Puspita, et al., 2020); (Erlirianto, et al., 2015); (Nilashi, et al., 2016)
Human	System Use	(Anugrawan & Rahadian, 2022); (TryWindy, et al., 2020); (Setiorini, et al., 2021); (Puspita, et al., 2020); (Febrita, et al., 2021); (Erlirianto, et al., 2015); (Yusof, 2015); (Sari, et al., 2020); (Nilashi, et al., 2016)
	User Satisfaction	(Novita, et al., 2022); (Alfarraj & Abugabah, 2017); (TryWindy, et al., 2020); (Chirchir, et al., 2019); (Setiorini, et al., 2021); (Puspita, et al., 2020); (Yusof, 2015); (Erlirianto, et al., 2015); (Anugrawan & Rahadian, 2022 (Febrita, et al., 2021); (Stylianides, et al., 2018); (Deharja, et al., 2020)
Organization	Structure	(Novita, et al., 2022); (TryWindy, et al., 2020); (Deharja & Santi, 2018); (Nilashi, et al., 2016); (Setiorini, et al., 2021); (Puspita, et al., 2020); (Febrita, et al., 2021); (Yusof, 2015); (Erlirianto, et al., 2015); (Deharja, et al., 2020); (Anugrawan & Rahadian, 2022); (Sari, et al., 2020)
	Environment	(Novita, et al., 2022); (Nilashi, et al., 2016); (Puspita, et al., 2020); (Deharja, et al., 2020); (Sari, et al., 2020); (Setiorini, et al., 2021); (Erlirianto, et al., 2015)
Net Benefits	Net Benefits	(Setiorini, et al., 2021); (Noviandi, 2020); (Puspita, et al., 2020); (Yusof, 2015); (Erlirianto, et al., 2015)

As tabulated in Table 1, the technology aspect has three dimensions: system quality, information quality and service quality. **System quality (SQ)** was measured by 17 studies included in this study and is measured on ease of learning/user friendliness, ease of use, response time, usefulness, availability, reliability, completeness, flexibility and security. **Information quality** is the second dimension measured on completeness, accuracy, legibility, timeliness, availability, relevancy, consistency, reliability, and compatibility. 13 of the 17 studies reviewed evaluated information quality of the system. **Service quality** was measured on quick responsiveness, assurance, empathy and follow-up/technical support. 11 studies evaluated service quality.

The human aspect has two dimensions: System use and User satisfaction. **System use** was measured on the level of use, attitude, expectations, knowledge/expertise, acceptance, resistance and training. **User satisfaction** was measured on perceived usefulness and user satisfaction. Nine (9) studies evaluated system use, while twelve (12) studies evaluated user satisfaction.

The organization aspect has two dimensions: structure and environment. **Organization structure** was measured on top management support, nature, culture, planning, strategy, communication, leadership and medical sponsorship. **Organization Environment** was measured on financing source, government, politics, competition and communication. The number of studies that evaluated organization structure were 12 and for organization environment there were 7 studies which evaluated it.

Net benefits are measured on effectiveness of the system, efficiency, direct benefits and job effects. The net benefits are dependent on the organization and human aspects of the HOT-fit framework. The net benefits were evaluated by 5 studies.

Discussion

This study aimed to systematically review HIS/IS evaluation studies in the field of health based on the HOT-fit methodology. The results of the study were obtained by reviewing relevant studies which evaluated/analysed/assessed HIS/IS implementation/adoption in the health care industry using the HOT-fit evaluation framework. The results of the study were categorized and classified according to the Human, Organization, Technology and Net Benefits categories of the HOT-fit framework in Table 1. Each of these categories comprises of different dimensions which are used to evaluate an HIS/IS in healthcare. Additionally, constructs/factors evaluated under each dimension are also discussed under each category of the HOT-fit framework.

Technology

The study's findings demonstrated that System Quality, Information Quality, and Service Quality were assessed in HIS/IS in the healthcare industry.

System quality (SQ) was found to have an impact on user performance, healthcare service quality, perceived usefulness (PU), perceived ease of use (PEOU), user satisfaction, system use and organizational structure. Another finding was that HIS quality affects the performance of users through perceived usefulness. User performance is the ability of a user to perform his/her tasks efficiently and effectively. Contrary to this, is a finding by Febrita et. al. (Febrita, Martinus, Syahrizal, Abdat & Bakhtiar, 2021), whereby system quality had no effect on system use. This, however, was as a result of a server damage, which limited the use of the system. We learn that it is important for a system to fully function and be free of technical errors. If a system is not functional, it will be used less or not at all. In addition, if the quality of the system is high, the organizational structure tends to improve. This means there will be a change on how the healthcare organization does things (culture) and there will be a change of view from top management when it comes to supporting the overall functionality of the organization. This means that the better the quality of a system, the better the user performance will be, and the better the user performance the better the quality of healthcare services will be. As a result, perceived usefulness and ease of use have emerged as crucial factors that influence how well a system is used and how it influences user performance.

Information quality (IQ) was found to have an impact on system use, user satisfaction, perceived usefulness and organizational structure. If the quality of information is high; in terms of the information being complete, accurate, available, relevant, consistent, reliable, and compatible; the system will be utilized more frequently, leading to use satisfaction. The system is perceived useful if it produces the expected results. If users are satisfied with the information quality of a system, user performance will be improved. In addition, the better the quality of information, the better improved the organizational structure will be.

Similar to the findings of SQ and IQ, *Service Quality* was found to have an impact on system use, user satisfaction and organizational structure. Whereas in some cases, service quality had no influence on system use and user satisfaction, although the relationship was positive. Meaning that the higher the quality of service is, it manages to gradually increase user satisfaction and system use. However, the influence of service quality on user satisfaction and system use differs per study. Despite this condition, we strongly believe that service quality influences user satisfaction and system use to some extent as it encompasses the overall support provided by the service providers/vendors (Deharja & Santi, 2018). For example, if a user encounters a technical error, this may hinder the user from using the system, which will have a negative impact on system use and user satisfaction, leading to poor user performance. Thus, the better the quality of services offered, the better the user satisfaction, system use and user performance..

Human

For the human category, system use and user satisfaction dimensions were found to be evaluated in HIS. User satisfaction was found to have an impact on system use. A system is more useful because users find it satisfying to use it, which improves the quality of hospital staff performance, the more accurate and superior the technology applied to humans, the more beneficial a system is (TryWindy, Sari & Chalidyanto, 2020). If a user is satisfied with the overall functioning of a system, the more frequent the system will be utilized. In addition, user satisfaction was also found to have a positive impact on net benefits of HIS. User satisfaction influences the user's impression of the benefits received and motivates them to use the system (Novita, Ismadi, Ginting, Nasution & Gusbakti, 2022). This means that the more satisfied the user is, the more efficiently and effectively they perform and use the system.

Organization

Under organization, the structure and environment of the organization dimensions were found to be evaluated in HIS. Organization was found to influence the use of the system and net benefits. Organizational structure was found to have an influence on organization environment, and organization environment has an influence on system use and net benefits. The top management of the healthcare organization would provide support and implement strategies in accordance with organizational environment (Deharja & Santi, 2018). In addition, policies and regulations in the healthcare industry has an influence on the development of HIS (TryWindy et al., 2020). This means that if the policies/regulations, which falls under organization environment, affects the implementation of HIS, it will impact the use of the system also. Furthermore, the organization environment impacts the net benefits provided that there is effective communication and competition. If there is competition, this will push the organization to aim to improve its performance by working effectively and efficiently.

Net benefits

The net benefits is measured on effectiveness of the system, efficiency, direct benefits and job effects. Under direct benefits and job effects, it was found that the system benefited healthcare professionals by assisting them in performing their daily tasks with ease. For efficiency and effectiveness, the system assists employees to work more effectively by automating some tasks/processes such as creating charts. The employee's efficiency was improved by reducing resource consumption and facilitating information access, recording, and processing using automated tools. In return, this provides the healthcare personnel to spend more time with patients. It was also noted that efficiency and effectiveness on work performance benefited employees who already know how to use the system, while other employees needed more time to learn the system, which then compromised patient care.

Fit between the human, organization, technology

The fit between the three aspects of the framework has been established. The fit between human and technology was observed as strong. This was influenced by how the system, information and service qualities influences the decision for the user to utilize the system based on the level of satisfaction on the system. The fit between technology and organization was also established, with the technological aspects having an influence on organization structure. This informs us that if the technological dimensions are of high quality, the implementation of the HIS will receive support from top management. Therefore, it is crucial to assess whether the system (1) satisfies the expectations of the anticipated users, (2) is practical and simple to use, (3) fits the work schedules of the professionals for whom it is meant, and (4) is compatible with the entire health system (Yusof et al., 2008).

Conclusion

Continuously evaluating HISs is necessary in order to make sure that the overall goals of the system, such as conducting research, health information management, quality of care, and lower costs, are achieved. The

HOT-fit framework serves as suitable evaluation model for HIS/IS in the healthcare industry. . The fit between the human, organization and technology aspects against net benefits is important to achieve effective and efficient HISs. Effective planning and management within the organization fosters the effective use of the system. Special attention should be given to user satisfaction, meaning that implementation of HISs should be carried out with the thought of benefiting the user it is intended for. Although user satisfaction came out as a strong factor, all dimensions of the HOT-fit framework should be evaluated for the overall success of the HIS. Based on the study's findings, the following is recommended:

- A thorough evaluation of the health care system and its HISs is required in order to successfully implement or improve HISs.
- Proper planning of the improvement/development of an HIS, giving great attention to the resources that will be needed (including financial resources), benefits and the need for the HIS in healthcare. This will ensure that the system is useful, effective and efficient for its users and achieves its main function.
- Address security concerns. Assuring the healthcare organization that the HIS system/innovation is secure, as it will host confidential medical information, will gain the top managements support for developing the system.
- Ensure the system is cost-effective. The budget allocated to South Africa's public health sector is constrained. Therefore, it would be wise to implement innovations and systems that are more cost-effective.
- Establish good communication amongst the users of the system within the healthcare organization across all levels.
- Ensure the system is always responsive. The response time of the system should be quick as the information required is crucial for employees, especially in healthcare considering the heavy workload they have.
- Provide the necessary training to users to ensure they are well equipped to work with the system. Provide more support to employees with lower skills levels.
- Continuously keep the system up to date to ensure minimal rate of error.
- The top management should be the driving force of utilizing the HISs, by encouraging employees to utilize the system and exposing them to the benefits of the system on their jobs.
- Lastly, government policies around the storage and accessibility of confidential medical information must be revised and amended to accommodate the implementation of HIS innovations.

ORCID

Nomabhongo Masana https://orcid.org/0000-0002-3333-001X

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Use of internet memes in creating awareness of the COVID-19 pandemic among youths in Jos Metropolis, Plateau State, Nigeria

Zwansuun Emmanuella Daloeng[1]

[1]*Department of Mass Communication, University of Jos, Plateau State, Nigeria. daloengz@unijos.edu.ng*

Isaac Ejiga[2]

[2]*Department of Mass Communication, University of Jos, Plateau State, Nigeria. ejigai@unijos.edu.ng*

*Corresponding author

Abstract: This study examined the use of Internet memes in creating awareness of the COVID-19 pandemic among Youths in Jos metropolis, Plateau State, Nigeria. It was guided by three research objectives and hinged on the visual rhetoric model. A quantitative research approach, a survey research design, a questionnaire as an instrument for data collection, and a purposive sampling method were employed. Findings from the study revealed that Facebook is the social media platform often used to access memes during the COVID-19 pandemic. The study also found that a significant majority of the respondents indicated that Internet memes to a great extent were used to create awareness of the pandemic. The study, however, found that memes on COVID-19 were used to promote falsehood about the pandemic. From these findings, the work recommends that health, local and international bodies should leverage the huge shareability and accessibility of health campaign messages that Facebook offers. It also recommends that health bodies and the government should employ more visuals such as memes in disseminating health communications on social media due to their ability to communicate health messages in simple, attractive, and easy-to-understand ways. The study further recommends that the learning environment, media, health bodies, government, and non-government organisations should give time to teaching and promoting visual literacy to help counter the use of memes to promote falsehood about diseases and to acquaint themselves with the ethics of photos, including how they could be ethically used for health campaigns.

Keywords: Awareness, Internet Memes, Social Media, COVID-19, Pandemic

Introduction

The architectural framework of the Web and the interplay of technologies therein has made it the "most powerful instances of information and communication technology (ICT)" (Cantoni & Tardini, 2006: 1). This fruit of modernity has revolutionized the world, making it possible for a variety of tools, techniques, and platforms to be employed in the communication process and across multiple devices. Its inception and advancement from a read-only state [Web 1.0] to its read-write state [Web 2.0] and now to its read, write and execute state [Web 3.0] has further democratised the online environment, decentralised its operation and allowed for a brilliant utilisation of its space either publicly or privately. The Web otherwise referred to as the Internet has indeed impacted all spheres of modern society. Its potential and evolving character, including the multi-faceted functions it serves, have also made it a subject of interest in multi-disciplinary fields.

The Internet is "both a hedge against old technologies (such as printing and broadcasting) and a platform of its own" (Dennis & Merrill, 2006: 160). As a platform, it is through social media such as Facebook, Twitter, Instagram, Snapchat, and LinkedIn, among others, and they have changed how information is accessed, created, consumed, and shared globally. Chukwuere (2021) explains that social media has broken traditional barriers to accessing information thus allowing the sourcing and sharing of ideas in different fields. On the web and its web-based applications, visual communications (animated GIFs, screenshots, images, videos, pie charts, and infographics, among others) are increasingly been shared and notable among them are images. Milosavljevic (2020) captures this when he states that visual content such as images is commonly shared online because they are at the centre of attraction for Web users, particularly among the youth. Tulsyan (2015) corroborates the above finding when he states that a significant proportion of Web users share pictures on social media and often like them because they are easily understood.

On the online ecology, pictures (images) are creatively been altered with symbols and phrases to create meaning and this alteration birthed a form of visual communication called memes. The term *meme* was coined by Richard Dawkins, a British evolutionary biologist in 1976. He conceived it "as the parallel to biological genes and considered them, in a way similar to "selfish" genes, as being in control of their own reproduction and thus serving their own ends" (Rogers, n.d: 2). Dawkins (1976) cited in Lombard (2014) describe meme as genes that propagate themselves. While genes propagate themselves in the gene pool by jumping from body to body via sperms or eggs, memes, on the other hand, spread in the meme pool by jumping from brain to brain through a process referred to as imitation. Neville (2021) buttresses this analogy when she states that memes could be understood in the manner in which genes spread through replication, competition, and natural selection.

Memes are a form of engagement that captures the attention of its viewers and divert them to salient issues in society (Richard, 2020). They offer a mental picture of our perception and interaction in society and they help us understand human behavioural patterns, social issues, and their underlying impact on society (Francisco, 2014) and serve as "a window to analyzing human behavior, and can be used to influence or create symbolic interaction" (Francisco, 2014: 1). Shifman (2011) views memes as an 'analytical tool' that could be used to analyse the rapid spread of ideas in the ecology of online communities, particularly social media platforms, to express dissatisfaction or protest in society (Mina, 2013), and they "holds the answer to unlocking some of the solutions to our social problems" (Francisco, 2014: 1).

Memes come in different formats and are used in different industries or sectors, particularly on the web. They have become part of our digital culture and are important visual communication tools employed in different industries and sectors. The common types of memes include text, text and images, and video. These types of memes have been used in different advertisements (Bury, 2016), education (Dongqiang, De Serio, Malakhov, & Matys, 2020), health (Francisco, 2014; Neville, 2021), politics (Kadir & Lokman, 2013), among. While there are different types of memes in the online ecology, particularly on social media platforms and their usage in different fields, this paper, however, focused specifically on image memes (pictures and the text) used in disseminating information on the COVID-19 pandemic as against video and text types of memes.

The world is made up of different demographic (children, adolescents, youth, and the elderly) and among those, the youth constitute a significant group. The term youth has no universally accepted definition as it has different interpretations in different parts of the world. In other words, it has a fluid meaning from one milieu to another. For instance, the United Nations (2019) defines youth as persons between the ages of 15 and 24 years. The African Youth document cited in Ejiga, Omirigwe, and Nelson (2021) categorises youth as persons between the ages of 18 and 35 years who are citizens of the Federal Republic of Nigeria. While Ejiga, Omirigwe and Nelson (2021: 112) define youth as "persons between the ages of 18 to 40." They add the term youth refers to "the state of being young, active, and agile." For this paper, however, the age category of the

term youth offered by Ejiga et al. (2021) suffices. While the youth demographic is characteristically adventurous, creative, energetic, enthusiastic, innovative, and nimble.

Youth are an important group across the world and they are recognised in the scheme of things including diseases and awareness creation therein by both international and local bodies. The United Nations (2019) highlighted the significance when they reported that the youth population (between the ages of 15 and 24 years) is approximated to be 1.2 billion. In the African continent, those between the ages of 15 and 34 years constitute 22.7% of the global youth population; the second largest after Asia's (58.0%) (Rocca, 2022). While in Nigeria, about 70% of its demographic is under 30 years (PremiumTimes, 2022). The global population, including that of Nigeria, is key for the success of any meaningful development and their buy-in to health campaigns is also crucial in curtailing the spread of diseases such as the COVID-19 pandemic.

Also, in the online ecology, youth still constitute the majority, particularly the digital natives (those born in the year 2000 and afterward). As digital natives, Chukwuere and John (2021) posit that they are digitally inclined, and possess and use mobile communication devices daily. Similarly, they (youth) remain the most active users on social media platforms globally as well as creating and sharing a variety of content including memes on diseases. With regards to diseases such as the coronavirus, youth also contract the virus although often remain asymptomatic or are less at-risk in terms of developing severe physical symptoms compare to the older age group (WHO, 2020). Besides, the disease affects them in other ways too, especially the vulnerable ones, in the field of education, employment, mental health, and disposable income (OECD Policy Responses to Coronavirus (COVID-19). 2020). The lockdown period, for instance, led to the closure of schools, and businesses and a huge capital was lost thus leading to the downsizing of the global workforce which consists of young people. Hence, the need to investigate how the youth are using digitally created content (memes) on the internet to create awareness about the pandemic as a means to help curtail its spread is worthy of being studied. The paper focused on youth as opposed to other demographics because they make up a significant global population, are the most active users of the web and their web-based applications (social media platforms) and are also impacted by the COVID-19 pandemic.

Statement of the problem

Memes are used in different fields including health (Francisco, 2014; Neville, 2021). During the lockdown period necessitated by the coronavirus pandemic, social media platforms became the convergence point for a lot of people, particularly youths, and also became a place where information on the disease was created, accessed, shared, and consumed. Ferreira and Borges (2020) highlight this when they state that social media platforms rose to become one of the key sources of information with 65.2% of the people relying on them to be informed about the pandemic. During that period too, memes were shared on these platforms raising issues as well as creating awareness on health matters. While studies on the use of radio, television, and newspaper campaigns on COVID-19 are easily available in this clime, there is, however, a dearth of literature on the use of internet memes through social media platforms in creating awareness of the pandemic. Therefore, this paper seeks to examine the use of Internet memes in creating awareness of the COVID-19 pandemic among the youth in Jos metropolis in Plateau State, Nigeria with the view to bridging the gap.

Research questions

1. What are the social media sites used to access Internet memes during the COVID-19 pandemic among youths in the Jos metropolis?
2. To what extent do youths in Jos metropolis perceive Internet memes to create awareness of the COVID-19 pandemic?
3. What are the concerns among youths in Jos metropolis with the use of Internet memes in creating awareness of the COVID-19 pandemic?

Literature review

Visual communications in pandemic

Visual communication is an important method of sharing information on a variety of subjects including during a pandemic because they present issues or a subject in an easy-to-understand way to your viewers that is impossible to achieve with words alone. There are several types of visual communication used in health communication and they include animation, data visualization, GIFs, images, infographics, pie charts, screenshots, screen recordings, slide decks, and videos, among others.

In the digital era, particularly on social media, there is an increase in the use of images. According to Pew Research Center's Internet Project (2013), over half of the world's internet users post or share photos. The popularity of images on social media and their incorporation with text and symbols to disseminate messages birthed a new form of visual communication called ''meme''. Using visuals such as memes, complex and or serious issues are taken up and presented efficiently and effectively in that is easily understood by everyone irrespective of the level of literacy, geographic location, and language. According to Hamaguchi, Nematollahi, and Minter (2020), visual communications are powerful tools in health campaigns as the combination of texts and images into a 'unified model' enhances understanding and retention of health campaign messages. They add that "During the current COVID-19 pandemic, visuals have emerged as a particularly powerful vehicle for information dissemination" (2). Tahir, Padil, Abd Rashid, Baharom and Kamarudin (2020: 174) posit that, "Visual communication has helped communities to identify the instructions, guidance, and actions that need to be carried out for the control and transmission of Covid-19 disease".

A meme, a form of visual communication, predates the Internet but gained popularity and relevance in the digital era. Due to the acceptability and shareability of memes on the Internet, the term Internet memes have become part of our lexicon. Rogers (n.d: 5) states that "Internet memes spread from person to person through imitation, typically by email, social media, and various types of Web sites. Lombard (2014: 25) posited that the Internet provides the enabling environment for memes to thrive, replicate, and increase their lifespan thus allowing "a greater possibility of the variation, selection and heredity of memes". Internet memes are different from other memes and they have three unique characteristics and they include; "(a) a group of digital items sharing common characteristics of content, form, and/or stance; (b) that were created with awareness of each other; and (c) were circulated, imitated, and transformed via the Internet by multiple users" (Shifman, 2014: 40).

Internet memes and COVID-19 pandemic

Memes offer creative and appealing ways to create campaign messages, particularly on health matters, and using social media platforms, they are widely shared. Neville (2021, para. 5) opines that "despite their jovial appearances, deconstructing memes from a behavioural science perspective reveals that memes are an extremely sophisticated form of communication". During the peak of the coronavirus pandemic and the lockdowns, memes emerged as unique tools for communication and were used to offer coping strategies, encouraging the public to adhere to non-pharmaceutical measures and get vaccinated (Neville, 2021). Pandemic and Beyond (2021: 4) buttresses the above when they state that "During the pandemic, visual information has become more important for a wide range of reasons, including ensuring those who have difficulty reading and interpreting a high amount of information to have the means to understand what is being communicated".

According to BBlunderRR (2021: 24), "memes are a great tool for encouraging people to stay home and be safe from the Coronavirus". Internet memes are being used for COVID-19 campaigns because they can present complex and important issues in simple, concise, and digestible chunks thus reminding us that "less is more in the art of effective communication" (Neville, 2021: 17). They also can go viral (Neville, 2021). Buttressing their virility, BBlunderRR (2021: 9) aver that "What makes memes go viral is that they are so relatable. They

convey scenarios that most people have experienced or emotions that everyone can relate to". This is true of coronavirus virus pandemic memes because the global audience could relate to it through personal experience or shared experiences with friends and loved ones.

See below some examples of memes used for COVID-19 campaigns:

Figure 1. COVID-19 Campaign on numbers of passengers in a vehicle Figure 2: Doctors and police effort to curtail the spread of COVID-19
Source. Facebook, 2020 - https:www.facebook.com/2162019960547059/posts/pdbid02hZYEPk3

Figure 2. Doctors and police effort to curtail the spread of COVID-19
Twitter, 2020 - https://help.twitter.com/using-twitter/how-to-tweet#source-labelsLtbdmiVN8Lkhf9Tpdym9NXXFN3SNCdaKuQNXiRrLWK13mrPSJeQN7HZI/?mibextid=Nifoz

Use of social media for COVID-19 pandemic campaigns

Social media platforms have made memes important for everyday social interactions on a variety of subjects or issues including diseases as well as providing the avenue for their creation, shareability, and accessibility (Andreallo, 2017). These platforms, including Facebook, in comparison to traditional media, offer the benefit of speed, broader reach, robust interactivity, instant feedback, constant update of information, massive storage, and instant digitization of images and content in multimedia format (Dennis & Merrill, 2006). Buttressing the viability of using social media for COVID-19 pandemic campaigns, Msughter (2020) posits that the platforms could be used to "monitor public response to health issues, track and monitor disease outbreak like Covid-19". The potential of using social media in disseminating health communications and campaigns on the COVID-19 pandemic using memes, particularly to young people has led health bodies like the World Health Organisation (WHO) and National Centers for Disease Control and Prevention (NCDC) to utilise them as a medium for dissemination of sensitization messages on coronavirus.

Memes on social media are widely shared and like infectious diseases, they share similarities in terms of their shareability and contagion, because they both travel through social ties from one person to another, although

social contagion has distinctive characteristics that are different from epidemic diseases (Kostygina et al., 2020). To effectively use memes for COVID-19 campaigns on social media platforms, Neville (2021) offers three important views that should be taken into account and they include; (i) keep your message simple, and favour repletion over reinvention; (ii) invite participation and co-creation to help your audience to invest themselves in your product and help your messages land, and (iii) mimic the language of your audience and highlight the popularity of the ideas you're communicating to give them extra power.

Concerns in using Internet memes in creating awareness of diseases

Memes provide a unique and exciting way of creating awareness of diseases and sensitising the populace to preventive measures. Hence as online content can be created by anyone, they are subject to different interpretations, and manipulations and are sometimes used to spread falsehood, among other concerns. According to Eosco (2008: 15), memes are given different interpretations and meanings due to differences in the visual literacy levels of their viewers. Visual literacy which is "the ability to 'read,' interpret, and understand the information presented in pictorial or graphic images" (Wileman, 1993: 114 as cited in Eosco, 2008: 14) is not a skill possessed by all and sundry thus raises the concern of using memes for health campaigns on diseases such as the coronavirus disease. More so, the difference in memes literacy among their viewers on social media undermines their effectiveness on a broad scale when used in health campaigns, especially among those who are not virtually literate thus leading to an ill-informed decision on the intended campaigns.

Another worrisome concern about the use of memes in promoting health campaigns is their use to promote falsehood. Dahiya (2021) states that while memes mostly appear harmless and humorous, they are persistently being used to promote misleading information on diseases, especially during the COVID-19 pandemic. Barack (2022) corroborates Dahiya when he avers that memes were used to promote falsehood about the COVID-19 vaccination, hence, leading to misinformation about the efficacy and the importance of being vaccinated. The memes in figures 3 and 4 below highlight the concerns associated with the use of memes in the dissemination of misleading about the pandemic.

The age of the internet and social media, including the increasing use of visual communications like memes, have heightened an old concern of image manipulation with utter disregard for the ethics of images. GCF Global (n.d.) posits that manipulating images by way of editing such as adjusting colours, and lighting, to adding and removing background can create misleading messages thus creating problems. The act of creating memes has seen an increasing alteration of images without the consent of the owners and to a misleading point to the viewers. While it is not entirely out of place for media outlets and individuals to make minor variations like cropping or light balancing, "it's unethical for journalists to edit a photo in a way that changes its meaning or misleads viewers" (GCF Global, n.d: 1). Find below examples of misleading memes on COVID-19:
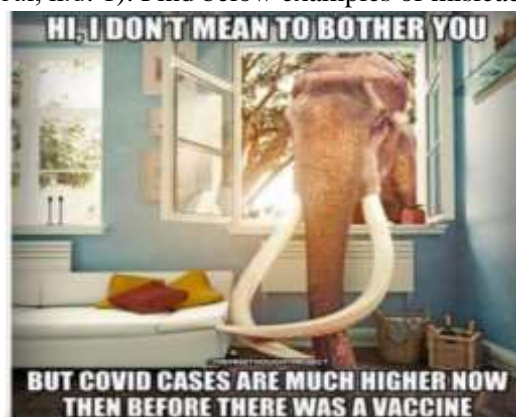
Figure 3. Misleading information on COVID-19 vaccination. Facebook, 2019
Source.https://www.facebook.com/1992501667723704/posts/pfbid05f8YcnRyp79BqEHVKSmcADr8ibVKJvVqLZPdcjUCwn9Zq
HzV6Exwg6MjFBA82I/?mibextid=Nif5oz

Figure 4. Campaign against vaccination and mask-wearing. The quint, 2021
Source. https://www.thequint.com/amp/story/news/webqoof/memes-covid-19-conspiracy-theories-misinformation-fake-news#readmore

Undoubtedly, through the creation and dissemination of COVID-19 memes in the online environment, without the intent to mislead, but to create awareness, particularly on social media, more young people have been informed about the disease, including its preventive measures. Despite the misleading memes on the virus that are circulated on the web to undermine the efforts of health workers, health bodies (local and international), governments, and individuals who are championing the campaign to curtail its spread, there are ample others that are informative and capable of helping young people to make informed decisions about the virus.

Empirical reviews

Choursia and Suri (2020) conducted a study titled *Memes Related to COVID-19 on Social Media: A Study* which sought to find out the popularity of memes among social media users in Tricity, among others. The study used a quantitative research approach and employed a survey design and questionnaire as an instrument for data collection. From the data collected and analysed, the study found that COVID-19 memes on social media platforms played a huge role in the dissemination of information on prevention and caution about the pandemic. Another notable finding from the work revealed that COVID-19 memes are frequently been shared and viewed on Instagram with 67% of the respondent attested while only 15% said they have viewed them on Facebook.

A related study was conducted by Wasike (2022) titled, *Memes, Memes, Everywhere, Nor Any Meme to Trust: Examining the Credibility and Persuasiveness of COVID-19 Related Meme*s. It used an experimental design to examine the credibility and persuasiveness of COVID-19-related Internet memes based on pro – and anti-mask / vaccine messages; randomly sampled 1200 U.S respondents. Data analysed showed that memes from professional source attribution are more credible than those that originated from nonprofessional. The study also found that campaign messages with an objective message tone are more credible and persuasive than those with a subjective message tone. Furthermore, the study found that age correlates opposite with persuasion and pro-mask/vaccine memes are more credible and persuasive than those that oppose mask/vaccine memes.

Fafowora and Saludeen (2022) in a study titled, *Nigerians and COVID-19 Humour: Discursivity and Public Engagement Through Pandemic Internet Memes* explored emergent themes in coronavirus-related memes and investigated the discursive strategies applied by Nigerians to portray the pandemic. Findings from the study revealed that meme creators employed the combination of humour, non-humour, and sarcasm in driving awareness about the pandemic and also less-discussed socio-political and socio-economic issues aggravated by the recent health crisis. Another notable finding from the study showed the utilization of memes to create awareness and highlighted the negative impact of COVID-19 regulations on the lives of the average Nigerian and critique the role of the government in handling the pandemic.

Theoretical framework

This study is hinged on the visual rhetoric model; a subset of rhetorical studies that focused on the persuasive use of images autonomously or accompany by texts to disseminate messages on a variety of subjects. Alim and Rahim (2021: 767) opine that "Visual rhetoric is the application of knowledge that focuses on the process of translating symbols into pictures to convey a message or communicate". They add that "Images used as visual rhetoric have a function as a tool of persuasiveness, and aesthetic value" (Alim & Rahim, 2021: 767). For an image to be considered visual rhetoric, three features must be present and include: (i) it must be accompanied by a symbol; (ii) it must involve human intervention and; (iii) it must be made public to communicate with the audience (Foss, 2005; Richard, 2020).

The COVID-19 memes on social media share similar characteristics with visual rhetoric tenets such as being accompanied by symbols, and involving human intervention and are made public to the audiences through social media platforms. The visual rhetoric model is also relevant to this study because the COVID-19 memes on social media platforms are persuasive and attractive communication tools that attract the attention of the viewers on the pandemic thus helping in creating awareness of the disease, concerns, and preventive measures; making them important health campaign tools. In other words, the use of the visual rhetoric model helps understand how memes might be used to persuade their viewers of positive and preventive attitudes toward the COVID-19 pandemic.

Methodology

This study employed a quantitative research approach and a survey research design. Adinlewa and Olubodede (2021) aver that the survey research method uses a technique that assesses knowledge, attitudes, and practices. Hence, suitable to use to assess how young people use internet memes in creating awareness of the COVID-19 pandemic. The population of the study was residents of Jos metropolis which comprised Jos North, Jos South, and parts of Jos East (Plateau State Government, 2009). This population is made up of male and female and it is estimated at 816,824 by the National Population Commission (2022). The Jos metropolis (Greater Jos Metropolis as it is also called) was picked for the study because it is the most urbanised part of Plateau State. Since the study focuses on youth and internet memes, the Jos metropolis was choosen because the locations under it have a significant number of young people and also, the widespread of telecommunications infrastructure and high mobile phone usage to surf the web. The sample size was 384 and it was determined using Survey Monkey Sample Size Calculator. While the purposive sampling method was employed to reach out to only "persons between the ages of 18 to 40 as defined by Ejiga, Omirigwe and Nelson (2021: 112) was adapted for the study. The sample size only included those who are social media users in the metropolis and the purposive sampling method was employed to draw out sample from the category. Justifying the use of the purposive sampling method, Emaikwu (2013: 97) posits that "In purposive sampling, specific elements, which satisfy some predetermined criteria, are selected".

The study used the instrument of a questionnaire to gather data. The questionnaire was administered online and face-to-face. The online questionnaire was partly shared on social media groups made up significantly of youth within tertiary institutions in the Jos metropolis using research assistants (3) who were properly briefed on the selection of respondents before the administration of the questionnaire. While the face-to-face method was employed to reach out to respondents in the commercial hub of the metropolis (Ahmadu Bello Way, Rwang Pam Street, and Terminus axis), particularly locations where mobile phones and computers are sold, these locations attract youth in good numbers on daily basis. The face-to-face method enabled the researchers and their research assistant to not only identify those who were within the age defined as a youth in the study (18-40 years) but also those who use one or more than one social media platform. Also, the face-to-face method provided clarity to some respondents who did not have complete understanding of the variables in the instrument for better response to the questions. While data were analysed using simple percentages to determine the frequency of responses to questions raised in the questionnaire and presented in tables.

Data presentation and analysis

The data obtained from the respondents are presented below:

Table 1. Exposure to COVID-19 memes on social media
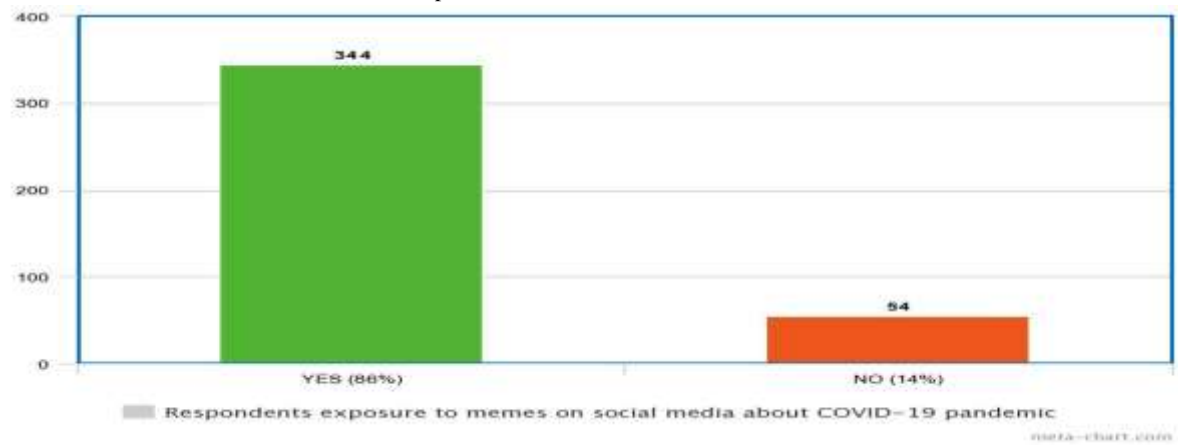
Arising on Table 1 above implies that COVID-19 campaign memes are widely seen on social media.

Table 2. Social media platform often use to access COVID-19 memes
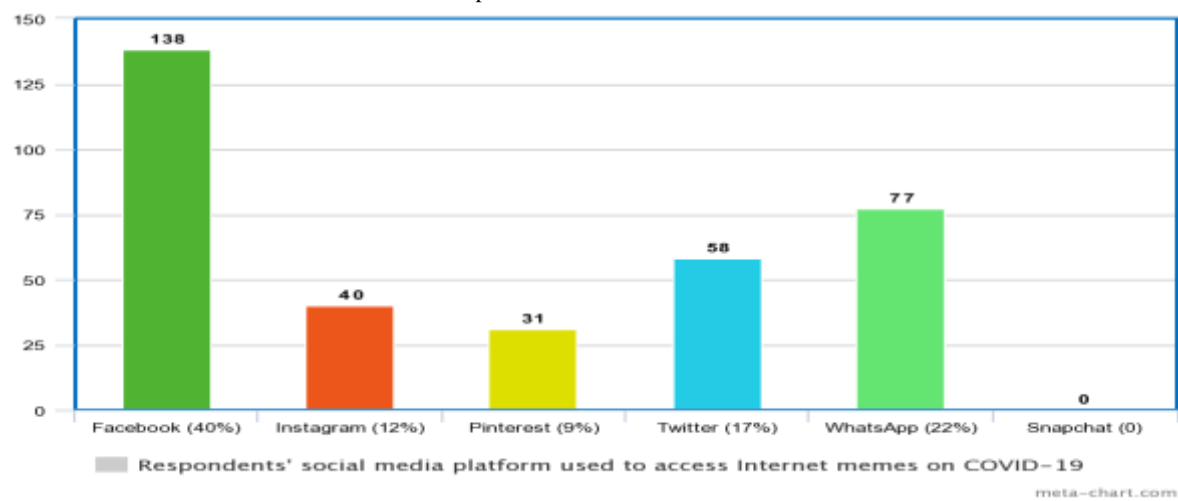
Data contained in Table 2 implies that Facebook is the most commonly used social media platform to access COVID-19 memes.

Table 3. Using Internet Memes to Create Awareness of the COVID-19 Pandemic
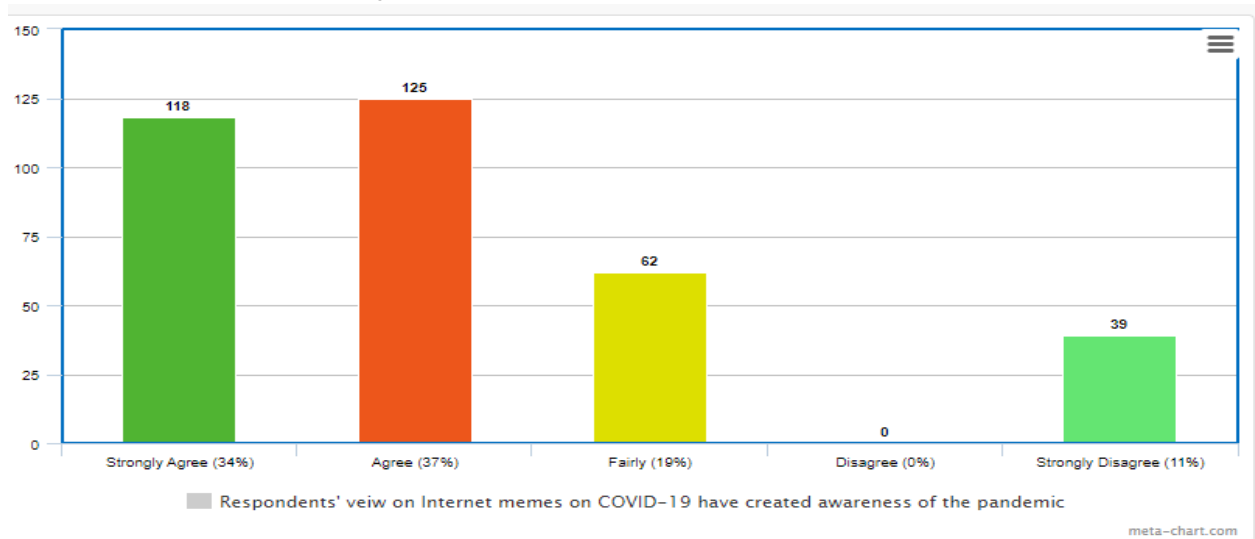
Table 3, infers that the significant majority of the respondents agreed that Internet memes are viable communication tools to use to create awareness of COVID-19.

Table 4. Extent of Internet memes use to create awareness of the COVID-19 pandemic
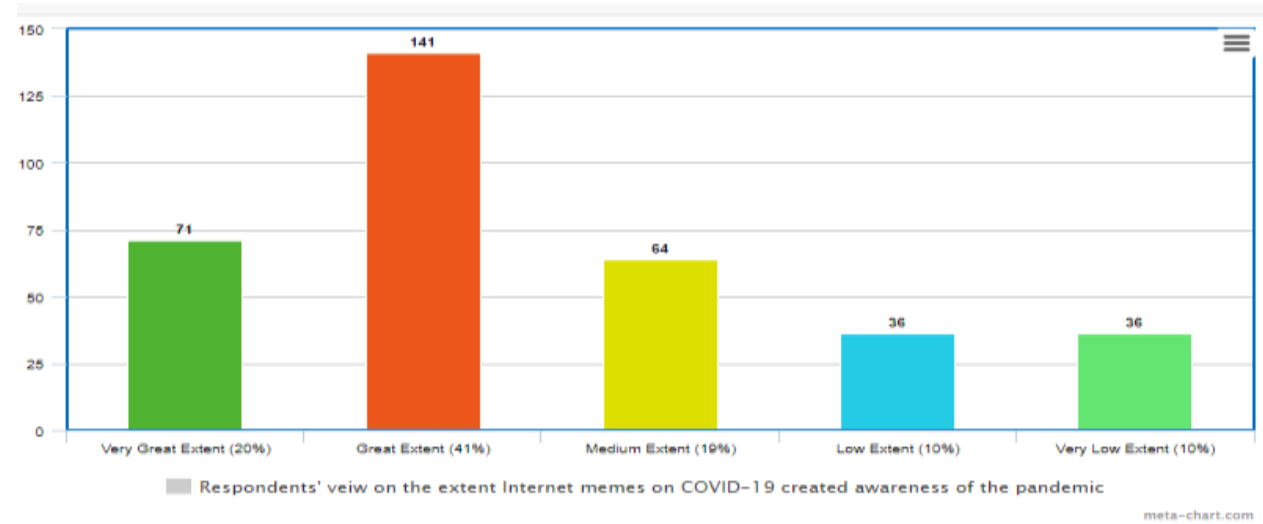
Inferring from Table 4 shows that most of the respondents representing 41% attested that to a reasonable extent, Internet memes are used to create awareness of the COVID-19 pandemic.

Table 5. Concerns with the use of Internet memes in creating awareness of COVID-19
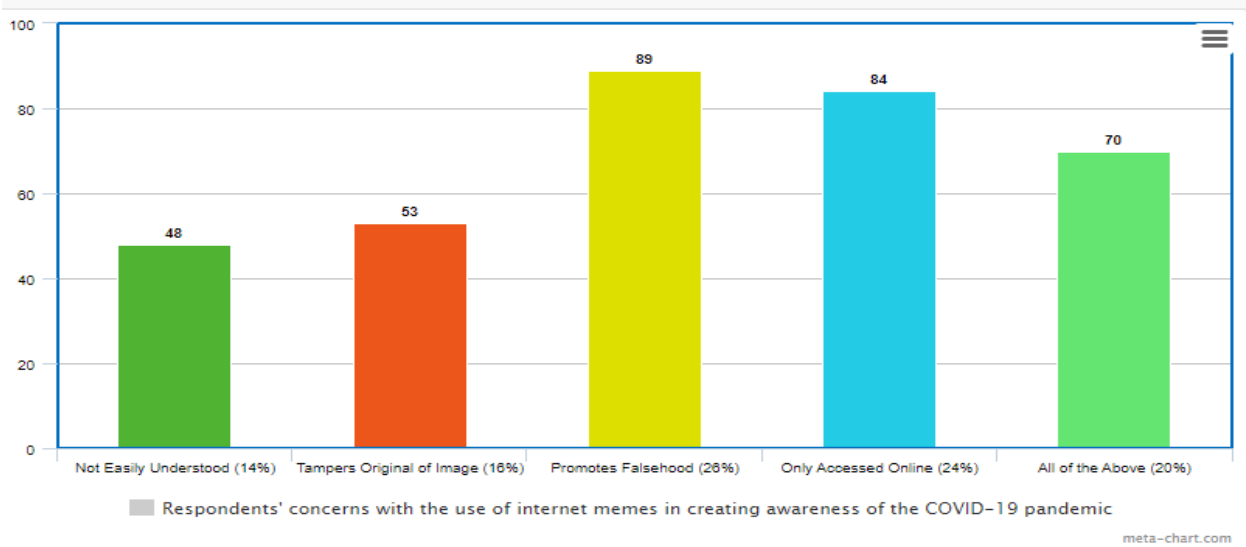
From the data contained in Table 5, it can be deduced that COVID-19 memes on the Internet are used to mislead viewers.

Result and discussion

The first research question sought to find out the social media sites often used to access Internet memes during the COVID-19 pandemic. From the data collected, the majority of the respondents indicated Facebook as the social media platform often use to access Internet memes during the COVID-19 pandemic. This finding disagrees with Choursia and Suri (2020) whose work revealed that COVID-19 memes are frequently been shared and viewed on Instagram by 67% while only 15% viewed them on Facebook. The global popularity and users of Facebook may not be unconnected with the frequency of usage in disseminating COVID-19 campaign messages using memes.

The second research sought to ascertain the extent to which Internet memes are used to create awareness of the COVID-19 pandemic. From the data collected, the majority of the respondents indicated that memes on COVID-19 did create awareness of the virus to a great extent. This finding aligns with Kostygina et al. (2020) whose work stated memes traveling far thus are used to create awareness due to their shareability like infectious diseases. The finding is also in agreement with BBlunderRR (2021: 9) who avers that "What makes

memes go viral is that they are so relatable. They convey scenarios that most people have experienced or emotions that everyone can relate to".

The third research question sought to find out the concerns associated with the use of Internet memes in creating awareness of the COVID-19 pandemic. From the gathered, a significant majority of the respondents attested that Internet memes on social media are used to promote falsehood on the COVID-19 pandemic. This finding corroborates that of Barack (2022) and Dahiya (2021) findings. Barack (2022) contribution in Poynter shows that internet memes were used to promote falsehood about the COVID-19 vaccination, hence, misleading misinformation about the efficacy and the importance of being vaccinated. While the finding agrees with Dahiya (2021) who states that while memes mostly appear harmless and humorous, they are persistently being used to promote misleading information on diseases, especially during the COVID-19 pandemic.

Recommendations
Based on the findings above, the following recommendations are put forth:
1. Health bodies, local and international, should leverage the huge shareability and accessibility of health campaign messages that Facebook offers, particularly among young people.
2. Health bodies and the government should employ more visuals such as memes in disseminating health communications on social media due to their ability to communicate health messages in simple, attractive, and easy-to-understand ways.
3. The learning environment, media, health bodies, government, and non-government organisations should give time to teaching and promoting visual literacy to help counter the use of memes to promote falsehood on diseases to enhance their comprehension thus leading to informed decisions on health matters.
4. Media outfits, health organisations, government, and their officialdom and individuals should seek consent and knowledge on how and to what extent images aimed at being used for health campaigns could be manipulated so as not to be unethical or run foul of the law.
5. Social media users should seek memes of the COVID-19 pandemic from experts in the health sector and or from recognised institutions (health bodies and government) as opposed to non-professionals, including accessing online content on health communications from these bodies to be better informed about the disease as well as make informed decisions too.

Conclusion
This paper examined the use of Internet memes in creating awareness of the COVID-19 pandemic among the youth in Jos metropolis in Plateau State, Nigeria. From the data collected and analysed guided by the research questions, it can, therefore, be concluded that Facebook is the most popular social media platform youths often use to access memes on the virus and that memes, with their imitative and virality features, are to a great extent a viable visual tool to create awareness on diseases, including the coronavirus. The study also concludes that as important as memes are in being used in creating awareness of the COVID-19 pandemic, they are, nonetheless, prone to being used to promote falsehood about the disease thus undermining campaigns aimed and leading ill-informed decisions about the virus.

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Theme 2:

Education and Educational Technology (EET)

The use of technology in foreign language pronunciation teaching at higher education level

Sandra Román[1]

[1]*Human Sciences and Education Department, La Rioja National University, La Rioja, Argentina/ Phonetics and Phonolgy Chaired professor in the Teaching, Translation and Research program*
National University of Southern Patagonia, (UNPA) Argentina/ Research fellow at at IEC Institute of Education and Citizenship, Argentina. sroman@unlar.edu.ar, https://orcid.org/0000-0002-5735-8826

*Corresponding author

Abstract: Higher education institutions are experiencing a transformation process to fit the demands of the Knowledge Society and the ICT leading role, in all the aspects of our lives. In the field of education, it has generated a new learning ecology centered in the student who, accompanied by the teacher as a guide or facilitator, uses ICT to accomplish their goals. Everything happens in a new scenario where the educational process is influenced by the ubiquity and the blurring of barriers between formal and informal learning. In foreign language teaching, there is a growing interest in the communicative approach that gives more importance to the oral transmission, for which pronunciation is a path toward intelligibility. In this respect, new technologies offer several advantages that go from linguistic immersion to the use of resources for practice and self correction. However, it is not possible to guarantee student autonomy unless them and their professors have developed the digital competences required for learning. The aim of this paper is to examine the use of technology for teaching English pronunciation at University. The first part of the paper presents the relevance of pronunciation for oral performance. The second part, provides an overview of the use of technology for foreign language teaching. And, the last part, discusses the competences that are required to accomplish the learning goals.

Keywords: Oral skill, Intelligibility, Digital competences, Autonomy, Higher education

Introduction

The linguistic competence in a language is reached with the development of four macro skills; listening, reading, speaking, and writing. For speaking, pronunciation is one of the most important aspects, since it implies not only the proper articulation of sounds, words and phrases, but also the production of prosodic features of fluent language to express ideas and interact with other people. Pronunciation is related to speaking properly as well as to the listener clear understanding of the speaker words and intentionality. It is possible to state that bad pronunciation interferes with communication whereas good pronunciation contributes to the fluent interaction that ranges from language sounds to features such as accentuation, rhythm, and intonation (McDonough & Shaw 2003).

Foreign language teaching has undergone different pedagogic and methodological trends. Based on the interest in the communicative approach, pronunciation has gained more importance in the last decades (Couper, 2006; Isaacs, 2009). Nevertheless, there are several aspects that give complexity to good pronunciation acquisition. It is not enough to know the phonological system of a foreign language (L2); that

is to say, how a sound in a certain word is articulated or what syllable to accentuate, but it is also necessary to command the articulation motor aspects (McCrocklin, 2014). This has been further combined with lack of agreement between spelling and sounds- particularly in the English language- and tone changes that native speakers use to convey meaning. Another important aspect is the development of the auditory capacity to perceive and to imitate L2 sounds and the tendency to compare them with the ones in the mother tongue (L1) that can interfere with production.

It is also highlighted the importance of the phonological model that it is aimed at consolidating; the predominance of English in different international contexts has generated the necessity to reconsider the traditional pronunciation standards that took native speaker (NS) as a model to follow, to focus itself in a competent speaker (CS) model. Even so, a great controversy exists about the best model to adopt for teaching and assessment of English as a second language (ESL) or as a foreign language (EFL). In a study made in Malaysia about competent speaker intelligible pronunciation, Rajadurai (2007: 5) states that to aspire a native speaker pronunciation is unreal. It is a way to ignore, on the one hand, the expansion of English as the lingua franca and its resulting changes in the usage patterns. And, on the other hand, that is the second language of many countries in which it has been redefined based on their identities and local cultures. All the above-mentioned leads us to think about the teaching methodology and the technological resources' usage, to offer student the possibility of attaining learning autonomy. Synchronous work, either in person or virtual, must be supported with individual and self-directed work that allows students to be exposed to auditory material, to monitor their progress and to obtain instantaneous feedback. Accordingly, technology can be a very valuable resource for the development of autonomous learning.

It has been used in foreign language teaching for several decades; from the second half of the XX century the CALL approach, Computer Assisted Language Learning, has gained importance and has evolved according to users accessibility to technology. In 1997 Levi described it as "search and study of computer science applications for language teaching and learning". Particularly in the Phonetics field, the CAPT approach, Computer-Assisted Pronunciation Training, is not only used for foreign languages teaching and learning but also for speech therapy. Pennington and Rogerson-Revell (2019) emphasize that learning based on technology has a motivating effect due to its originality and the possibility of combining different resources. It also allows student to manage and to tailor their learning process and to be exposed to native speakers models. CAPT technology offers pupils the possibility to repeat and to imitate, and to get automatic feedback of their oral productions. This technological offering in the field of foreign languages does not guarantee its application nor the student autonomy, if they do not have the digital competences that allow them to learn.

The importance of pronunciation for the development of oral skills in foreign language teaching

Pronunciation is an umbrella term for all the elements that take part in effective communication; it ranges from vocal and consonant sounds articulation, at a segmental level, to the use of characteristics of the fluent language that correspond to a suprasegmental level. It is not enough to perceive and to produce sounds and their combinations to create an intelligible speech, it is also required to use other features like rhythm, intonation, and prominence. They make it possible for the listener to understand, not only what it is said but also how it is said, as an indicator of the speaker attitude towards their audience (Pennington & Rogerson-Revell, 2019). In spite of the importance of pronunciation for oral competence development, more attention has been given to the study of other fields (Lang, Wang, Shen & Wang, 2012). Authors, like Underhill (2013), considers it the "Cinderella" within foreign languages teaching. Although as we mentioned previously, the study of pronunciation has received more attention thanks to the communicative approach (Couper, 2006; Isaacs, 2009), it is still one of the most difficult competences to acquire because of the motor, perceptual and cognitive capacities that are put into play (Fouz, 2015) and for the lack of agreement concerning intelligibility and the intended phonological profile.

The concept of intelligibility is wide-ranging, and it could have different interpretations. But the fact is that English is the lingua franca in the scientific and academic field, and that there is a considerable amount of speakers in the world who use it whether as a second language (L2) or as foreign language (FL) (Rajadurai, 2007). As a result, the learning goals have moved from trying to speak like a native speaker to being intelligible; intelligibility is then the parameter that determines if communication really exists.

The use of technology in foreign language teaching

As we already mentioned, technology has been widely used in language teaching, but quantity does not mean quality. The rapid growth of ICT in the educational field creates a scenario where individuals have to perform new roles to develop competences to have access and to process the amount of information available. On the one hand, teachers, as facilitators and guides, have to create learning situations where "it is probably more important how than what to teach" (Cabero & Gutiérrez, 2015) fostering learning situations where pupils find a logical sense and take a positive attitude. On the other hand, students, need abilities to interact with that information and thus, to make autonomous decisions and to solve problems. In this ground, ICT show themselves as facilitators and have potential to favor student centered learning. And it is directly linked to the last thinking level of "Bloom's Digital Taxonomy" that Churches (2007) calls creating and involves the ability to "put elements together to form a new coherent or functional whole; reorganize elements into a new pattern or structure." (Chursches, 2007).

There are experiences in different parts of the world that, from the digital literacy conception, consider the effective use of new digital technologies in education must be incorporated as a requirement for the XXI century student. Concerning Phonetics and Phonology, there is interesting and very valuable literature, published in the last years, that can be classified among the ones that describe resources to teach, to learn and, to investigate; and studies that relate experiences and analyse the effects of their application. Researchers continoue to investigate and describe resources (Pennington & Rogerson-Revell, 2019; Walker, 2014; Yoshida, 2018; Calvo Benzies, 2017).

Pennington and Rogerson-Revell (2019) in "English Pronunciation Teaching and Research" make an exhaustive analysis of specific products, applications, and resources online available for pronunciation teaching and learning, together with some resources for assessment. They consider that one of the main characteristics of CAPT are their motivating effects and the immediate feedback for users oral productions; but they observe that many of them, are more centered in technology than in pedagogy. Besides, they suggest teaching experts, phonologists and technical developers to work together to design programs with pedagogic aims based on methodological principles. The results should ensure quality in terms of validity, reliability, accuracy, and usability. On the other hand, Walker (2014) classifies some applications and programs in three categories: instruction, listening and recording tools. Grounded on this classification, Yoshida (2018) organizes the existing tools according to those that provide pronunciation models, the ones that can be used for recording and those that can be used for independent training.

Calvo Benzies (2017) recommends teaching pronunciation integrated with other macro skills, for which new technologies can be very useful. Apart from analyzing current tools, he gathers students opinions about design and utility of applications, software and, websites for pronunciation practice. McCrocklin (2014) also makes a design focused on the student, and suggest fostering abilities and resources for self training and autonomous learning, assessing the advantages of Automatic Speaking Recognition (ASR). There are other specific experiences with ICT made by scholars (Jolley, 2014; Fouz, 2015; Leceta, 2014). Jolley (2014), could verify that the CALL approach could help to improve the students productive and receptive abilities in relation to paralinguistic features. In 2015 Fouz carried out a study in Spanish secondary schools, oriented in the development of students perceptive ability, and analyzes some mispronounced words in Twitter messages. In

her paper "English pronunciation and ubiquitous learning", Andrea Leceta (2014) describes classroom experiences with blended learning that are taking place in Latin America.

Development of digital competences

Previously we highlighted the relevance of locating, processing and transforming information to solve specific problems; for that purpose it is required to have digital competences. In this respect, Federico Laje (2020) considers that it is not only a question of developing technical abilities but also realizing the effects of digital technologies in users and their surroundings to be immersed in the digital culture. There is a continuous proliferation of resources and requires a reflective attitude towards their application. In addition, Terreni, Vilanova and Varas (2019) emphasize that these tasks must be made "in a critical and appropriate way" so that students can be creators of their own learning process. Because of the comprehensive characteristic of digital competences concept, some well known authors like Adell as mentioned in Terreni, Vilanova and Varas (2019) has subdivided it in five categories: informational, informative, cognitive generic, multiple literacies and digital citizenship.

Within them, the informational competence is connected with information management by means of "a set of knowledge, procedures and attitudes" integration "to have access to digital sources and Internet, to transform them into knowledge, for decisions making and problems solving in different and surging contexts at personal and social level" (Valverde-Crespo, Pro-Bueno & González-Sanchez, 2018). The emphasis in this category is directly linked to the amount of content to which society is exposed, claiming for autonomy towards critical command of knowledge (Terreni, Vilanova & Varas, 2019). As a consequence, there is a significant shift in the teacher's role, from the traditional knowledge owner, to a students guide or facilitator, for a society that demands lifelong and life wide learning. That is why further research in educative practice is required to provide resources for teachers training as well as "to overcome teaching issues and to improve educational processes" (Romero-Ariza, 2014).

A valuable contribution was made by Cabero, Almenara and Palace-Rodriguez (2020) in their work "Digital Competence Framework for Educators (DigCompEdu)". They highlight its advantage to foster educators training and research according to a common criteria that considers literacy in the new scenarios for permanent learning, and promotes self assessment together with considerations about personal strengths and weaknesses. DigCompEdu was elaborated on the basis of a general reference frame UE Council (2005), mentioned in Cabero, Almenara and Palace-Rodriguez (2020) to consider the digital abilities and strategies educators need not only to develop successfully in the Knowledge Society but also to foster students' autonomy in their own learning processes. Educational autonomy has been encouraged by proponents like Paulo Freire who considers it a fundamental goal to emancipate students and "to allow them to be life-long learners" (McCrocklin, 2014). Specifically speaking of the area of the foreign languages, Holec defines it as "the ability to take control of their learning" (McCrocklin, 2014). And can be reached when students are able to use tools that allow them to make decisions on their own learning process. Fortunately, technology, today more than ever, constitutes one of the most accessible tools to obtain autonomy.

Higher Education institutions, as citizens and professional educational centers, are undergoing a transformation process, according to the Knowledge Society requirements. In relation to it, Cesar Coll (2013) considers that formal education should be ready for this "new learning ecology" where he recognizes three main characteristics. In the first place, digital technologies, like social networks and virtual communities, become new scenarios, which the author call "potential learning niches", and go far beyond formal education and contribute to lifelong learning. Secondly, the WMUTE (Wireless, Mobile and Ubiquous Technologies), plays a more important part in this ecology, since they can be used either in the physical context and in any other place, whenever Internet connection exists. And finally, Coll reaffirmed that the education aim, is not new knowledge incorporation, but the development of abilities to learn.

These characteristics are focused in the student who is able to make their own personal learning journey according to their interests and needs and should be relevant in education actions. Terreni, Vilanova and Varas (2019) indicate that in higher educational level there are educative offerings where "flexibility of spaces and working methods" are highlighted. In this transformation, the Learning Management Systems (LMS) have gain prominence as a means of communication, management of activities and as instruction complements. Suarez Guerrero (2003) refers to Virtual Learning Environments (VLE) as "mediation tools that propose a specific action structure to learn" and to recognize each one's possibilities and strategies. Although virtual environment provide access to all kind of information, only their previous knowledge and their own critical thinking will determine the arguments students will construct.

Conclusion

Technological offerings for oral skills' development in foreign languages teaching are wide and enriching; they offer the possibility of being exposed to L2, interacting with native and foreign speakers, assessing performance progress and also getting instantaneous feedback. Nevertheless, it is required to have the required digital competences so that the learning process is carried out. For that purpose, teaching institutions should be ready for the spaces and modalities flexibility, and educators need to be technological and pedagogically trained to support students in their lifelong learning process.

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Challenges faced in online education & learning in Pakistan during COVID-19 pandemic

Zohaib Hassan Sain[1]*

¹*Faculty of Business & Management Sciences, Superior University, Pakistan.* *zohaib3746@gmail.com*
https://orcid.org/0000-0001-6567-5963

*Corresponding author

Abstract: This study was required to analyze the challenges/issues teachers and students encountered in the online education & learning process as it was being carried out in Pakistan during the Covid-19 pandemic. The social, economic, and political systems around the world have all experienced COVID-19 as nightmarish. In Pakistan, one of the most damaged sectors is thought to be education. The collection countries like Pakistan were most adversely affected and ss a result they lacked the mandatory technology for online learning for any purpose throughout the COVID-19 pandemic, whereas developed countries have already created the transition from ancient room settings to online learning environments. There have been several difficulties in getting teachers and students to adopt new technology. In this study, closed-ended questionnaires were used in a mixed-method research design. To improve data collection and analysis, the researcher issued questionnaires to students, teachers, and the management in addition to conducting management interviews. This study provides guidance to Pakistani online instructors on how to deal with challenges. The results show a negative attitude toward faculty members using online learning environments for teaching and learning. The difficulties faced by faculty members prevented them from providing effective teaching and learning. Faculty members also needed extensive expertise in teaching online and were not provided the right training to deal with the technical difficulties. By examining experiences and challenges faculty members have with online education and learning, this study will help educators discover relevant solutions and proposals to improve the quality of online teaching in Pakistan.

Keywords: COVID-19 Pandemic, Online education & learning, Online teaching & learning challenges, Pakistan

Introduction and background

Authorities suggested applying alternatives to learning that is mainstream in situations following the abrupt closing of educational organizations as a result of the introduction of COVID-19 in order to ensure that students aren't kept without an option to acquire and also to end herpes from spreading. E-learning is a name that has been given to the formal system that involves using electronic resources in the classroom. The usage of computer knowledge therefore online may be the element that is essential, but training can take spot inside or outside of classrooms (Aboagye et al., 2020). Since social gatherings at educational institutions are believed to provide the potential for the COVID-19 virus to spread, traditional educational approaches were substituted when the virus first appeared with online learning. E-learning happens to be the alternative that is better

available to make sure that conditions don't spread since it guarantees geographic distance, regardless of the challenges and proof suggesting that pupils are less likely to want to take advantage of this type of education (Lizcano et al., 2020). In addition to being a worry for worldwide public health, the COVID-19 pandemic also has an impact on politics, economics, culture, religion, and education. Everywhere on the surface and even deeper, we can see cracks. The break in the global learning systems of more than a billion students is one of the more significant flaws. According to UNESCO, the COVID-19 epidemic has affected about 1.6 billion pupils in more than 190 countries and created the biggest disruptions to educational systems in history. School closures have impacted up to 99% of students in low- and middle-income nations and 94% of students nationwide. The financial effects associated with the epidemic alone may cause a supplementary 23.8 million kiddies and teenagers to drop away from school or not the year that is next.

Meanwhile, there has long been controversy about using technology in educational settings on a worldwide level (Daniela et al., 2018; U.S. Department of Education, 2017). Similar to this, using ICT in Pakistan is advised to get the best outcomes because it improves teachers' pedagogical skills and encourages students to engage in active learning (Pakistan Ministry of Education, 2018). With all the advancements in digital technology, new educational choices have emerged to give learning that is remote to larger populations, such as for instance open educational resources and massive open online courses (Saykl, 2018). In the modern age that is electronic innovations like online learning, blended learning, social networking, and available learning are crucial for effective education (Bates, 2018). Furthermore, the use that keeps growing of learning tools has changed how we view learning online. The motivation, self-management, control, and environment personalization of learners are all positively impacted by the usage of mobile learning technology in distance learning (Sönmez, Göçmez, Uygun & Ataizi, 2018). Teachers must be taught how to utilize these new tools and how to incorporate them into their own implementations because the majority of educators lack a variety of skills necessary to educate with new technology (Makoe, 2012). Students must also be inspired and prepared for the many and frequently used sorts of remote education classes (Bertiz & Kocamankarolu, 2020). Millions of instructors and students are actually at the mercy of on-the-web learning, a method that is basically new and untested in Pakistan because of the speed and range associated with the chaos that is educational. They're trying out a selection of e-learning systems, such as for instance Zoom, Google Classroom, Hangout, Edmodo, Facebook Live, and WhatsApp Messenger, to avoid education from being disrupted during lockdown (Jahangir, 2020). The Higher Education Commission (HEC) urged university administrators to start offering courses online. It has been a hit in a lot of nations. The HEC in Pakistan overcome a number of challenges and deserves recognition for staying pragmatic throughout the crisis by providing technical assistance to colleges and making a number of online training policy tips. Schools and institutions all over the world have switched from in-person instruction to online learning as part of a huge global interactive learning experiment. Professionals use the tools of the Internet and current software and technology to think outside the traditional conceptions of education to excel in their careers. This points to a great opportunity for educational services to reconsider how schools operate to meet contemporary economic demands.

This study tries to uncover issues that online learning and education in Pakistan during the Covid-19 pandemic encountered. Management, teachers, and students from Lahore's four main universities made up the research population. Teachers and administration received two different sorts of questionnaires, while students received a polling survey to complete using Google Forms. The statistical study of the outcomes uses the descriptive approach. We have obtained encouraging discoveries through the evaluation of the data that highlight some of the difficulties and offer recommendations.

Research questions
Q1. What difficulties have teachers and students encountered in online education and learning in Pakistan during the Covid-19 pandemic?
Q2. What recommendations can be suggested to overcome the challenges faced in online education & learning in Pakistan during the Covid-19 pandemic?

Research objectives
Primary objective

To identify the difficulties encountered in Pakistan's online education and learning during the Covid-19 pandemic.

Secondary objective:

- To determine the connection between a lack of training and online learning.
- To determine the connection between a lack of devices and online education & learning.
- To determine the connection between a lack of support services and online education & learning.
- To determine the connection between time management and online education & learning.
- To determine the connection between differentiated tasks and online education & learning.

Theoretical framework

The adopted arrangement of this study was developed by observing the relationship between the parameters. The parameters in this research were online education & learning, lack of training, lack of devices, lack of support services, time management, and differentiated tasks. The dependent variable was online education & learning and the independent variables were lack of training, lack of devices, lack of support services, time management, and differentiated tasks.
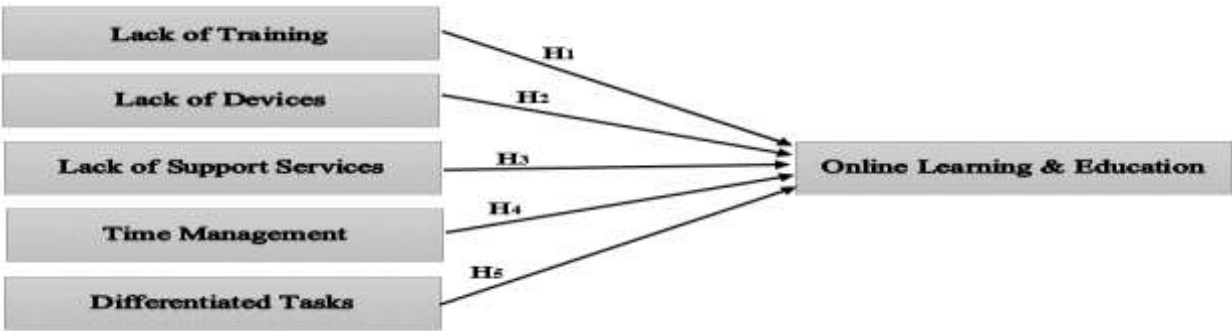
Research Hypothesis

From the proposed arrangement, the following statements can be prepared:

H1: The lack of training is related to online education & learning.
H2: The lack of devices is related to online education & learning.
H3: The lack of support services is related to online education & learning.
H4: Time management is related to online education & learning.
H5: The differentiated tasks are related to online education & learning.

Literature Review

Usage of learning and training, updating skills, increasing expense efficiency, improving the quality of this academic framework, increasing system capability, balancing age gaps, supplying training to specific target teams, supplying excellent training to focus on groups, and increasing learning ability in brand new topics are only some of the reasons why academic organizations choose online education and learning (Moore & Kearsley, 2005).

According to Davis, Gough and Taylor (2019), instructor challenges to online learning may include expectation clarification, feedback distribution, and interactive connections, whereas student obstacles may include objectives misunderstanding, poor time management, and interaction that is interpersonal. O'Doherty, Dromey, Lougheed, Hannigan, Last, McGrath (2018) noted in their research in line with the literature that challenges to online learning in medical training may include time restraints, not enough technical expertise,

insufficient infrastructure, a lack of institutional strategies and support, and unfavorable attitudes from all parties.

You will not find many reports regarding the challenges that learners face in learning contexts including learning online, online learning, and learning that is electronic. There are not many studies on the issues that arise in learning environments like remote learning, online learning, and electronic learning. The majority of the related studies have involved managers and administrators (Berge & Muilenburg, 2000; Bilgiç & Tüzün, 2015; Durak, Ankaya & Zmirli, 2020), parents (Apriyanti, 2020), teachers (Fauzi, Hermavan & Khusuma, 2020; Mailizar, Almanthari, Maulina & Bruce, 2020; Rasmitadila et al., 2020), and students These programs cover everything from kindergarten through higher education, including social sciences, health education, and teacher preparation.

Scientists Fauzi et al. (2020) found that the absence of possibilities, systems, and usage that is internet planning, execution, and evaluation of learning, along with parent collaboration, are hurdles faced by instructors during the Covid-19 epidemic. Rasmitadila et al. (2020) claim that technological concerns, pupil training, low participation prices, and also the Covid-19 epidemic are hurdles teachers face while implementing learning that is online.

Methodology

This research paper employed an exploratory strategy. The goal of implementing this strategy is to identify the challenges encountered in online education and learning in Pakistan during the Covid-19 pandemic. Six universities were chosen as a sample because they were all connected to the same government department and involved with the same local government (Provincial Government). This sample's preference was justified by the same setting, reliance on a comparable superior ministry, location, and classification. Students and faculty from the targeted six universities completed 594 questionnaires, one from each institution.

Table 1. Student information

S.No.	Institutions	Students	Teachers	Management
1	A	95	4	5
2	B	95	4	3
3	C	95	4	2
4	D	95	4	3
5	E	95	4	2
6	F	95	4	5
Total		**570**	**24**	**16**

Table 1 contains information on 570 students (via a polling survey), 24 teachers (via forms), and 16 management staff (via interviews) from the six institutions studied. The researcher hired triangulation to evaluate the validity and trustworthiness of the info helping the conclusion. The researcher hired scholar surveys, trainer questionnaires, and meetings (interviews) with control to perform this triangulation. The records from the questionnaire became accrued through the use of Google Forms. Using this technique, actual target market responses have been revealed.

Findings

Study Query 1: What complications have lecturers and students encountered in online education & learning in the Islamic Republic of Pakistan throughout the Covid-19 pandemic?

Findings based on the students' viewpoint

One of the most crucial applications of e-learning (online education & learning), in the opinion of the students, is the employment of electronic/multimedia versions of the scientific method. Online education and learning are good, raise academic standards, and keep pupils safe, according to the students. Rendering to scholars, the

most challenge to the execution of virtual learning is the underprivileged quality of web language. The learners show that there are unit drawbacks to virtual learning (e-learning), with the most one being that it puts additional pressure on students who drop off the work for academics. The students concur that time management is no doubt a success factor but it was a big challenge during the covid-19 pandemic. Conferring to the scholars, the utmost complication to the implementation of online education & learning is the lack of coaching of employees.

Findings based on the teaching staff's viewpoint

According to the teaching employees, one all the foremost necessary blessings of e-learning is that it fosters students' technological proficiency. All members of the schooling employees concur that virtual learning is extensively used and school members' access to e-mail and alternative e-services is its utmost significant application. The coaching group of workers recognizes that there are demanding situations in imposing virtual learning, with certainly considered one of the largest demanding situations being excessive expense.

The coaching body of workers recognizes that e-mastering has drawbacks, with the principle one being that, in assessment to conventional mastering, it necessitates economic support. All members of the teaching staff concur that preparing the staff for various technological applications presented difficulties. The coaching team of workers recognizes that the truncated value of net offerings is the largest impediment directed toward the deployment of online education & learning.

Recommendation

Study Query 2: What recommendations can be suggested to overcome the challenges faced in online education & learning in Pakistan during the Covid-19 pandemic?

Taking into account the research findings, the following suggestions should help to succeed:
This study aids in the development of a practical assessment of online teaching methods and issues during the COVID-19 pandemic; when face-to-face teaching and learning were severely missing in the educational system. This study offers advice on how professors can more successfully use technology in their pedagogical practices and serve as an efficient substitute for in-person training. The study's conclusions indicate that students did not demonstrate significant interest in or participation in coordinated lessons.

To promote students' e-learning, it is proposed that teachers use interactive communication-based tools and activities to grab their attention and encourage involvement. Parents and institutional administrators should support their students to create a conducive working environment. The university should set up an IT support unit for instructors and students to give technical support, and the Higher Education Commission (HEC) should create a policy to allow internet access for educational reasons. Additionally, a suitable channel should be established to oversee how well teachers are doing in achieving the best results. Management authorities should use a well-designed Learning Management System (LMS) appropriately for this purpose while assessing remote teaching and learning. To deal with unforeseen occurrences that may arise in online education and learning, a contingency plan should be developed.

Conclusion

In light of Pakistan having just experienced the bloodiest day of the coronavirus outbreak, online education and learning have a real possibility to turn a new leaf and seize the chance to move towards a brighter future. It will be important to employ unconventional thinking and proactive, constructive, and proactive strategies across the board to accomplish this. More broadly, internet education and learning have had a big impact on the pandemic. Despite the many obstacles, there are ways to improve education and learning's affordability and accessibility. In conclusion, online education is today positioned to revolutionize the global and Pakistani educational landscapes. However, a considerable shift in pedagogy will be necessary to benefit from

advancements in this subject. Instead of replacing classroom discussions entirely, technology can be utilized to enhance them.

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ORCID

Zohaib Hassan Sain https://orcid.org/0000-0001-6567-5963

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Effects of emergency remote teaching on academic performance of undergraduate students during COVID-19 pandemic in South Africa

Vusumzi Funda[1]*

[1]*Department of Information Systems, University of Fort Hare, South Africa. vfunda@ufh.ac.za,*
https://orcid.org/0000-0001-9185-8237

Liyabona Jali[2]

[2]*Department of Information Systems, University of Fort Hare, South Africa. 201710529@ufh.ac.za*

*Corresponding author

Abstract: The COVID-19 global epidemic caused a radical shift in delivery methods, forcing teachers and students alike into the online space rather than the traditional brick-and-mortar-learning model. Using secondary data, the main objective of this study is to look into the effects of emergency remote teaching on academic performance of undergraduate students during COVID-19 pandemic in South Africa. To facilitate the shift to the online space, higher education institutions in South Africa needed to ensure digital equality during the disease outbreak. This is an area that is not well researched in higher education in South Africa, thus it is important to determine the impact of emergency remote teaching on academic performance of undergraduate students. In comparison to using mobile internet data, authors discovered that students' performance is strongly associated with good Wi-Fi access. Researchers also see lower academic performance among students who found the transition to online complicated and who preferred self-study reading class slides and notes, over helped study such as joining live lectures or watching recorded lectures. This study explores literature on the effects of emergency remote learning in South Africa. The findings suggest that higher education institutions ought to invest in inclusive Information Technology strategy and infrastructure and embed student computer skills in foundation modules. Future studies can be carried out using primary data to determine specific constructs and variables and their impact.

Keywords: Education Technology, Academic Performance, E-learning, Higher Education Institutions

Introduction

The planet is full of confusion, and higher education institutions are no exception when it comes to being exposed to unexpected events (Mashau & Nyawo, 2021). Respiratory infection referred to as COVID-19, is a highly infectious respiratory illness triggered by the SARS-CoV-2 virus, which was discovered in late December 2019 in Wuhan (Talib, Bettayeb & Omer, 2021). It spreads through the respiratory tract or through hand contact with sneezing sick people's droplets dispersed in the environment, infecting the mouth, nose, or eye. The disease outbreak, which causes symptoms like coughing, flu, and severe acute respiratory infection, has been fatal, putting the entire world at risk (Hebebci, Bertiz, & Alan, 2020). Hebebci et al. (2020) assert that governments used quarantine practices and education restrictions to halt the spread of the pandemic. The spread of the disease outbreak COVID-19 has had a devastating effect on all aspects of human life, including education. It has brought a new educational challenge with it. Because we live in a changing world, Ibe, Aneke

and Abamuche (2020) believe that distance learning is here to stay as a form of education in a globalized world. Its widespread adoption has altered the teaching and learning environment.

Statement of the problem

Since the sudden closure of educational facilities caused by the COVID-19 pandemic, higher education institutions in South Africa were forced to make drastic changes in the way they taught. Because most studying was done in person, e-learning had to be a regular occurrence. This drastic change and adaptation have its own set of challenges and benefits, such as the need for students to be technologically well informed. The list of problems associated with emergency remote teaching during pandemics is quite long; students must be self-disciplined, there are coverage issues because students live in different areas, and students struggle with digital devices because some are from poor, marginalised rural areas. There is no longer any face-to-face interaction with students during lectures. E-learning can lead to social isolation and widened digital divide, and it necessitates a high level of self-motivation and time management skills especially from students.

Literature review

Definition of e-learning

E-learning includes online schooling, digital learning, interactive learning, computer-assisted teaching, and internet-based learning (Aljawarneh, 2020). While Crompton and Burke (2018: 55) stated that e-learning refers to learning that takes place on a mobile device and it has some advantages and drawbacks. It is primarily a web-based educational system that makes use of technology to provide information or knowledge to students. Many e-learning platform users believe that e-learning makes it easier to manage e-learning and provides students with easy access to lectures and educational materials (Gautam, 2020; Mukhtar, Javed, Arooj & Sethi, 2020). Moreover, Choudhury and Pattnaik (2020) assert that the concept of remote learning changes as the Web progresses from Web 0 to Web 4.0. As a result, "Web 0, a read-only platform, was used to introduce the world to internet-based learning". Web 2.0 and Web 3.0 respectively, allowed real-time connectivity and connected intelligence. We are now witnessing Web 4.0, in which machines and "human brains can communicate directly" (Choudhury & Pattnaik, 2020).

Theoretical framework: Social constructivism

The study employed Social Constructivism as a theoreticical framework. McKinley (2015) defines social constructivism as a sociological theoretical framework that maintains that human development is socially positioned and that knowledge is constructed through engagement with others. The teaching and learning process, according to social constructivism, is heavily reliant on interpersonal interaction and discussion, with the primary emphasis on students' comprehension of the discussion (Luan & Bakar, 2008). People are active participants in the creation of their own knowledge, according to social constructivism, a social learning theory developed by Russian psychologist Lev Vygotsky (Schreiber & Valle, 2013). According to Vygotsky, education occurs primarily in social and cultural contexts rather than solely within individuals (Schreiber & Valle, 2013). Students, for example, gain knowledge through interaction with other students, teachers, and parents, whereas teachers encourage and facilitate classroom discussion by leveraging the natural flow of conversation (Powell & Kalina, 2009). Teaching and learning process, according to social constructivism, heavily rely on relational meetings and communication, with a primary focus on the students' perceptions of the discussion (Luan & Bakar, 2008). Social constructivism is based on a set of beliefs about reality, knowledge, and learning. It is necessary to first understand and then apply models of instruction based on social constructivist perspectives in order to understand and apply them. Human activity, according to social constructivists, creates reality. Individuals of a society collaborate to create the world's properties (Kukla, 2013). Actual fact, according to social constructivists, cannot be discovered because it did not exist prior to social invention.

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Methodology

This study was done using secondary data, which was accomplished by analyzing information from various scholars as there was no primary data collected due to the Covid-19 pandemic. The literature was sourced from the library's various computerized databases, which are available through the university's website. The context of the study is limited to a higher education institution in the Eastern Cape province of South Africa.

Barriers of e-learning during the COVID-19 Pandemic

A barrier, in accordance with Oxford Dictionary (2015), is "a fence or an obstacle that prevents movement or access." E-learning development is not every time straightforward or effective. It varies from country to country because of cultural, contextual, and preparedness factors (Almaiah & Al Mulhem, 2020). As stipulated in table 1 below, teaching staff, schools, curriculum content, and students were identified as four major barriers to e-learning development (Almanthari, Maulina & Bruce, 2020).

Table 1: Classification of Barriers

Type of Barrier	Description
School Level	System integration accessibility, internet, teaching materials, school rules, period, and technological assistance.
Teacher Level	Self-assurance, information, experience, and faith
Curriculum Level	Content frame, examination, and curriculum-aligned e-learning resources
Student Level	Encouragement, e-learning facilities, and skill and knowledge

Source: Almanthari et al. (2020).

Effective e-learning requires total student satisfaction with the teaching-learning procedure. Many other research findings, likewise, cited multiple challenges and obstacles in implementing e-learning. These investigations documented failure in e-learning in a variety of contexts. Briefly, the reasons for e-learning failure are summarized in the table 2 below.

Table 2: Reason for e-Learning failures

Cause for failure	Source	Description
Readiness of varsities to use e-Learning platforms	Al-Araibi, Naz'ri, & Yusoff (2019)	Students with varying levels of e-learning readiness over time.
Lack of technical support	Eltahir (2019)	Inaccessibility, a lack of technical personnel and an inadequate infrastructure to support variety of activities, as well as slow internet speed and connection issues during the e-learning process.
Teaching stuff acceptance of e-Learning systems	Almaiah & Al Mulhem (2019)	Teaching staff may not accept technology use, as some are not equipped.

Challenges of emergency remote teaching

The disease outbreak crisis is driving the most widespread trial and error in online education around the world. Given its prevalent adoption and expansion, recognising the upsides and downsides of online learning, as well as putting money in, making preparations for, and executing it, requires a systematic approach (Vlachopoulos, 2020). The challenges and potential problems differ depending on the features and readiness of the educational institution. Almaiah & Al Mulhem (2019) and Al-Araibi, Naz'ri and Yusoff (2019) discussed that the key problems associated with e-learning are students' lack of technological ability, which has an effect on the e-learning development through the use of digital platforms and devices This complication when it comes to technology is sometimes felt by teaching staff.

According to Ferri, Grifoni and Guzzo (2020), the primary technological issues are linked to a scarcity of Internet access and digital equipment. This issue may exacerbate imbalance by limiting students' and teaching staff access to necessary technology. According to Kanwal and Rahman (2017), the primary problems impeding the effective rollout of online learning systems in developing nations are software key features, internet knowledge, as well as computer self-efficacy. The major barriers to the effective existing e-learning projects are being implemented, according to Mulhanga and Lima (2017), are substandard interface prototypes, too little technical support, and an absence of IT expertise. According to Al-Araibi et al. (2019),

who mention technical problems as the major indicator for online learning education success, 45 percent of digital learning programs in growing nations are complete breakdowns, 40 percent are slight failures, and only 15 percent succeeded.

The immediate crisis was considered as an excellent possible chance for students to learn skills that improve their individuality as well as competence. One of the most crucial constraints, however, is the destruction of human engagement between lecturers and undergraduates, including between students. When it comes to inclusion issues, the experts recommend taking a hybrid approach whenever possible. Garrison, Anderson and Archer (2008) defines blended learning as "the thoughtful fusion of face-to-face and online learning experiences." It enhances perceptions of "human" aspects and perpetuates feelings of community belonging. The lack of student user interaction and motivation is associated with a social challenge associated with the lost opportunity of human contact between lecturers and undergraduates and among students themselves. Thomas and Rogers (2020) propose using so much engaging tools to gamify schooling in order to increase student engagement and curiosity.

Factors that influence student engagement

A significant amount of study is being carried out to better fully comprehend the impact of various factors on students' viewed studying. Social support, quality of the content and student efficacy in Figure 1 below are mentioned by Khlaif, Salha and Kouraichi (2021) as being some of the factors that influence student engagement. A considerable number of researches have been conducted on the quality of online education, efficient studying, teaching approaches, and course structure. Impactful emergency remote teaching, according to research, is the result of thoughtful curriculum and delivery planning and design, as well as a methodical model of design and implementation. The online design process and choices affect the perceived value of online learning (Hodges, Moore, Lockee, Trust & Bond, 2020).

Figure 1. Factors influencing student engagement
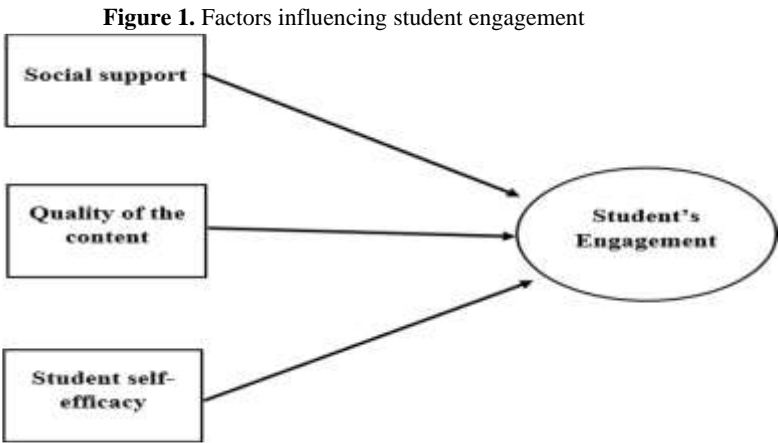
Source. Khlaif, Salha and Kouraichi (2021)

Challenges of emergency remote teaching in rural areas

According to the World Bank (2020), students who are already familiar with using digital techniques to aid their effective learning, particularly from online sources, who have adequate access to good channel capacity and connected devices, and who are supported by their relatives and peers, will be able to make the best use of emergency remote teaching.

Lack of network coverage

While noble, the COVID-19 setup is exclusive and omits many students from poor communities. It is inequitable to design educational systems and processes that would exclude certain students because they are poor or live in underprivileged areas. Moreover, a shortage of connectivity has an adverse influence not only on educational issues but also on COVID-19 prevention strategies used in various contexts (Dube, 2020). In

conclusion, a lack of connectivity disturbs online education and restricts access to knowledge, both of which are crucial in the fight against COVID-19.

Lack of computer skills

The World Bank (2020) asserts that only a small percentage of teaching staff has been educated in online educational techniques and theories, which supports the preceding argument. If lecturers are to assist their students with online learning while schools are closed, they must be ready to do so prior to the closure of the schools (World Bank, 2020). Online learning tools such as Google Classroom, Blackboard Collaborate, Moodle, Prezi and Udemy must be holistically utilised. Computer skills are critical for online learning.

Expensive data

According to Dube's (2020) research, undergraduates and teaching staff in rural South Africa struggled with internet coverage, a lack of devices and gadgets, and the high cost of internet data. Cyber cafés are commonly used by students in rural areas to connect to the internet. However, due to the lockdown, all internet cafes are closed, making participation in the online class difficult. COVID-19 also has an effect on family income. In some cases, their parents' jobs and monthly salaries were lost. The most difficult challenge identified by the students with the highest mean score was the high cost of internet data. To take online classes, you must have a large amount of internet data and consistent connectivity for the learning method to run smoothly (Gohiya & Gohiya, 2020).

Result and discussion

The main objective of this paper was to investigate the factors influencing the academic performance of undergraduate students during COVID-19 pandemic in South Africa. Considering how the forced implementation of emergency remote teaching-learning process affected both the teaching staff and students. This forced transition was not well taken by students as some had serious situations that forced them to being not able to fully participate in digital learning. Having to learn from home where there is no social interaction with other students was one of the factors that affected the academic performance, the internet access and environmental conditions students had to learn under at their homes were not favourable to other students. First year students who were not well equipped with the use of technology (laptops, Learner Management System such as Blackboard) were affected the most. According to the previous studies, there are plenty of variables affecting student engagement in emergency remote learning, but their resilience is not always obvious.

Conclusion

In remote settings, inclusive student engagement in educationally enhancing practices is critical for broadening involvement in computing, but it is difficult to achieve. It is critical to note that even in simple requirements; COVID-19 highlighted the significance of accomplishing digital equality and confidentiality. The level of student participation in the emergency remote learning world was lower than before the COVID-19 emergency (Khlaif, Salha & Kouraichi, 2021). Furthermore, when in comparison to online learning subject matter under regular circumstances conditions, the quality of the value content was poor. Recognizing different variables and their correlations in the same investigation at the same period would improve the accuracy of the research and allow us to analyse the effect of different variables in online learning and students' viewed learning. The research may also enable us to estimate which variables have the greatest influence on how students perceive their knowledge acquisition. The future research using primary data can investigate the circumstances that undergraduate students had to endure when during social isolation as they were forced to learn and study from home due to the COVID-19 disease outbreak.

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ORCID

Vusumzi Funda https://orcid.org/0000-0001-9185-8237

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Availability of instructional materials model of the technical-vocational livelihood curriculum implementation for public senior high schools

Ritchie Barrera[1]

1Graduate School, Negros Oriental State University, Philippines. ritchie.barrera001@deped.gov.ph

*Corresponding author

Abstract: This study is aimed at designing a model that will enhance the availability of instructional materials of the Technical Vocational Livelihood curriculum implementation. A descriptive-correlational design was the over-all strategy of the study. In obtaining the necessary data, a researcher-constructed survey questionnaire had been developed which was then later subjected to pilot-testing in the public senior high schools in the division of Bayawan City. The questions which had been developed were focused on the school and the teacher trainers' profiles, their knowledge, beliefs and attitude, their perceived self-efficacy, and the identified restraining and driving forces that affects the extent of availability of instructional materials of the TVL curriculum implementation. Likewise, queries about the extent of appropriateness of work immersion and extent of availability of instructional materials of the strand offered were also developed. All these questions served as exploratory variables for the study. Apparently, the researcher used total population sampling. The respondents included seventy-six (76) TVL teacher-trainers from the twenty-four (24) identified public secondary schools in the three cities of 2nd congressional district of Negros Oriental namely Dumaguete, Tanjay and Bais. This study has revealed that instructional materials are the primary needs in developing the skills of all the learners in the SHS-TVL schools undertaking the successful conduct of all the activities inside the classroom. Therefore, students learning progression is hindered due to insufficiency of instructional resources but considering also other motivating forces to enhance and innovate availability of instructional resources.

Keywords: Senior High School TVL, Teacher-trainers, Senior High School Work Immersion, instructional materials, DepEd Order No.19 series of 2016, TVL specialization, availability of instructional materials

Introduction

Quality education is essential not only for an individual but also for a country's development and economic growth (Hanushek & Woessmann, 2010). This eventually is also the fundamental pillar of human rights, democracy, peace and sustainable development (Kinara, 2014). Skills and knowledge are the engines for any nation's economic growth and social development (Ayonmike, Okenwela & Okeke, 2013). Careful study relative to curriculum research in other countries such as Norwegian vocational education and training has pointed towards severe vocational educational content issues. The main problem is that the educational content is not sufficiently relevant to qualifications in the actual vocations. Vocational firms complain that students are not adequately qualified (Dahlback, Hansen & Halland et al., 2011).

Since Senior High School Technical Vocational and Livelihood education is now in its third year of implementation in the Philippines, the country is facing with so many challenges as the much-needed facilities, tools and equipment, materials, workshop laboratories, and instructional rooms. According to Ehiametalor (2011), to achieve the goals of an organization, facilities are those factors that enable workers to function effectively. Olokor (2006) evidently assert that instructional facilities enhance learning experiences and augment an interaction within the learning environment. However, there is still a lack of qualified teachers to teach the specific strand of the TVL track. Shulman (2008) identified the teacher as a significant and primary factor in student learning. These are the notable emerging issues in the SHS TVL schools in the Philippines.

Therefore, with these realized gaps, the researcher decided to conduct this study among the TVL teachers in the different public senior schools in three cities of the 2nd Congressional District in the province of Negros Oriental to assess the extent of availability of instructional materials of the TVL curriculum implementation. Data gathered will be used as basis to create a model that would augment and/or enhance the availability of instructional materials of the TVL curriculum implementation.

Literature review
Historical background of technical vocational livelihood education in the Philippines
In a conference presentation made by De Guzman, 2014 on "K to 12 Basic Education Program, a large majority of our tertiary students pursue a college degree and most likely would land a job that mismatches with their skills and competencies. Based on the latest industry data, more than 650,000 available jobs require technical-vocational skills, but more than a million professionals cannot fill these jobs. The system is producing many professionals annually, and it continues to widen the job-skills gap. The K-12 (Kindergarten to Grade 12) system aims to address this gap by solving skills shortage and high youth unemployment and guide students' career choices. The K to 12 systems in the Philippines was enacted through the Enhanced Basic Education Act of 2013 (Republic Act 10533) to place the Philippine primary education at par with other countries. It addstwo years in high school which are specialized upper secondary education composed of a standard Core Curriculum and Tracks. These tracks are comprised of eight core curricula of learning areas that include Language, Humanities, Communication, Mathematics, Philosophy, Science, Social Science, and Physical Education and Health.

Sarmiento and Orale (2016) made a comparative review of related literature on the Philippines' senior high school curriculum, Japan, and the United States. They found out that these countries' senior high school curricula are intended to prepare graduates of the senior high school program to enter college, become entrepreneurs, and find work in the industry. The study revealed that the Philippines has a more definite senior high school program because it has four definite track as compared to Japan which has only two tracks namely academic and technical-vocational. The United States has indefinite tracks considering that the curriculum varies from one state to another; it is up to these states to decide for their curriculum. The study also found out that there is a stigma among students across the three countries to take the vocational track because of the perception that vocational courses are for low-performing and problematic students. The enrollment in the technical-vocation courses in the United States has declined. In the three countries, finding qualified teachers in Senior High School remains an issue.

The scope of TVL curriculum: Vocational education, or the career and technical education, prepares people to work as a technician in jobs such as a trade or a craft (EdGlossary, 2014). A vocational school provides vocational education at the secondary and higher education levels and is the main focus during the apprenticeship. The essence of Technical-Vocational Education (TVE) provides the recipients with essential knowledge and practical skills necessary for entry into the world of work as employees or as self-employed. In particular, the TVE provides knowledge, skills, attitudes, and values that develop middle-level skills to enable the students to start a business, gain employment, and pursue higher education. It is also called Technology and Livelihood Education (TLE), Technical-Vocational and Livelihood (TVL), or Technical & Vocational Education (T&VE). One of the most critical aspects of TVE is acquiring skills and attitudes for gainful employment in a particular or professional area. Agwubike, Akpomudeye and Bestmart (2007) noted that vocational/technical education is a necessary tool for self-reliance and technological development because its main thrust is applying practical learning techniques.

The curriculum is essential to learning development, capacitating students with the necessary knowledge, skills, and attitude. However, curriculum development must not be a one-time event but a continuing process. Farkas (1993) suggested that curriculum update must be a continuing process, with educators remaining up-to-date and leading the changes. Purcel (1993), on writing curriculum, recommended that changes in the past, and changes that are likely to happen should be considered. This process has been evident in the TVL curriculum in the Philippines. The Curriculum and Instruction Division of the Department of Education ensures that the department focuses on delivering an applicable, responsive, and effective primary education curriculum around which all other strands and offices provide support. Such policy is manifested in the TVL curriculum development. The said curriculum was initiated through the 2010 Secondary Education Curriculum (Department of Education Order No. 76 s. 2010). This move was in response to Section 3 (2), Article XIV of the constitution that states: "All educational institution shall inculcate patriotism and nationalism, foster love of humanity, respect for human rights, appreciation of the love of national heroes in the historical development of the country, teach the rights and duties of citizenship, strengthen ethical and spiritual values, develop moral and personal discipline, encourage critical and creative thinking, broaden scientific and technological knowledge and promote vocational efficiency."

The study of Talambayan (2008) and the present study are similar because both studies deal with Technical-Vocational programs. However, Talambayan's study dealt with the students' readiness. In contrast, the present study deals with the Senior High schools in implementing the Technology Vocational and Livelihood curriculum, particularly the different strands with its specializations. The present study deals with the competencies that SHS-TVL students should acquire to prepare and equip themselves for the world of work locally and globally to mold them to be academically proficient and creative and critical thinkers.

Extent of availability of instructional materials in the implementation of the TVL curriculum

The Bureau of Learning Resources of the Department of Education is responsible for developing and managing the national education policy framework on learning resources. They formulate policies, standards, and guidelines for the design, development, evaluation, production, and utilization of learning resources across all organizational levels. The acquisition, allocation, procurement, and equitable distribution of learning resources provide access to quality-assured learning resources. When it comes to quality assurance, all resources delivered to the field should be practically ready for use. Inadequacy of teaching and learning resources, for instance, in Ethiopia, is a constraint to the implementation of TVET in public institutions (Hailu, 2011). Particularly, a lack of standard workshops and modern instructional materials affects the teaching of TVET (Bandele & Faremi, 2012). A corollary effect is the low acquisition of practical skills among students due to ineffective instructional delivery (Dasman, 2011).

In many developing nations, inadequate curriculum resources and outdated equipment hinder the effective implementation of training and teaching programs (Maino, 2013). Teachers' utilization of appropriate equipment, materials, and teaching tools facilitates learning and enhances students' achievements (Umunadi, 2012). However, in most of these nations, instructional materials are inadequate for effective teaching in TVET institutions (Wondaferew, 2012). Such institutions may have insufficient equipment and lack specialist rooms for practical teaching (Ncube, 2014). Similarly, in Kenya, the inadequacy of teaching and learning resources hinders TVET implementation (Indoshi et al., 2010). This inadequacy is expressed in terms of obsolete equipment (Hooker et al., 2011), shortage of material resources (Indoshi et al., 2010; Mupinga et al., 2006), and insufficient time allocation (Indoshi et al., 2010). Automobile engines, sewing machines, computers, computer software, textbooks, stationery, and internet access are often inadequate or unavailable (Mupinga et al., 2006).

Vladimir Quetua, a senior high school teacher at Araullo High School, said senior high school facilities were often lacking (Umil, 2017). In their school, no facilities were provided for some courses such as automotive and baking. A colleague of his had to teach automotive theoretically, without hands-on exercises. As discussed in the preceding literature (Bandele & Faremi, 2012; Umunadi, 2012; Ncube, 2014), appropriate equipment, materials, and tools such as workshops laboratories, lecture rooms, course, and reference texts are required in the teaching and learning process to yield the intended educational outputs. Curriculum implementation is an

interplay of content, teaching and learning process, provision of support services, and monitoring and feedback activities to achieve the intended educational outputs (Ebenehi, Rashid & Bakar, 2016). Therefore, the educational process' kind of outputs depends on utilizing these physical facilities and teaching and learning resources in the curriculum implementation process.

Instructional materials provide opportunities for teachers to promote effective learning. Instructional materials can be derived through various modes, either purchased, locally made, imported, or even improvised when necessary for effective instructional delivery (Iwu, Ijioma, Onoja & Nzeweike, 2011). Many studies have revealed the relationship between instructional materials and academic achievement. The study by Isola (2010) found the effects of instructional materials resources on students' performance in each of the subjects taught in the West Africa School Certificates Examination (NASCE) in Kwara State. Ezeugwu (2009) noted that no subject area does not use instructional materials. Agun (2009) said that learning materials would enable learners to learn faster and better if adequately used. Similarly, Ikeriowu (2000) refers to them as objects or devices that help the teacher make lessons real to the learner. In sum, a large body of research has consistently found that school facilities impact teaching and learning in profound ways over the past century.

Global and local studies on the factors influencing the effective implementation of TVET programs demonstrate a superficial interrogation of some of these factors. For instance, most studies lack specificity in facilities and resources (Ayuba & Gatabazi, 2010; Hooker et al., 2011; Mupinga, Busby & Ngatiah, 2006; UNESCO, 2010). More specifically, little empirical evidence exists on TVL curriculum implementation, thereby creating a dearth of literature in this area. Additional studies have shown that instructional materials have improved achievement (George, 2008) and Nwagbo (2006), but still more research is needed in this area.

Teachers implement the curriculum inside the classroom utilizing different techniques and strategies; thus, transfer of learning continues with necessary classroom interaction among the students and instructional materials, where the teacher demonstrates and facilitates learning sticking to the plan prepared. If the teacher finds some weaknesses in the curriculum, they can make minor changes and flexible enough to make personalized activities more meaningful and successful.

Faculty qualification in teaching TVL and competence in implementing TVL curriculum
Quality education will be delivered if it has quality resources, and teachers are an essential strategic component. Effort to improve educational outcomes requires the involvement of teachers as the key implementers and, at the same time, the central point of any educational reform. This means that teachers must have the appropriate qualifications. The teachers must have professional skills, professional efforts, time devoted to professional activities, and rewards for their work results (Tampang & Wonggo, 2017). Teachers should continuously reflect on their performance, review scientific literature, observe their practice, and communicate with others as benchmarks. Teachers should adapt to changes in their institution, profession, world of work, market, national educational system, and vocational pedagogy (Enock, 2019). Teachers must be up-to-date about the pedagogical theories and updated on the world of work and those vocations he is teaching (Education and Culture-Slovenia, n.d.).

Central to teaching vocational education methods that are practical includes imitating, practicing real-world problem solving and sketching, while those which are theoretical include listening to theoretical input, reflection on experience, and coaching, which draws out a theory. All vocational education subjects require a judicious mix of theory and practice to achieve the desired outcomes (Lucas et al., 2012: 110). According to Wolfe (2012), the thing that always strikes him about vocational subjects like music and sport is teachers' absolute perfectionism. Good teachers of music are utterly disinterested in it being good enough. There are a brutal minimum and an assumption that all learners will reach it. That is very different from academic subjects. Good vocational teachers do not have low expectations; they do not do low expectations. Specifically, the level of skills and knowledge of teachers and work-based instructors is a vital determinant of the quality of any country's education and training system. Instructors' insufficient numbers and qualifications are among the main factors responsible for the low quality of instruction (ADB 2009). Teachers must have appropriate academic qualifications, competencies, and certifications. They must be physically and mentally healthy and can realize national education goals. They are the education system's primary mechanism, general or

vocational education (Paryono, 2015). Thus, TVET teachers' competencies are the key points that reflect the quality of vocational education and graduates in the job market.

Any educational institution's importance is teachers' training and professional development in the primary, middle school, high school, or even the university level. Teachers at all levels need to be trained in their related fields and subject matter regularly to change their teaching beliefs, attitudes, and daily life practices in classrooms (Boudersa, 2016). However, teachers' behavior cannot be changed overnight if they believe the curriculum implementation is rightful.

Teachers' knowledge, beliefs and attitude towards TVL curriculum implementation
Teaching is a noble profession, and the knowledge, belief, and attitude a teacher possesses will significantly affect the learning center's goal and direction, whether it be a public or private school. The teacher who possesses the necessary qualification to implement the curriculum will lead to a successful teaching-learning process. One study shows that TLE teachers and students at a state university in the Philippines had positive attitudes towards their work and the physical and learning environment (Retome et al., 2012). This condition led to a successful teaching-learning process for the university.

Mays (2008) emphasized the importance of having qualified teachers in teaching, and he said that the success of any vocational, educational, or any specialized course of instruction is conditioned by the teacher's ability to teach. If there is a failure at the teacher level, the whole structure fails. Hence, vocational education teachers' selection, preparation, and supervision significantly impact the courses of actions undertaken. The relevant issues in selection and preparation differ somewhat in the different year levels and vocations for which training is given.

Social and environmental factors affecting TVL implementation (international and local schools)
Education that has become a shared experience in the learning community's contexts benefits that public (Clark & Fiency, 2007). Education brings a change in society. It will raise the countryside's development, promote knowledge and understanding of the rural communities, and enable the people to understand themselves, and increase economic growth and stability (Huda, 2016). Education is the golden ticket to a better life. Benjamin Franklin once said, "An investment in education pays the best."

However, the new educational reform in the Philippines, the K-12, is bombarded with issues and concerns at the curriculum development, implementation process, and bureaucratic processes. One of such issues is the massive training of teachers and the school head's orientation. The national training of trainers' program was cascaded down to the regional and division level, which affected the implementation since much time was spent on training while also complying with the school year's prescribed number of school days. In terms of the availability of instructional materials, most of the time, there are none or, if available, they are inadequate learning materials. The instructional materials deficit includes the students' textbooks and teacher's manuals and science and vocational subject facilities, equipment/ apparatus, and supplementary teaching/ learning materials.

Other barriers to effective curriculum implementation are large classes, teacher availability (for the specialized secondary subject areas), and instructional supervision quality. There is an emphasis on instructional supervision since it is also one factor that makes every school successful. Supervision is "the glue of a successful school" (Glickman, Gordon & Ross-Gordon, 1998: 6), and it is a tool for school improvement (Sharma, 2011).

Self-efficacy of teachers in the implementation of TVL curriculum
Selfefficacy is defined as "people's judgments of their capability to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986: 391). Grounded in Bandura's social cognitive theory's theoretical framework, since its introduction, the construct of self-efficacy has been identified as a significant variable for predicting an individual's behavior (Bandura, 1977). Expectations of self-efficacy determine whether instrumental actions will be initiated, how much effort will be put into the action, and how long the action will be sustained in the face of challenges and failures. Once an action is taken, highly self-efficacious people invest more effort and persist longer than those with low self-efficacy. When setbacks occur, they recover quickly and stay committed to their goals (Schwarzer & Hallum, 2008).

Teacher'sself-efficacy is commonly used in several studies. Teacher'sself-efficacy was found to be one of the factors that impacted student success (Armor et al., 1976 cited in Woolfolk Hoy & Spero, 2005). Tschannen-Moran &Woolfolk-Hoy, 2001), Armor et al. (1976), and Bandura (1977) define teacher self-efficacy as the teachers' judgments regarding the extent they could affect student outputs, including challenging students who have low motivation. Woolfolk-Hoy and Spero (2005) argue that teachers' self-efficacy beliefs impact teachers' degree of professional targets and the targets to best for the future. Moreover, it is pointed out that teachers with a high degree of self-efficacy beliefs tend to continue learning their subject matter, use innovative techniques, and encourage their students to succeed (Ross, 1994, 1998 cited in Woolfolk-Hoy and Spero, 2005). Moreover, teacher self-efficacy tends to influence student success (Caprara et al., 2006; Ertmer, 2005; Goddard et al., 2000; Guo et al., 2010, Roberts, Henson, Tharp & Morena, 2001; Tschannen- Moran & Johnson, 2011), innovative teaching (Ahllinder, 1994; Lee et al., 2013), and teacher motivation and performance (Caprara et al., 2006; Colodarci, 1992; Khurshid et al., 2012; Tschannen-Moran & Woolfolk Hoy, 2001; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998; Woolfolk & Hoy, 1990).

Research methodology and design

Research methodology
For this study, the researcher used total population sampling. The respondents included seventy-six (76) TVL teacher-trainers from the twenty-four (24) identified public secondary schools in the three cities of 2ⁿᵈ congressional district of Negros Oriental namely Dumaguete, Tanjay and Bais. The data used in carrying out this investigation and eventually fashioning a model were extracted from these respondents. Descriptive statistics were used by the researcher in presenting the profiles of the schools identified and the TVL teacher-trainers. Similarly, the respondents' extent of knowledge, beliefs and attitude, their perceived self-efficacy, the restraining and driving forces that affect their notion towards the availability of instructional materials, along with the extents of appropriateness of work immersion and availability of instructional materials were presented categorically using weighted mean. Moreover, the extent of relationship between the extent of availability of instructional materials of the TVL curriculum implementation and the number of trainings attended, extent of knowledge, beliefs and attitude and perceived self-efficacy of respondents were established using Spearman correlation coefficient test. The analysis of variance was used to unveil the degree of influence of the independent variables such as extent of knowledge, beliefs, and attitude, perceived self- efficacy, and the number of trainings of the respondents to the dependent variable, extent of availability of instructional materials of the TVL curriculum implementation. Finally, the stepwise linear regression was used to predict the values of a response (dependent) variable from a collection of predictors (independent) variable values and for fitting regression models in which the choice of predictive variables is carried out by an automatic procedure. In each step, a variable is considered for addition to or subtraction from the set of explanatory variables based on some pre-specified criterion.

Research design
The researcher utilized descriptive-correlational design as an over-all strategy for the study. A researcher-constructed survey questionnaire had been constructed which was then later subjected to pilot-testing in the public senior high schools in the division of Bayawan City. The pre-testing result yielded an excellent outcome after it had been subjected to reliability testing using Cronbach alpha. Moreover, the researcher-constructed survey questionnaire was used in describing the profiles of the identified schools and teacher-trainers. The same questionnaire was used to measure the respondent's knowledge, beliefs, and attitude, their perceived self-efficacy, as well as the restraining and driving forces. The extent of availability of instructional materials and extent of appropriateness of work immersion were also determined using the same questionnaire. Most of the questions were adapted from Department of Education Order No.9, series of 2016 regarding "Guidelines on the Organizational Structures and Staffing Patterns of Stand-Alone and Integrated Public Senior High School", policies and guidelines on the implementation of the K-12 program particularly the SHS curriculum and the SHS work immersion program and from the General Self-Efficacy Scale of Matthias Jerusalem and Ralf Schwarzer in 1979 particularly on the self-efficacy questions.

Results and discussion
This section presents the analysis, results, and its discussion, which is arranged according to the sequence of this study's research questions. Different statistical procedures were used to answer research objectives. The analyses' main aim was to achieve the highest level of statistical power possible to detect a true treatment effect (Schneider et al., 2005). Factors that affect statistical power include sample size, level of significance,

and effect size. The first objective was to describe the school's profile, while the second was to identify the respondents' profile in terms of the grade level taught, the number of training attended, highest educational attainment, and grade level.

The third objective focused on the extent of knowledge belief and attitude, while the fourth objective was to determine the perception of self-efficacy to implement the school's TVL curriculum. The fifth objective explored the extent of instructional materials' availability, followed by the 6th objective, which aimed to determine the extent of work immersion's appropriateness. The eighth objective was on the extent of relationships between the teachers' profile, the knowledge beliefs and attitudes, and the perceived self-efficacy. The last objective was aimed at creating a Technical-Vocational and Livelihood education curriculum implementation model for the senior high school.

The school's profile was characterized by its offerings of TVL strands, the number of teachers handling the different TVL strands, training conducted, and the school's proximity to the business centers.

Problem statement 1: What is the profile of the schools in terms of curriculum offerings, teachers handling the TVL strands, trainings conducted and proximity of the school?

Table 1 shows that out of 24 school respondents, only 4 or 16.67% offered Agri-Fishery Arts (AFA), a total of 8 or 33.33% offered Information and Communication (ICT), 50% or 12 schools offered Industrial Arts and Home Economics respectively. This disparity in schools' offerings in terms of strands and specialization may have been affected by the availability of qualified teachers or trainers in the area as well as the equipment and facilities (ADB and DepEd Survey 2019). Adding to this is that the three cities were highly agricultural and industrial, and most public secondary schools were situated in the far-flung areas, of which agriculture and the presence of different industries were the main source of livelihood of the people.

In terms of the number of TVL trainers for each specialization cited, there were 10 out of 76 trainers or 13.16 % handling AFA, 21 or 27.63% were teaching IA, 29 or 38.16% in HE, while the remaining 16 or 21.05% were in–charge in ICT courses. These figures suggested that AFA, IA and HE were the common TVL specializations offered by most of the public secondary schools in the three cities covered in the study. These figures also equate to the number of teacher-trainer required to teach the offered specialization.

Moreover, there were trainings conducted by the respondent-schools relative to their specializations offered. Survey results showed that there were 9 or 37.50% respondent-schools which conduct about 1 to 2 trainings, 11 or 45.83 schools led about 3 to 4 trainings relative to specialization offered, 3 schools or 2.5% directed about 5 to 6 trainings, while only a school or 4.17% out of 24 schools conducted 7 or more TVL trainings relative to its specialization offered.

Finally, the proximity of these public senior high schools (as rural or urban) to the business center is also reflected in the table. These schools were categorized into urban schools of which the distance to the business center is within the 5 kilometer radius. Schools beyond the 5 kilometer radius were already considered rural schools, in as far as this study is concern. Figures revealed that majority of the schools were located in rural areas at 62.50% or 15 schools out of 24 in contrast with 37.50% or 9 schools in the urban areas. With these contrasting figures, the researcher inferred that the distribution of schools has an effect on the school's immersion program, where it would be easier to deploy students in urban rather than in rural areas.

Table 1: Profile of the Schools in terms of Curricular Offerings, Teachers, Trainings Conducted and Proximity of the School

Variables		Responses			
		Not Offered	**Percent (%)**	**Offered**	**Percent (%)**
TVL Strand Offered	Agri-Fish	20	83.33	4	16.67
	Indu Arts	12	50.0	12	50.0
	HE	12	50.0	12	50.0

			Frequency (f)	Percent (%)
	ICT	16	66.67	8	33.33

		Frequency (f)	Percent (%)
Teachers Handling TVL Strand	Agri-Fish	10	13.16
	Indu Arts	21	27.63
	HE	29	38.16
	ICT	16	21.05
Total		**76**	**100**
Trainings Conducted	Number of Trainings Conducted	Frequency (f)	Percent (%)
	1 - 2	9	37.50
	3 - 4	11	45.83
	5 - 6	3	12.5
	7 or more	1	4.17
Total		**24**	**100**
Proximity of the School	rural	15	62.50
	urban	9	37.50
Total		**24**	**100**

Problem Statement 2: What is the profile of TVL teacher-trainers from the respondent-schools in terms of grade level taught, highest educational attainment, number of trainings attended, and National Certification (NCs, TMs) earned?

The succeeding table herein displays the profile of TVL teacher-trainers in terms of the grade level their handling, their educational attainment, the number of trainings attended relative to their specialization handled, and the national certifications they have obtained, again relative to their specialization handled. In terms of grade level taught, table 2 shows 40 or 52.63% of TVL teacher-trainers were assigned in Grade 11, while 36 or 47.36% of them were handling Grade 12 TVL classes. In the course of the informal group discussion between the researcher and some TVL teacher-trainers, it came out that some teacher-trainers were handling both TVL classes in Grade 11 and 12, particularly schools in the rural areas.

Figures in table 2 also reveals the educational attainment of TVL teacher-trainers from both class levels. There were 34 teacher-trainers or 44.74% who had bachelor's degree, while there were also 34 teacher-trainers who had master's units. Seven or 9.21% of them had obtained their master's degree while a lone teacher-trainer or 1.32% has doctoral units. The data imply that the majority of the teachers still needed to upgrade their educational qualifications through graduate and post-graduate studies, considering that the competencies of the courses in senior high school need higher qualifications and expertise. According to Diep and Hartmann (2016), teachers must be competent to teach the specialization because teaching competency entails integrating theory and practice in classroom activities. Relative to qualification, vocational teachers must design teaching and learning appropriately (Ball et al., 2008) while considering vocational learners' background. They also need to use different teaching techniques and use a practical approach to attain the teaching objectives. All these can be achieved when teacher-trainers continuously upgrade themselves and keeping abreast of the latest trends and development in teaching and learning.

On the number of trainings attended by the teacher-respondents, data shows that majority of the teachers at 29 or 38.16% had only attended 1 to 4 trainings comparative to their specialization taught, 26 or 34.21% teacher-trainers had attended about 3-4 trainings, 9 of them or 11.84% had participated in about 5 to 6 trainings, while 12 or 15.79% had joined more than 6 trainings relative to their specialization handled. These figures imply that teachers disproportionately received trainings, and that majority of them only attended or joined a handful of trainings in their area of specialization. This disparity may not fully equip all teachers with the necessary skills needed for each strand and specialization. Abassah (2011) argued that teaching technical education requires training in relating both science and technical education to practical problems from primary to higher education. This is because TVL education aims to develop practical skills and creative and innovative abilities and enable decision-making skills and problem-solving abilities.

Finally, the data also reveal that majority of the teacher-trainers obtained only National Certification II (NC II) at 53.95% which equates to 41, 3 or 3.95% of them had NC III, while 11 or 14.47% of them had Trainers Methodology (TM) certification. Teachers to be hired in the TVL track should possess at least an NC 2, which should not be lower than that of the specialization to be handled. In the case of Bread and Pastry NC II specialization, a teacher-trainer must also be of the same level of the required NC or higher certification level as stipulated in the DepEd Order (DO) 3, s. 2016. An additional requirement for a TVL teacher applicant is the Trainer's Methodology Certificate (TMC) only if it is available. The TM holder could be given a Teacher II position immediately upon the availability of an item.

Professional competency for vocational teachers is necessary for them to master their subject matter with the latest information needed by vocational learners (Grollmann, 2008). Effective professional development should transform and restructure the quality of teaching and educational institutions.

Table 2. Profile of Teacher-Trainers in terms of Grade Level Taught, Highest Educational Attainment, Number of Trainings Attended and National Certifications Earned (N=76)

Variables		Responses	
		N	**Percent**
A. Grade Level taught	Grade 11	40	52.63%
	Grade 12	36	47.36%
Total		**76**	**100.00%**
B. Highest Educational Attainment	Bachelor's Degree	34	44.74
	Masteral Units	34	44.74
	Masters	7	9.21
	Doctoral Units	1	1.32
Total		**76**	**100**
C. Number of Trainings Attended	1 -2	29	38.16
	3 -4	26	34.21
	5 -6	9	11.84
	6 or more	12	15.79
Total		**76**	**100**
D. National	NC 2	41	53.95

Certificates Earned	NC 3	3	3.95
	TM	11	14.47
Total		**76**	**100**

Problem Statement 3: What is the extent of knowledge, beliefs, and attitude of the respondents towards the availability of instructional materials of TVL curriculum in the school?

Table 3 shows the teacher-trainers' knowledge towards the availability of instructional materials of the TVL curriculum. There were about 15 statements describing their knowledge in the delivery of instructions of the TVL curriculum using the available instructional materials. The average mean of teacher-trainers' knowledge came out to be at 4.39, which fits in to the verbal description of "strongly agree". It could be noted that all of them expressed strong agreements in all the 15 statements describing knowledge towards the availability of instructional materials. These figures suggested that teacher-trainers had sufficient knowledge in delivering instructions using available instructional materials of the TVL curriculum particularly in the specialization they handled.

Table 3. Respondents' Extent of Knowledge towards the Availability of Instructional Materials of TVL Curriculum Implementation
N= 76

ITEM	Mean	Standard Deviation	Verbal Description
1. Familiarity with the pedagogy of a proactive lifestyle relative to the specialization taught.	4.37	0.644	SA
2. Identification on between visual and verbal learners during the actual hands-on activities.	4.29	0.766	SA
3. Grasping the importance of video tutorials available on the Internet in congruence with specializations taught.	4.41	0.706	SA
4. Purposively knowing how to foster self-controlling responsibility towards every learner inside the classroom and other stakeholders.	4.34	0.635	SA
5. Understanding how to shape team work creatively.	4.51	0.616	SA
6. Seeing the characteristics of each individual inside the classroom.	4.48	0.636	SA
7. Knowing students' developmental phases to give essential coaching and mentoring.	4.43	0.632	SA
8. Knowledge of values and the crisis in the modern age.	4.35	0.638	SA
9. The process of vocational practical training is well-planned.	4.26	0.67	SA
10. Pedagogical characteristics of vocational practical training.	4.26	0.707	SA
11. Familiarity with developing problem-solving capabilities during technical vocational hands-on training in the school.	4.36	0.661	SA
12. Understanding on how to search for information on the Internet relevant to competencies to be taught.	4.41	0.65	SA
13. Cognizance of the role of self-determination when working.	4.46	0.674	SA

14. Recognition of the importance of personal role modeling.	4.45	0.654	SA
15. Performed an ability to think out of the box in work related scenarios.	4.41	0.63	SA
Mean	4.39	0.661	SA

Legend:

Rubrics	**Verbal description**
4.20 - 5.00	Strongly Agree
3.40 - 4.19	Agree
2.60 - 3.39	Moderately Agree
1.80 - 2.59	Disagree
1.00 - 1.79	Strongly Disagree

Subsequent table 3.2 shows the beliefs and attitude of teacher-trainers towards the availability of instructional materials of the TVL curriculum. There are also 15 statements assessing beliefs and attitude of teacher-trainers towards the availability of instructional materials. The weighted mean of beliefs and attitude of respondents is 4.46 with equivalent verbal description of "strongly agree." Item number 10 on the *"access to modern equipment, instructional materials, and the availability of learning resources such as books and laboratory equipment"* has the lowest mean rating among all the statements at 3.79 with verbal description of "agree". This rating might be a little vague but overall, this revealed that students had very limited access to modern equipment and instructional materials. It is quite definite that public Senior High Schools offering TVL strands in the three cities mentioned had the necessary equipment and facilities but may not be sufficient for all learners. It can be recalled that in DepEd's Computerization Program (DCP) package, senior high schools were not considered or included yet, but it does not mean they don't have computers to be used in their respective laboratories.

Finally, according to Young (2015), the future of students is linked to the highly changing global community. As they are called the 21st-century students with which they would be able to conquer the world, join and collaborate in international companies, compete and work with people from other countries, supervise employees from other cultures, and collaborate with people all over the world and work out problems globally. Thus, there is a need to provide sufficient modern equipment and learning resources for them.

Table 4. Respondents' Extent of Beliefs and Attitude towards the Availability of Instructional Materials of TVL Curriculum Implementation N=76

Item	Mean	Standard Deviation	Verbal Description
1. Workplace communication participation.	4.69	.708	SA
2. Team environment working.	4.68	.570	SA
3. Career professionalism practice.	4.71	.537	SA
4. Occupational health safety practices and safety procedures.	4.69	.542	SA
5. Updating and developing industry knowledge.	4.51	.639	SA
6. Workplace observation on hygiene procedures	4.62	.629	SA
7. Computer operations and performance.	4.36	.939	SA
8. Provide effective customer service.	4.37	.854	SA
9. Curriculum is very comprehensive.	4.23	.821	SA
10. Students don't have access to modern equipment and instructional materials of the school.	3.79	1.231	A
11. The economic development of both individual and the country and the students are well developed through learning of vocational subject.	4.64	.644	SA
12. Professional training is essential to teacher's efficiency.	4.78	.526	SA
13. Industry partners could cater to work immersion of students with relevance to the strand offered.	4.55	.696	SA

Item	Mean	SD	VD
14. Parents/guardians take responsibility of the work immersion of their son/daughter in terms of finances.	4.24	.871	SA
15. Learning resources availability such as modern equipment which also include textbooks and in the case of practical vocational training which enables hands-on training and supports skills acquisition of the students.	4.03	1.081	A
Mean	**4.46**	**.752**	**SA**

Legend:

Rubrics	Verbal Description (VD)
4.20 - 5.00	Strongly Agree
3.40 - 4.19	Agree
2.60 - 3.39	Moderately Agree
1.80 - 2.59	Disagree
1.00 - 1.79	Strongly Disagree

Table 4 shows the teachers-trainers' perceived self-efficacy towards the availability of instructional materials of the TVL curriculum. About 15 statements were crafted appreciating the self-efficacy of teacher-trainers towards the availability of instructional materials. Survey results revealed that respondents are highly capable of delivering top-notch instruction using available instructional materials. The average mean of 4.28 with verbal description of "highly capable" indicates that despite of the meager instructional resources, teacher-trainers find ways and means and use their creativity and ingenuity to supplement what is lacking or needed to consummate delivery of instruction. However, it can be noted that in item number 14 on *"ensuring that all students pass the NC II assessment from TESDA by providing………"*, teacher-trainers are a little doubtful of the task on hand. This is probably because of the limited resources of the school for learners to use and practice their skills. Nevertheless, teachers are ever ready to serve and assist the students, which has been proven over time. The mean rating for this statement is 3.89 with verbal description of "very capable". The rating does not totally affect the overall self-efficacy of respondents towards the availability of instructional materials rather a manifestation to better their craft.

Teachers' self-efficacy, namely teachers' beliefs in their ability to effectively handle the tasks, obligations, and challenges related to their professional activity, plays a key role in influencing important academic outcomes (for example, students' achievement and motivation) and well-being in the working environment (Barni, Danioni & Benevene, 2019). On the other hand, Djigić et al. (2014) in his study revealed that teachers with higher levels of openness to experience and conscientiousness reported to have a stronger sense of efficacy.

Table 5. Perceived Self-Efficacy of Respondents towards the Availability of Instructional Materials of TVL Curriculum per Specialization N=76

Item	Mean	Standard Deviation	Verbal Description
1. Set instructional goals for the offered specialization.	4.52	0.595	HC
2. Include all parents as part of any planning that impacts teaching and learning which includes immersion activity that needs their financial and moral support.	4.27	0.811	HC
3. Assist and coach co - teachers who are struggling particularly in the topic or lesson seems to be difficult for them or teachers who are not expert on the specialization they are handling	4.06	0.847	VC
4. Ensure that the new strategies/techniques that affect teaching and learning in school are implemented with respect to the TVL strand offered particularly its specialization.	4.27	0.746	HC
5. Take the responsibility for improving instruction by being creative and innovative in the teaching of the different competencies of the TVL specialization offered.	4.43	0.725	VC

Item	Mean	Standard Deviation	Verbal Description
6. Feed backing about TVL program is considered in school	4.11	0.842	VC
7.Inspire learners to perform to the highest level in all TVL programs in school	4.45	0.71	HC
8. Maximize time to teach the learning competencies of the specialization taught in the TVL strand.	4.4	0.704	HC
9. Perform all the necessary hands-on activities utilizing all the required tools and equipment on the specialization offered.	4.24	0.815	HC
10. Take charge in the preparation of daily lesson logs to make teaching and learning meaningful and purposive.	4.34	0.795	HC
11. Ensure that all necessary materials and other supplies needed in the activities are prepared ahead of time.	4.26	0.759	HC
12. Apply understanding of research-based knowledge and principle of teaching and learning in the specialization offered in the school.	4.33	0.632	HC
13. Provide enrichment activities to students at risk.	4.30	0.683	HC
14. Ensure that all students pass the NC ll assessment from TESDA by coaching and mentoring and conduct pre- assessment in the school level.	3.89	1.067	MC
15. Demonstrate mastery of all the skills found in the curriculum guide in a certain specialization to be taught as what is being offered in the school.	4.36	0.716	HC
Mean	**4.28**	**0.763**	**HC**

Legend:

Rubrics	**Verbal Description (VD)**
4.20 - 5.00	Highly Capable
3.40 - 4.19	Very Capable
2.60 - 3 39	Moderately Capable
1.00 - 1.79	Not Capable
1.80 - 2.59	Less Capable

Problem statement 5: What is the extent of availability of instructional materials used in the strand offered? Table 5 presents the extent of the availability of learning materials used in each strand offered by the respondent-schools. The overall mean score of 3.47 with verbal description of "agree" denotes that learning or instructional materials in each strand are not sufficient to consummate delivery of instruction, so that teachers need support in securing facilities and equipment necessary for effective transfer of instruction. On item number 6, *"Learners' materials are sufficient and delivered on time",* the mean score of 2.69 with verbal description of "moderately agree" only suggest the need for government agencies concern to improve production and delivery of instructional materials to schools, and probably develop a system that can forecast or project the number of students in a particular division especially those in the far-flung areas.

Table 6. Extent of Availability of Instructional Materials of the TVL Curriculum Implementation N=76

Item	Mean	Standard Deviation	Verbal Description
1. Availability of complete and sufficient supply of curriculum guide, textbooks and workbooks	3.26	.990	MA
2. Availability of instructional materials that are innovative and interactive.	3.56	.884	A
3. Instructional materials stated in the curriculum guide are available	3.56	1.003	A

Item	Mean	Standard Deviation	Verbal Description
4. Procedures of the lessons are properly followed in the teacher's guide (TG) utilizing interactive facilities.	3.91	.874	A
5. Curriculum guides for all TVL strands and specializations are delivered on time.	3.78	1.043	A
6. Learner's materials are sufficient and delivered on time.	2.96	.974	MA
7. Supplementary materials are also provided.	3.06	.998	MA
8. Instructional materials are safe and attractive to the pupils	3.54	1.043	A
9.Availability of collaborative technology-enriched learning environments conducive to innovation for improved learning	3.61	1.013	A
10.Availability of computer and other modern technologies to support and enhance instructional methods that develop higher-level thinking, decision- making, and problem-solving skills	3.76	1.05	A
Mean	**3.47**	**.987**	**A**

Legend:

Rubrics	**Verbal Description**
4.20 - 5.00	Strongly Agree
3.40 - 4.19	Agree
2.60 - 3.39	Moderately Agree
1.80 - 2.50	Disagree
1.00 - 1.79	Strongly Disagree

Problem statement 6: What is the extent of appropriateness of work immersion program for each strand offered? The survey result on the appropriateness of the work immersion program for each TVL strand is revealed in table 6. There were 10 questions or statements describing the appropriateness of the work immersion to which teacher-trainers rate or score base on their experience. The total mean for the appropriateness of the work immersion as shown in the table is 4.15, with verbal description of "agree". The result can be interpreted as, referring to the work immersion programs, proper and fitting to the strand taken by the learners. Rates given by respondents were not perfect because, as there were flaws and lacking in the delivery of instructions, there were also limitations of real work experience of learners in their respective workplace assigned. Industry partners, especially in the remote areas are not high-tech and that they provide training based only on their manpower capability and the availability of their technologies or machineries. Item number 3, *"on the learning competencies of the student-trainees are completely applied in the industry"* mean score of 3.96 suggested that not all competencies of the work immersion were applied in the workplace or in the industry where the learners are assigned. Item number 5, on *the "actual use and access to the company/industry workplace and equipment as part of their work immersion program are being implemented"*, mean score of 4.03 also revealed limited access to industries' equipment and other facilities by learner-trainees. Moreover, the three cities in this study are not first class nor highly urbanized that presence of government regulators are rarely felt.

Table 7. Extent of Appropriateness of Work Immersion Program for each Strand N=76

Item	Mean	Standard Deviation	Verbal Description
1. Industry is observant to the health and safety of work immersion students pertinent to their specialization.	4.15	0.858	A
2. The activities provided are relevant and applicable to the Work Immersion students in consonance with their specialization.	4.12	0.848	A

3. The learning competencies of the Work Immersion students are completely applied in the industry.	3.96	0.934	A
4. Relevant learning experiences are provided for exposure in their actual workplace setting.	4.16	0.803	A
5. Actual use and access to the company/industry workplace and equipment as part of their Work Immersion Program are being implemented.	4.03	0.871	A
6. Work Immersion Daily Schedule of activities are religiously followed with proper guidance and monitoring.	4.15	0.982	A
7. Student's performance are assessed by the industry through a day to day checking with proper coordination and feed backing on their performance and technical assistance provided.	4.16	0.934	A
8. Opportunities are given to work immersion students to discover their talents and skills and specifically learn on what to do when they get on the job.	4.3	0.786	SA
9. Actual performance on the use tools and equipment with proper instruction and guidance for work immersion students for the enhancement of skills, knowledge and attitude.	4.23	0.729	SA
10. Creation of a wholesome workplace environment in order for the work immersion students to feel at ease and comfortable during their immersion.	4.15	0.931	SA
Mean	4.15	0.774	A

Legend:

Rubrics	Verbal Description
4.20 - 5.00	Strongly Agree
3.40 - 4.19	Agree
2.60 - 3.39	Moderately Agree
1.80 - 2.59	Disagree
1.00 - 1.79	Strongly Disagree

Problem Statement 7. What are the perceived restraining and driving forces identified by respondents that affect the availability of instructional materials of the TVL curriculum? The restraining forces that affect the availability of instructional materials are displayed in table 7. Restraining forces are forces working to block or counter progress towards a goal or objective. They tend to limit or decrease the driving forces. It is part of the Force Field Analysis tool for change management created by Kurt Lewin.

For this survey, there are 15 statements by which respondents are to assess each statement's level of prevalence as restraining force towards the delivery of instruction using available instructional materials in TVL curriculum. Overall mean score of 3.15 construed as "moderately prevalent" came out to be the general sentiments of the respondents. This means that restraining forces enumerated impacted or hinders the delivery of instruction using the available learning resources, thus affecting the learning progression of students. Of the 15 statements of forces, item number 13 on *"sufficient supply of computer units and other modern technologies that support instructional method……."* has the lowest mean score of 2.91 interpreted as "moderately prevalent". Evidently, most of the public secondary schools offering SHS TVL curriculum don't have sufficient computers and other educational technologies in their respective laboratories. Other items contributory to the overall low mean score are items number 2, 5, 10, and 11, on *"sufficient number of strands and specialization offered, specializations offered do not match with the interest of the learners, standard classroom sized used as laboratories are spacious, and appropriate and sufficient working space"* respectively.

Table 8. Extent of Restraining Forces affecting the Extent Availability of Instructional Materials of the TVL Curriculum Implementation N= 76

Item	Mean	Standard Deviation	Verbal Description
1. Specializations offered match with the interest of the learners in the community.	3.35	1.066	MP
2. Sufficient number of strands and specializations offered by the school.	3.00	1.180	MP
3. Business stakeholders cater the graduating students for work immersion in the localities.	3.35	1.163	MP
4. Establishments and organizations caters work immersion students.	3.20	1.161	MP
5.Some of the specializations offered do not match with the interest of the learners in the community.	3.09	1.113	MP
6.The school adequately engages with business stakeholders to create a plan for achievement and success for work immersion of each student in all required competencies.	3.41	1.107	SP
7.Discussions on the student's progress during work immersion in the linked industry.	3.38	1.103	SP
8. The school encourages an active network of industrial partners and educators working together	3.51	1.028	SP
9.The school motivates the business partners to participate in school activities pertaining to TVL programs.	3.36	1.014	MP
10.Standard classroom size used as laboratory or workshops and spacious working areas are evident	3.00	1.212	MP
11. Appropriate and sufficient working space, demo room, and learning resource center.	3.04	1.252	MP
12.Availability of tool room, storage area, supply room, circulation area, toilet, and locker room.	3.17	1.328	MP
13.Sufficient supply of computer units and other audio-visual equipment to support and improve instructional methods that develop higher-level thinking, decision-making, and problem-solving skills.	2.91	1.316	MP
14. Sufficient budget to cater the needs of the TVL program.	3.23	1.277	MP
15. School level Insets have been conducted to improve the capabilities of teacher.	3.23	1.230	MP
Mean	**3.15**	**1.15**	**MP**

Legend:

Rubrics	Verbal Description (VD)
4.20 - 5.00	Very Seriously Prevalent
3.40 - 4.19	Seriously Prevalent
2.60 - 3.39	Moderately Prevalent
1.80 - 2:59	Less Prevalent
1:00 - 1.79	Least Prevalent

Table 8 outlines the driving forces identified by respondents affecting delivery of instruction using available instructional materials of the TVL curriculum. Driving forces are also part of the Force Field Analysis tool developed by Kurt Lewin for change management. Influencing a situation with these forces in a particular direction. The 'positive' causes that are typically viewed to enable change include new personnel, shifting markets, new technology, managerial pressure from competitors, incentives, politics, legislation, and shareholders (DanielLock Consulting, 2019)

There are 15 statements of forces intended to drive respondents towards the delivery of instruction using available learning materials. Survey result showed a 4.05 average mean with verbal description of "seriously prevalent". This result indicates that respondents are extremely considering the forces enumerated as driving or motivating to enhance and innovate the availability of instructional resources. What drives most of the teacher-trainers is the participation of business and industry partners in school activities pertaining to the TVL programs. They rated it as "very seriously prevalent" with a mean score of 5. This insinuates that respondents are welcoming collaboration and alliance with business and industry partners of the schools relative to the delivery of quality, relevant and meaningful TVL education to learners in public secondary schools, hence, they can simulate classroom instruction based on theories to actual industry practice. This corroborates to item number 11 on *"appropriate and sufficient working space, demo rooms and learning resource center"*, of which respondents scored it at 4.41 equating to "very seriously prevalent" verbal description. The industry partners' workplaces would now be the laboratories, demo rooms, and learning resource centers of student-trainees, as they go on-board for the work immersion program.

Table 9. Extent of Driving Forces affecting the Availability of Instructional Materials of the TVL Curriculum Implementation (N=76)

Statements	Mean	Standard Deviation	Verbal Description
1. Specializations offered match with the interest of the learners' in the community.	3.96	.962	SP
2. Sufficient number of strands and specializations offered by the school.	3.77	.920	SP
3. Business stakeholders cater the graduating students for work immersion in the localities.	3.90	.963	SP
4. Establishments and organizations caters work immersion students.	3.84	1.028	SP
5. Some of the specializations offered do not match with the interest of the learners in the community.	3.44	1.160	SP
6. The school adequately engages with business stakeholders to create a plan for achievement and success for work immersion of each student in all required competencies.	4.04	.881	SP
7. Discussions on the student's progress during work immersion in the linked industry	4.12	.840	SP
8. The school encourages an active network of industrial partners and educators working together	4.12	.758	SP
9. The school motivate the business partners to participate in school activities pertaining to TVL programs.	5.00	6.912	VSP
10. Standard classroom size used as laboratory or workshops and spacious working areas are evident	3.81	1.003	SP
11. Appropriate and sufficient working space, demo room, and learning resource center.	4.41	4.425	VSP
12. Availability of tool room, storage area, supply room, circulation area, toilet, and locker room.	3.68	1.052	SP

13. Sufficient supply of computer unit and other modern technologies to support and enhance instructional methods that develop higher-level thinking, decision-making, and problem-solving skills.	3.40	1.195	SP
14. Sufficient budget to cater the needs of the TVL program.	3.83	.950	SP
15. School level Insets have been conducted to improve the capabilities of teacher.	3.93	1.033	SP
Mean	4.05	1.605	SP

Legend:

Rubrics	Verbal Description
4.20 - 5.00	Very Seriously Prevalent
3.40 - 4.19	Seriously Prevalent
2.60 - 3.39	Moderately Prevalent
1.80 - 2.59	Less Prevalent
1.00 - 1.79	Least Prevalent

Succeeding table summarizes the weighted means of all variables relative to availability of instructional materials of the TVL curriculum implementation.

Table 10. Summary of Respondent's Weighted Mean for All Independent Variables relative to the Extent of Availability of Instructional Materials

	Weighted Mean	SD	VD
Knowledge towards availability of IMs	4.39	.525	SA
Beliefs and Attitude towards availability of IMs	4.46	.725	SA
Self-efficacy towards availability of IMs	4.28	.763	HC
Availability of Instructional Materials	3.47	.987	A
Appropriateness of Work Immersion Program	4.15	.774	SP
Extent of Restraining	3.15	1.15	MP
Extent of Driving Forces	4.05	1.605	SP

Problem statement 8: Is there a relationship between the extent of availability of instructional materials and;

      8.1 number of trainings attended;

      8.2 extent of knowledge;

      8.3 extent of beliefs and attitude; and,

      8.4 extent of perceived self-efficacy.

Table 10 shows the Spearman's correlation coefficient test result between the extent of availability of instructional materials of the TVL curriculum and number of trainings attended by respondents, their extent of knowledge, beliefs and attitude, as well as their extent of perceived self-efficacy. Results reveal a strong association of the accessibility of instructional resources of the TVL curriculum with the respondents' number of trainings at coefficient of correlation (r) level of -.242, and extent of knowledge at r=.356 level. Extent of beliefs and attitude and perceived self-efficacy of respondents had also trivial and significant relationships

with the availability of instructional materials of the TVL curriculum at coefficient of correlations levels of .085 and .432 respectively. Correlations were significant at the 0.01 level.

The strong correlation of the extent of knowledge and the availability of instructional resources of the TVL curriculum can be attributed to the general awareness of the respondents in terms of the instructional materials, facilities and laboratory equipment needed to carry out TVL curriculum instruction. They are also cognizant of the implementation processes and guidelines in the conduct of the training, and the core competencies to be attained. According to Bransford (2014), teachers need knowledge of their students' subject matter. Teachers must be equipped in terms of pedagogy content, content of the classroom and the ability to impart this to the real classroom setting. (König et al., 2016). Moreover, this include relationships with students, subject matter knowledge and an understanding of pedagogical processes to develop the understanding that is required. Should a teacher fail to have any of these, then it is likely that the learning in the classroom will never be successful. However, it would be foolish to single out one of these abilities to the exclusion of the others because teaching, like the majority of people-centered professions, calls for a variety of skills and abilities that the practitioner carefully combines in order to offer the most fulfilling learning experience.

Because it impacts the level of effort put forth on a given work as well as the sorts of aspirations and goals that principals will set for themselves, self- efficacy is an essential to individual's success (Bandura, 1986; Gist & Mitchell, 1992 in Versland, 2009). The importance of self- efficacy in leadership settings is promoted by Bandura (2000) claims that people who have a strong sense of self- worth will work harder to overcome challenges " (as cited in Versland, 2009).

Bandura (1997) further elaborated that self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance". He found that rather than their real talents, people are motivated to achieve the goals they set for themselves by their beliefs and judgments about their personal capabilities. People's efforts are more active and persistent the higher their self-efficacy. Bandura made it obvious that the evaluation of what a person can do with the skills he or she possesses is more significant than skills alone. "It is when one is applying skills that high efficacy intensifies and sustains the effort needed to realize a difficult performance" (as cited in Versland, 2009).

Hereunder is table 8 showing the relationships of the availability of instructional resources with identified variable.

Table 11. Relationship between Extent of Availability of Instructional Materials and Number of Trainings, Extent of Knowledge, Beliefs and Attitude and Perceived Self-Efficacy of Respondents

Variables	Coefficient of Correlation	Remarks
Number of Trainings	-.242	Strong
Extent of Knowledge	.356	Strong
Extent of Beliefs and Attitude	.085	Weak
Extent of Perceived Self-Efficacy	.432	Strong

Problem statement 9: What implementation model can be designed to explain the availability of instructional materials of the TVL curriculum implementation in the schools covered in the study? Table 11 shows the effects of the extent of knowledge self-efficacy, and number of training on the extent of availability of instructional resources of the TVL curriculum implementation. As seen, only self-efficacy and number of training had significant effects on the availability of instructional materials. Specifically, self-efficacy is positively related with availability of instructional resources ($b = .313$, $p = .021$). This implies that teachers who had high perceived self-efficacy tended to maximize better the use of available instructional materials of the TVL curriculum implementation in their respective schools. However, number of training had negative relationship with TVL implementation ($b = -.214$, $p = .050$). This finding seems counter-intuitive: those who

attended more training tended to lessen or minimizing the use of available instructional materials of the TVL curriculum implementation. Probably, these teachers were too preoccupied with attendance to numerous training that lessen their time devoted to instruction and use of available instructional resources of the TVL curriculum implementation

Table 12. Coefficient[a]

Model		Unstandardized Coefficient		Standardized Coefficient	t	Sig.
		B	Std. Error	Beta		
1	(Constant)					
		1.082	.778		1.391	.169
	Mean (EOK)					
		.191	.202	.125	.947	.347
	Mean (POC)					
		.441	.186	.313	2.369	.021
	NumTrainings					
		-.161	.081	-.214	-1.995	.050

a. Dependent Variable: mean (EOA)

Table 12 shows the results of the hierarchical regression performed to determine what statistical model can best explain the availability of instructional materials of the TVL curriculum implementation and what other factors could be included in such model. As shown, all of the three models can explain the availability of instructional materials for TVL curriculum but of all the models, Model 3 can be considered the best one to explicate and clarify the availability of instructional materials of the TVL curriculum implementation. This is because Model 3 describes the biggest variance of the latter (Adj. R^2 = .157). This is not totally surprising, because all of the three independent variables namely extent of knowledge, extent of perceived self-efficacy, and number of training attended were entered into this model, while in Model 1, only extent of knowledge and in Model 2 only extent of knowledge and self-efficacy were entered in the statistical model.

Individually, the extent of knowledge explains the largest variance of the availability of instructional materials of the TVL curriculum implementation (R^2 Change = 0.084 or 8.4% of the variance). Thus, the most important factor that should be improved among the TVL teacher-trainers are their extent of knowledge towards the use of available instructional materials of the TVL curriculum implementation. On the other hand, self-efficacy (R^2 Change = .062 or 6.2%) and number of training (R^2 Change = .045 or 4.5%) can also explain some variance of the availability of instructional resources of the TVL curriculum implementation

Table 13. R square and R square changes in the model
Model Summary

Model	R	R Square	Adj. R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.290[a]	.084	.071	.763	.084	6.679	1	73	.012
2	.382[b]	.146	.122	.742	.062	5.244	1	72	.025
3	.437[c]	.191	.157	.727	.045	3.979	1	71	.050

a. Predictors: (Constant) mean Extent of Knowledge
b. Predictors: (Constant) mean Extent of Knowledge, mean Self-Efficacy
c. Predictors: (Constant) mean Extent of Knowledge, mean Self-Efficacy, Number of Trainings

ANOVA[a] test result as presented in table 9.3 shows that the model meaningfully predicts the outcome variable at F-value of 5.600 which yielded a p-value of .002[b]. This result is less than the set level of implication, hence

the model suggestively forecasts the use of available instructional materials of the TVL curriculum implementation.

Table 14. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.874	3	2.958	5.600	.002[b]
	Residual	37.502	71	.528		
	Total	46.375	74			

a. Dependent Variable: meanEOA
b. Predictors (Constant), NumTrainings, meanPOC, meanEOK

In coming up with the model proposal, the researcher employed stepwise linear regression. *Stepwise linear regression is a process or method of multiple regression variables while concurrently removing those that aren't important. It* essentially does multiple regression several times, each time of which removing the weakest correlated variable. At the end, only variables that explains the distribution best are left. The only requirements are that the data is normally distributed (or rather, that the residuals are), and between the independent variables there is no correlation.

The "Model Summary" as exhibited in table 9.4 gives details of the overall correlation between the variables left in the model and the dependent variable. With model 1 below, R square of .191 *indicates that* some 19.1% of the variation in the dependent or outcome variable, availability of instructional resources of the TVL curriculum implementation can be explained using the independent variables or predictors enumerated. These independent variables are the number of trainings respondents attended, extents of knowledge and perceived self-efficacy towards the use of available instructional materials of the TVL curriculum implementation.

Table 15. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.437[a]	.191	.157	.727

a. Predictors: (Constant), NumTrainings, meanPOC, meanEO

A statistical model that can best explain the availability of instructional materials for the TVL curriculum implementation can be constructed based on the R^2 Changes brought by the independent variables in the models presented in Table 16. With this, the following regression formula has been constructed to produce the best model expounding the availability of instructional materials for the TVL curriculum implementation as follows=

> **Extent of Availability of Instructional Materials = (.084 * Extent of Knowledge) + (.062 * Extent of Perceived Self-Efficacy) + (.045 * Number of Trainings)**
> **where the amount of variance expressed in percentage are,**
> **Extent of Knowledge = 8.4%**
> **Self-Efficacy = 6.2%**
> **Number of Training = 4.5%.**

Conclusion

Recognizing the challenges that influence the extent of availability of instructional materials in the Senior High School Technical-Vocational Livelihood track. This study has revealed that instructional materials are the primary needs in developing the skills of all the learners in the SHS-TVL schools undertaking the successful conduct of all the activities inside the classroom. The development of students' skills includes critical thinking, reasoning, effective communication, and problem solving. Teacher trainers must be

competent enough to teach the necessary specialization they have mastered with which they are apparently NC 2 and TM holders.

The Senior High School Technical-Vocational Livelihood track as one of the major tracks in the Senior High School of the K to 12 Program which eventually aimed to producing globally competitive Filipinos equipped with the 21st century skills and life-long learning. Along this line, these skills help them to become ready with employment in for jobs in the middle level, entrepreneurship, and higher education. However, this study reveals on the extent of availability of instructional among the Senior High School offering TVL strand is inadequate. The SHS-TVL schools must cater the students' needs in terms of competencies of the specializations being offered in which they must learn. But since instructional materials are not readily available which is the primary needs in the day today activities inside the classroom, teacher-trainers exhaust all means and take the full responsibility for the improvement of instruction by being creative and innovative. Likewise, school administrators of the Senior High School take the lead in the implementation of the program with the stakeholders' participation through feedbacking of the schools' issues and concerns during conferences. Stakeholders' involvement specifically in planning and for the financial and moral support as well also aided in the schools' program implementation.

Regarding the strand offered in this study, this acknowledges the four strands offered with different specialization of the public Senior High Schools in three cities of the 2nd congressional district. Only few schools offered Agri-Fishery Arts, followed by ICT, while Home Economics and Industrial Arts are equally offered. So therefore, the highest number of teachers is Home Economics followed Industrial Arts. Self - efficacy of the teacher trainers reflects the student's outcome in the outside world which is imperative to the high level of expectations particularly of the knowledge and skills they have. Majority of the teacher respondents in this study only have a handful of training in their area of specialization but sufficient knowledge, beliefs and attitude are acquired by them using available instructional materials particularly of the specialization they handled during delivery of instructions. Teachers' competence here dwells on the skills trainings they attended, updating of their professional competence gained through professional education. Teachers' requirement to teach the specialization a few have been conducted so it is positive that only a handful of training have been attained.

It also denoted that learning or instructional resources in each strand are not sufficient to consummate the delivery of instruction, so that teachers need support in securing facilities and equipment necessary for transfer of instruction. Since there is lack of facilities, tools and equipment work immersion is appropriately needed to improve the learner's capabilities and they will be given enough time to explore the industries real world of work but sad to note that in this study it has been found out that there are limitations., where those urban schools are more privileged compared to the rural schools where to be specific those located in the far-flung areas find it hard to avail the needed work experiences and tools in developing the necessary skills.

A model has been designed to explain the extent of availability of instructional materials of the TVL curriculum covered in this study which has a greater effect on the extent of knowledge, self-efficacy, and the number of trainings. This implies that teachers who had high perceived self-efficacy tended to maximize better the use of available instructional materials of the TVL Curriculum implementation in their respective schools. Relative to the number of trainings this has a negative relationship on the use of available instructional materials of the TVL implementation. Therefore, students learning progression is hindered due to insufficiency of instructional resources but considering also other motivating forces to enhance and innovate availability of instructional resources.

Funding

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Audio recorded-assisted teaching for improve instructional retention during integrated reading in ESP

Minerva Gonzales Paler[1]

[1]*Department of Education, Dapitan City National High School, Philippines. palerminerva8@gmail.com, https://orcid.org/0000-0001-8366-4328*

*Corresponding author

Abstract: The purpose of this analysis, which is in keeping with the theme of the study, is to determine the motivating effects of the instructional vocabulary on the ninth-grade students' recall of the tasks taught using Chomsky's primary principle of repetition. This study was conducted using a descriptive survey design. For this study, the pre-test and post-test arrangements constituted a single group. The participants in this sample were thirty (30) ninth-grade students from Dapitan City National High School. In this study, the purposeful testing technique was employed. The evaluation of the respondents with regard to the particular measure is illustrated by the objective analysis. The data shows that they were exposed to a lecture technique during the pre-intervention period. During the post-intervention method, researchers deliver identical material to students via audio-recorded conversation; however, the students must listen to the audio three times (3x) in addition to the self-learning module in the face-to-face environment. The results indicate that the retention rates of students differ dramatically from the lecture method. Therefore, it is obvious that audio-recorded information promotes retention among ninth-grade students since they can hear it repeatedly. Therefore, there is a demand for courses and tutorials on creating captivating audio recordings. Additionally, boost expenditure on educational technologies to improve instruction and literacy for students.

Keywords: Audio-Assisted Teaching, Instructional Retention and Repetition

Introduction

Students struggling academically and have developmental issues may benefit significantly from using audio-recorded reading as an educational technique. Listening to a multilingual audio recording (Morphs, 2017) and following along with what is said are required for the operation. Compared to traditional teaching methods, audio-recorded reading is more helpful in helping students in junior high school who struggle with reading improve their instructional vocabulary retention scores and attitudes about reading (Kaplanis, 2013).

Several goals may be accomplished via teaching reading. However, the most important ones are to excite students about reading, to stimulate their interest in the content they are studying, and to provide them with a compelling reason to read for leisure on their own. Reading instruction effective at the beginning level should provide students with a wide variety of reading-related activities, as this will help ensure that the program's goals are met with every student. Jay Samuel suggests that individuals who have difficulty reading should prioritize practicing their reading skills through repeated reading. In order to get their minds ready for reading, this strategy has the students listen to short audiobooks that range from 50 to 200 words. Listening to audiobooks requires the same cognitive abilities as reading print books, according to the National Literacy Trust (2017), which makes it easier to comprehend and remember the information. Utilizing read-along book

collections and audio CD collections can allow them to reap the benefits of the connection between writing and speaking. In addition, the child's listening abilities will improve as a result of listening to audiobooks, which will positively impact their academic success.

It may be challenging for a language instructor to teach literacy, particularly instructional vocabulary retention, especially if they are not native speakers of the target language. Students' interest in learning English terms or vocabulary relies on the sources of information and enjoyment they are exposed to, claims Chomsky (Chomky, 1976). According to some, the most effective and motivating design approach for reading is the repeated hypothesis. Reading instruction must provide kids with a broad range of experiences at the beginning of reading that leads to several crucial features of reading in order to accomplish these goals for all pupils (Owen, 2017) The researcher uses repetition theory in this study to examine how audio-recorded teaching can increase instructional retention during integrated reading in ESP.

Literature review

Reading, in particular, is a skill that can be learned across various subject areas, not only in language classes. Nevertheless, before introducing instructional vocabulary, it is essential to understand the critical grammatical concepts that EL students need to be aware of. First, they need to be aware that there will be as many distinct grammatical errors as there are students. Thirdly, instructors must possess enough awareness of variations and inconsistencies and appropriate knowledge of scientific terminology. Second, they must be aware of the first language phonetic system's entrance (Kelly, 2000). Teachers will be able to include instructional vocabulary examples in their lesson plans and aid their students in acquiring the necessary instructional vocabulary for effective and meaningful communication after they have realized the reality behind these aspects of instructional vocabulary (Griffiths, 2011). Teachers will also "enable students to attain the threshold level so that their speech ability will not interfere with their instructional vocabulary" (Murcia et al., 1996: 8).

Students should be taught instructional vocabulary and phonology, the two components of instructional vocabulary analysis, at the early stages of learning new words during ESP lessons (Kelly, 2000). While phonology "is concerned with how sounds operate in the language in contrast to each other," the examination of word definitions is related to instructional vocabulary (Forel & Puskás, 2015: 3). When learning instructional vocabulary, students may be able to hear mistakes and fix them on their own via word understanding.

Thus, audio recorded approach boosts students' attention, increasing their interaction when magnified adequately. In other words, better hearing enables children to acquire and remember more information. Students who use classroom amplification devices may hear more clearly and retain more information. Additionally, it promotes the development of fluency abilities, including appropriate expression and phrasing. Students' ability to recognize sight words is improved. It improves understanding. Due to this, students can hear the tone and tempo of an expert reader.

Methodology

The research is an exhibit of action research process. Action research is a methodology that conforms to a quasi-experimental approach to tackling problems in an incremental manner (McNiff, 2017). However, the most significant difference between the experimental group (15 students) and the control group (15 students) in the post-intervention process was that the experimental group students were forced to listen to the radio three times in addition to completing the self-learning module. It was repeated many times.

Selection criteria and sources of data and information

The respondents were ninth-grade students which later be applied with instructional retention activity utilizing audio-recorded teaching. This study's sample consisted of thirty distinct participants' responses. Purposive sampling is used to select participants for the investigation. In this strategy, respondents are picked depending

on whether or not they meet the study's predetermined criteria. Students from Dapitan City National High School are the responses' major target audience. The participants will first listen to the audio, and then be given a twenty-item instructional vocabulary exam to determine whether they are motivated to acquire new words during the ESP teaching session, specifically instructional vocabulary, and whether they can recall those terms.

Data analysis

The collected data was analyzed and interpreted using descriptive and inferential statistics, specifically: (1) descriptive analysis and (2) dependent or paired T-test.

Result and discussion

1. What is the retention level of the students with and without using audio-assisted teaching in learning vocabulary?

Table 1. Descriptive analysis of retention score with and without using audio-assisted teaching in learning vocabulary

Descriptive Analysis	*WITHOUT*	*WITH*
Mean	6.4	14
Median	6	14
Mode	6	14
Standard Deviation (SD)	1.846761034	1.835325871
Minimum	3	11
Maximum	10	18

Table 1 shows that students in the control group scored lower which implies low retention level with a mean of 6.4, while the experimental group who have received the intervention scored higher which implies a high level of retention with a mean of 14. Thus, the SD of 1.846761034 in the control group, and 1.835325871 in the experimental group shows that the data scores varies or dispersed. Furthermore, in the analysis of the minimum, the control group of students scored 3 out of 20 items, while the experimental group got a minimum score of 11 out 20 items, and the maximum scores in the control group scored 10 out of 20, while the experimental group scored 18 out of 20. Based on the data, the students applied with intervention scored higher in the vocabulary retention test.

Result and discussion

2. Is there a significant difference in the retention level of the respondents with and without the audio-assisted instruction learning vocabulary?

Table 2. Testing significant difference in the retention level of the students

t-Test: Paired Two Sample for Means

	With	Without
Mean	6.4	14.00
Variance	2.552380952	2.495238095
Observations	15	15
Pearson Correlation	0.060381228	
Hypothesized Mean Difference	0	
df	14	
t Stat	18.13951953	

P(T<=t) one-tail	2.01123
t Critical one-tail	1.761310136
P(T<=t) two-tail	4.02245
t Critical two-tail	2.144786688

The levels of retention that the students achieved after learning vocabulary with and without the use of audio-assisted teaching are compared in Table 3. According to the findings of the test, there is a discernible gap in the level of vocabulary retention shown by the students who used audio-assisted instruction and those who did not make use of such instruction.

Conclusion

This research examined the efficacy of the content of audio recordings in terms of their ability to motivate students who are in the ninth grade to improve the amount of vocabulary they know through the use of new words. Both of these students believed that the reading activities in ESP that they participated in were more enjoyable and informative if they were accompanied by audio recorded content that they listened to (replay/repetition) multiple times throughout the course of the activity, which was found to be effective. This is because they listened to the content multiple times during the course of the activity, which was found to be effective. This idea came from the educational principles of the 21st century, especially existentialism, which stresses how important it is for students to learn by doing.

Funding

In this study funds are not of primary concern since the author is enhancing and introduced innovation in the application of the teaching and learning process without sacrificing the unavailability of funds. It contains the passion of the teacher to extend an extramile of support to elevate the quality of the teaching instructions of the treaching and learning process.

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Theme 3:

Psychosocial Health and Wellbeing (PHW)

Evaluation of parental perception of psychosocial impacts of girl child's early and forced marriages in Anambra State Nigeria

Chinwe Uchechukwu Amatu[1*] , Doris Morah[2] , Oluchukwu Augustina Nwafor

[1,2&3]*Department of Mass Communication, Madonna University Nigeria, Okija, Anambra State, Nigeria.* adaolinma2008@yahoo.com[1], morahng@yahoo.com[2], oluchiaugustina@yahoo.com[3] https://orcid.org/0000-0002-7688-141X[1] https://orcid.org/0000-0002-7854-3238[2]

*Corresponding author

Abstract: The study investigated parental perception of psychosocial impacts of child marriage in Nigeria. The aim was to contribute to measures to end violence for positive psychosocial, well-being of girl child and peaceful co-existence for positive developments globally. The objectives include: determining whether the respondents were aware of psychological impacts of child marriage, evaluate the respondents' attitudes toward psychosocial impacts of child marriage and ascertain the respondents' perceived actions that can ameliorate the psychosocial impacts of child marriage. The study, anchored on selective exposure and selective perception theories, adopted survey research design with the questionnaire as data collection instrument. Multi-stage sampling technique was used to select three villages out of all selected Local Government Areas in Anambra where child marriage was prevalence. The population for the study was 1,831,255 adults in Anambra state and a sample of 384 was studied. Statistical tables with mean scores, frequency distributions and percentages were used to analyze raw data from the field. Results showed that respondents were: aware of psychosocial impacts of child marriage, had unfavorable disposition towards the impacts and were of the opinion that parents should join hands at different level with government and other stakeholders to help ameliorate the psychosocial scorch of child marriage. Based on the findings, the researchers recommended the need for more sensitization/advocacies to encourage parents to delay consenting to girl child marriage until daughters attained maturity age and provision of accommodating laws, monitoring compliances and giving punishments for all citizens involved in child marriage..

Keywords: Child marriage, Psychosocial impacts, Parental awareness, Attitude, Perception

Introduction

Advocacy against early marriage for the girl child is not only important for eradication of violence against the female gender: but also for mental stability and cultivation of socially acceptable behaviours among all females in the society. The tradition of advocating against early marriage for the girl child started many years ago. The link surrounding early marriage and health of the female gender was initially observed in the advice given by Soranus of Ephesus, a Greek physician in the 15th century. Then there were high risks of mother and child during delivery leading to high mortality rate: one in every fifty pregnancies ended with maternal death as a result of child birth complications. During the investigation, it was observed that the infections and hemorrhages that contributed to high mortality rate were attributed to very young age of the mothers, with underdeveloped pelvic bones (Sheilla & Odhiambo, 2019). Soranus' raised awareness and advice against Roman tradition of early marriage justifies the attestation that avoiding early marriage could improve the psychosocial health and well-being of the girl child.

In an attempt to promote and mobilize people everywhere to promote girl child protection especially in the aspect of child marriage and force marriage, the campaign against child marriage was instituted by United Nations (UN). Through the UN General Assembly's Conventions on the Rights of the Child in 1924 and 1959, "Declaration of the Rights of the child (CRC)" and "Elimination of all Forms of Discrimination against Women (CEDAW)" were adopted. Other organizations defending children's rights are; United Nations International Children's Emergency Fund (UNICEF), Defence for Children International (DCI), Child Rights International Network (CRIN), African Charter on Rights and Welfare of Child (ACRWC), International Bureau for Children's Rights (IBCR) and other international agencies. The United Nations General Assembly adopted 11th October, every year as International Day of the Girl Child. United Nations (2012) statistics reported that every year, many people from many countries of the world are part of this celebration.

The Nigeria government also followed the global trend to institute various domestic and religious laws to fight child marriage. Agege et al (2018) noted that these various domestic and religious laws to fight early marriage covered sets of variables such as equality within marriage, age, consents of marriage and personal property rights of the female gender. Furthermore, Nigerian government cued into United Nations' (2021) global day for girl child celebration every October 11th of every year. Each year's celebration comes up with a unique theme such as: "Hey Woman monologues" of 2016, "Orange the world: End violence against women now!" of 2021 and "Education cannot wait' of 2022 to strengthen the information on pressing need to end violence of any kind against women for positive psychosocial, health and well-being of the girl child.

Engaging children especially the girl child into early marriage aborts the girl's hope and cherished dreams. Agege et al. (2018) confirmed that "early marriage forces girls into adulthood before they are emotionally and physically matured, and it has harmful effects on their health, educational, economic and social development". When the psychosocial being of a girl child is negatively affected, it thwarts the move to end poverty, positive economic growth and desired equity. The nature of child marriage and its consequential effects are contained in the various themes of campaign messages against child marriage ("Hey Woman monologues" of 2016, "Orange the world: End violence against women now!" of 2021 and "Education cannot wait' of 2022) and need to be understood and accepted for effective global win. Parental' perception is essentially important; their knowledge of the various campaign messages against child marriage is of vital importance to the general public and policy makers because it will help them to respond to lifestyle changes that will positively impact on the psychosocial health and well-being of the girl child.

If the Anambra state residents are not adequately informed, it will be difficult for the citizens to communicate and interact with one another, understand the psychological and sociological complications of embracing marriage at too young an age and make demands on government, even when it is in their own interest. The act of interpreting and translating the messages of campaigns against child marriage into decisions that will change attitudes is complex and needs empirical investigation. It is against this background that the researchers evaluated parental perception of psychosocial impact of child's early marriage in Anambra state.

Statement of problem
The Nigerian society has been threatened with high rate of child marriage (Save the Children, 2021). This increases the girl child's vulnerability to all forms of violence especially psychosocial violence. UNICEF (2021) confirmed that much economic, health, psychological, social and well-being factors are accelerating the vulnerability of girl child to child marriage in various countries including Nigeria. Furthering the act of child marriage is the issue of Nigeria's unity in diversity nature, specifically, her multi-religious system. According to Arowolo (2022) COVID-19 pandemic and its compliances such as conflict, kidnapping and economic recession have joined forces with previous factors to increase the susceptibility of Nigerian girl child to all forms of violence.

To address all these mentioned psychosocial concerns, government and other international agencies have officially, approved the use of different legal, empowerment and communication strategies at different levels

with regard to opinion formation and the utilization of communication messages to achieve positive changes that will improve the value of the girl child for peaceful human co-existence. In spite of all these measures, Okoye (2022) confirmed reports of cases of child marriage prevalence in Awka North, Anambra West, Anambra East, Ogbaru, Ayamelum, Oyi as well as Orumba North and South Local Government Areas in Anambra state. Okoye (2022) narrates that parents are still involved in consenting to child marriage in the above mentioned areas. It is not clear how the respondents in the study area perceived these intervention programmes and their disposition towards the psychosocial impacts of child marriage. It is against this background that the researchers were motivated to empirically evaluate parental perception of psychosocial impacts of child' early and forced marriages in Nigeria.

Research objectives/research questions

The main Objective of the study is to evaluate parental perception of psychosocial impacts of child's early and forced marriages in Nigeria. The specific objectives include to:

1. Determine whether the respondents were aware of psychological impacts of child marriages
2. Evaluate the respondents' attitudes toward psychosocial impacts of child marriage
3. Ascertain the respondents' perceived actions that can ameliorate the psychosocial impacts of child marriage.

The following research questions guided the researchers to achieve the set objectives:

RQ1: Are the respondents aware of psychological impacts of child marriage?

RQ2: What are the respondents' attitudes toward psychosocial impacts of child marriage?

RQ3: What are the respondents' perceived actions that can ameliorate the psychosocial impacts of child marriage?

Literature review

Child marriage: A conceptual overview

Various international organizations such as United Nations (UN), United Nations International Children's Emergency Fund (UNICEF), Defence for Children International (DCI), Child Rights International Network (CRIN), International Bureau for Children's Rights (IBCR and African Charter on Rights and Welfare of Child (ACRWC) and the African Youth Charter (AYC) are united in agreement with the definition and explanation of the concept 'child" as any human being that is below 18 of age. In Africa, a child is also regarded as a minor, specifically, Nigeria in her 1999 constitution established 18 years and above as "the legal age" for marriage. The Nigerian legal institution accepts birth registration, emphasizes that the act of recording of birth must be by government authority and attaches importance to it as a legal document for prove and protection of children in all spheres of life including against child marriage. Through this recordings, the existence in law of a child is established which in turn, lays the legal framework for the acceptance of a child as a legal entity. In addition, birth registration of children serves as evidence for a child's age against various child abuses including early marriage. The study adopted this age concept "18 years and below" to evaluate parental perception of psychosocial impacts of child' early and forced marriages in Nigeria

United Nation (1924) "Convention on the Rights of the Child" established that Child marriage or early marriage occurs when at least one of the spouses is below the age of 18 years. At this age, the child is treated as a minor who may not be accepting marriage proposal out of his/her owe legal capacity. With regards to this under-developed "will" for marriage consent, the debate among different scholars came up, Some school of thought view child marriage as a marriage contract where one or both parties gives his/her consent before marriage while forced marriage should be separately viewed as a situation where one or both parties is married without his or her consent. Other scholars argued that all forms of child marriage should be regarded as forced marriage because even when the child gives his or her consent, he or she lacks the legal power to give consent as a minor. Turner (2013) through his work titled "Out of the Shadows: Child Marriage and Slavery" and the

Anti-Slavery International organization belong to this second school of thought. They x-rayed various angle of child marriage showing the slavery-like practices that occur with impunity thus:

"Children are in a weaker position to give free, full and informed consent to marriage than adults, even if they appear to 'agree' or do not express refusal. Children are less likely to be fully informed about the true nature or impact of marriage. The younger the child, the more vulnerable they will be, including when pressure to marry comes from their own parents or guardians."

The researchers agreed with this second school of thought by using child marriage interchangeably with forced marriage as a basic concept to evaluate parental perception of psychosocial impacts of child's early and forced marriages in

Psychosocial impact of child marriage

Reviewed literature on Child marriage revealed that child and forced marriages exist in various countries, cultures, religions and ethnicities and posse different challenges. It compels girls into adulthood prior to being emotionally and physically matured, resulting to devastating and harmful effects on their health, psychological and sociological beings, economical and well-being. The study looks at different cultivated behaviours that have both psychological and social implications by adopting the psychological general well-being index (PGWBI) (2004) which includes: anxiety, depressed mood, positive well-being, self-control and general health vitality to review the psychological and sociological impact of child and forced marriages. The essence of reviewing the perceived implications from various scholars helped the researchers to ascertain possible behavioural changes that can help in communicating the messages of mass media campaigns with the view of achieving positive behavioural changes for peaceful co-existence of Nigerians and the world at large.

Arowolo (2022), Turner (2013), Green (2014), Agege (2018) and Agege *et al.* (2021) narrate the negative psychosocial impacts of child marriage thus: As soon as a girl child is married at too early an age, her marital status intrudes unrightfully on many aspects of her rights. Here the relationship between marital status and rights produces a significant negative relationship that its direction and magnitude are progressively strong. These negative relationships include domestic violence of various magnitudes with higher risk for depression and suicidal attempts among child wives married as children due to exposure to forced sexual relationship that extends to other gender related violence. Sometimes, child brides who ran away from their matrimonial homes to their parental homes to seek refuge and scour are forced back to their husbands. Some who have alternatives many run to cities or other places outside their matrimonial and parental homes, leading to increase in population of commercial sex workers. Others, who were forced back to their husbands without alternative live with their domestic trauma, sink in depression, suicidal attempts or develop mental disorder. Psychiatric disorders were higher among girls married at early age. In some regions.

In various perspectives, John et al. (2019), Green (2014) and Agege (2018) in their studies of early child marriage and its implications on the Nigerian Economy equally confirmed that child marriage causes poor education which in turns affects the economy negatively. Child wives who should be in school are seen in their marital environs working in slave-like fettles designed either by their husbands or their in-laws. John et al. (2019) noted that in communities where child marriage is regarded as normal practice, child marriage comes with many negative effects. Child marriage breeds poor and limited freedom to peer group interactions because the girl child is caught in between the web of childhood and adulthood at the same time. Poor engagement on cultural activities in the girl child's community: adults will always look down on her as a child yet she is married There is limited access to resources, social support systems and limited ability to exercise choice in life. Green (2014) and Agege (2018) insist that child wives will always assume the role of an adult because of marriage whereas in real sense, they are children. She equally faces restrictions in civic activities'

participatory due to underage. Child marriage interferes and most times, terminates her education depriving her opportunity of acquiring both formal and informal education.

Perceptions on causes of child marriage

UNICEF (2021) report includes perception as one of the major factors responsible for prevalence of child marriage. Other scholars such as Chata and Quentin (2016) and Health pathfinder report (2021), elaborated more on the role of both male and female perception played in the increase of child marriage. Parental perception that marriage will protect girls from violence, particularly in times of crises or insecurity, male's perception that they should not have equal rights with the female, Male's perception of child wives being more obedient to them than the older ones.

Umemoto (2001) quoted Shobha (1999) who posits that in Rajasthan, India, parents perceived child marriage as a proven effective means of organizing, transferring and preservation of property and wealth within the family: thus, through the *Akha Teej*, the mass solemnization of marriages between young boys and girls, they increased the visibility of toddlers 2-3 years and children under 10 years in marriages. Assani (2000) in UNICEF report revealed that fathers in Niger were of the opinion that if they stop their girls from going to school and marry them off early, it will save them the stigma of unwanted pregnancy outside wed luck, a decision that will help them aligned with the tradition to reinforce interactions with community members. Umemote (2001) went further to explain that parents in Niger perceived that their daughters may be kidnapped on their way to school and may missed the opportunity to getting potential husbands. The World Bank (1999) revealed that Bangladesh parental perception that marrying off their girls early will ease their economic burden and protect their girls' sexual purity contributed to child marriage in Bangladesh. Since parental perception has been the main force driving child marriage, this paper seeks to use parental perception as a driver to ameliorate the psychosocial impacts of child marriage in Nigeria.

Mass media interventions to stop child early and forced marriage

The study recognizes many measures put in place to fight child marriage across the globe. These measures are reflected in marriage concept with instructions regarding considerations for age and consent, equality of persons involved in marriage when consumed and personal and property rights of women as contained in the rectified measures of United Nations Convention on the Rights of the Child (CRC) which Nigeria is a signatory to, 1948 Universal Declaration of Human Rights (UDHR) and various domestic and religious laws. The study concentrated more or communication /mass media interventions adopted by Nigerian government to ameliorate the scourge of psychosocial impacts of child marriage in Nigeria.

In Nigeria, campaign against child's early marriage was officially launched on November 19, 2016 at federal level by the vice president Yemi Osinbajo with Mohamed Fall, UNICEF Nigeria Representative, on behalf of the United Nations in Nigeria and other dignitaries. The campaign titled "Hey Woman monologues" was brought in as a peculiar means of advancement in alliance with the federal government / UNFPA Sustainable Development Goals that Nigeria has committed to achieve by 2030. This programme will run between 2016 and 2021. "2021 Hey Woman Monologues celebration" marked it, 30 years of the global campaign against Child's early and forced marriage. The 2021 "Hey Woman Monologues, a 16 Days of Activism against gender-based violence was officially observed with support and collaboration of the Federal Ministry of Women Affairs and UNFPA from November 25 - December 10, 2021. 11 videos created on March 2021 were created to reinforce the messages of an urgent need to end Gender-based Violence by deepening knowledge around sexual and reproductive health and rights. Both state government and NGOs were called to join in the action to protect women and girls from stigma by building on positive practices that ensured an end to child marriage.

The theme "Orange the world: End violence against women now!" 0f 2021 celebration and "education cannot wait" of 2022 celebration are all geared towards the recognition of the girl child's right, empowering her and sustainability of her psychosocial health and well-being well being.

Theoretical framework

The researchers leaned on Selective exposure and selective perception theories to evaluate parental perception of psychosocial impact of child's early and forced marriage in Nigeria. Selective perception theory is sometimes referred to as selective exposure theory. It was developed into mass communication theory by Smith, a prominent advertising researcher in 1960s. Smith (1960) posits Selective perception as "a procedure by which people let in, or screen out, advertising material they have an opportunity to see or hear. The consumers do this based on their pre-existing beliefs about the brand. Pre-existing belief here include: attitudes, beliefs, usage preferences/ habits and conditioning. People who like, buy, or are considering buying a brand are more likely to notice advertising than are those who are neutral toward the brand.

Ever since then, communication scholars such as Lazarsfeld, Berelson, and Gaudet leaned on selective exposure theory to investigate differential exposure to candidates who were virtually exposed to political speeches, newspaper stories, newscasts, editorials, columns, magazine articles of political campaigns. Using selective theory, a researcher can investigate cultivated attitude of media audience who are aware or unexposed to media messages as well as their perceptions of the media content. Selective perception is important because the ability of parents to focus and filter communication intervention messages that explained the psychosocial impact of child marriage creates meaningful positive perceptions that will effectively contribute to amelioration of the scorches of child marriage.

Empirical review

Agege et al. (2018) in their study titled "Parental perception of girl-child early marriage among the Urhobos in Nigeria" used survey research method to investigate the concept of early marriage, parental perceptions on causes, consequences and strategies to mitigate the problems. The study population was 2.1 million .360 out of 384 samples were drawn from 8-communities within the local governments in the Central senatorial district of Delta State. Data collected through the questionnaire were analyzed using Microsoft Excel Tool Pak and SPSS version 20.0. Findings revealed that there is early marriage among the Urhobos in the Central District of Delta State, 60% of the respondents did not accept girl child early marriage as an act of gender discrimination, 77% respondents perceived ignorance as the driving force that compelled parents to force their girl child who experienced unexpected pregnancy to marry the boys who impregnated them. They recommended Public Health campaign to enlighten and educate parents against forcing daughters into early marriage and how to prevent unwanted pregnancies. The knowledge gap in the above study which the present filled was in sampling: geographical location. The samples were drawn from delta state parents while the present study drew samples from Anambra state.

Mehra, Sarkar, Sreenath et al. (2018) in their study titled "Effectiveness of a community based intervention to delay early marriage, early pregnancy and improve school retention among adolescents in India", used cross-sectional (post-test) survey research method to determine the effect of the early marriage intervention. Specifically, the study sets to determine whether the multi-pronged intervention has reduced early marriage, early pregnancy and school retention among youths Uttar Pradesh (UP) and Bihar. The study adopted multi-stage sampling technique for the selection of a sample of 1770 youths out of a population of 100,000 between the age range of 10 and 24 years in eight districts in each of the two selected states in India. Copies of questionnaire were used as Data collection instrument. Raw data was analyzed using descriptive statistics, cross-tabulation, and chi square and logistic regression. Major finding revealed that access to YICs, which was one of the core intervention strategies of the project, led to a reduction of early marriage among girls. Recommend that similar community-based interventions be adapted and scaled up in regions with similar

socio-economic backgrounds, with the aim of reducing early marriage, early pregnancy, maternal morbidity and mortalities and in increasing school retention. The knowledge gap which the present study sets to filled was in the sampling and geographical location. While the previous study's sample was 1770 (bigger), the present study limited the sample to 382 for more critical investigation. Geographically, the present previous study was in India, the present was in Nigeria.

Getiye, Sileshi and Genet (2014) in their study titled "Perceptions and Practices of Early Marriage of Female Child From 2009-2013 in Sinane District Northwest Ethiopia", used Community based cross-sectional research method to investigate the prevalence of early marriage practice among female child from 2009-2013 in Sinane district northwest Ethiopia. Out of a population of community members in selected kebekes of Sinan district who practiced marriage in the last five years prior to the study, 802 respondents were selected using stratified multistage sampling technique. Questionnaire was used as data collection instrument while raw data were fed into Epi Data version 3.1 and analysis using SPSS version 20 statistical software. Findings revealed high prevalence of early marriage practice in the study area, majority of the marriages were contracted before the girls were 15 years, main reasons for early marriage practices are perceived social and economic benefits and little knowledge of the consequences of early marriage. The study recommended creation of awareness to the community with emphasis on the required legal marital age and the negative impacts of child early marriage on the girl, family and community. The knowledge gap the present study filled was in geographical area, sample and variables. Here, instead of Sinane District of Northwest Etopia and a sample size of 802, the present study focused on selected Local Government Areas of Anambra state with sample size of 384 for an in-depth study on awareness/knowledge, attitude and perceived measures to ameliorate the psychosocial impart of child marriage.

Mat, Mamsamba and Bomar (2020) in their study titled "Social and cultural factors perpetuating early marriage in rural Gambia: An exploratory mixed method study", used cross-sectional house hold survey research method to investigate the reason for continuing practice of early marriage despite existing legislation prohibiting child marriage in 24 rural settlements in lower Baddibu district in North bank region of Gambia. Out of a sample of 181 dwellers, the researchers conducted focus group discussion with 16 male and female parents and 8 key informant interviews with community-based decision markers. The study finds that, ethnicity and fear that girls may engage in pre -marital sex were important factors associated with early marriage in rural Gambia. In addition, lack of meaningful alternatives to marriage including work opportunities in rural areas also limited the options and resources to girls, resulting in early marriage. The study recommends that the role of ethnicity in determining marriage should be tackled and girl child should be provided with employment-oriented education including vocational studies that will result to more empowerment. The knowledge gap the present study filled was in research methodology.

Nyangas and Aswile (2022) in their study titled "Early marriage and parental influence: An evidence from Momba District in Tanzania", used Cross-sectional research method to evaluate how parents influence early marriage among girls in various households in the districts of Momba. Socio-economic characteristics were explored as factors influencing parents to marry off their daughters early. Data was collected from 120 respondents in Momba district while Multiple Regressions were used to analyze the data. Findings showed that age, occupation and household size were significant factors influencing parents to marry off their children early. The study recommends that parents and community should enlighten to discourage early marriage, households should diversify their sources of income and parents should maintain small family size that they can carter for. In all, government should re-enforce policies that prohibit early marriage and set up strict laws to end early marriages in the society.

Nona Intan, Nisau, Laili and Tetti (2019) in their study titled "The socio-cultural environment, parental perception, adolescent knowledge and attitude toward early marriage decision", used cross-sectional research

method and proportionate cluster random sampling of 144 parents and 250 adolescents to investigate the socio-cultural environment and parental perception toward early marriage decision. Finding revealed that socio-cultural environment (47.2%) and parental perception (62.4%), low level of knowledge (44%) and positive attitude (55.4%) to postpone early marriage. It concludes that the strengths of cultural value play a vital role in people health decision. It is necessary to develop a program between the government and health care community to overcome early marriage issues.

Methodology

The researchers adopted survey research method. This research method helped the researchers to investigate the opinions of the respondents which were later, generalized to all the residents in Anambra State, Nigeria.

Area of study

The study was carried out in selected residential buildings in Anambra East and West districts of Anambra State, Nigeria. Specifically, the study was carried out in selected residential buildings in Ayamelum, Awka North, Ogbaru, Anambra West, Anambra East, Oyi, Orumba North and South Local Government Areas in Anambra state, Nigeria. The choice of parents who are residents in Anambra State was based on the premises that children early and forced marriage advocacy recognize the use of parents as behavioural change agents in every society globally.

Population of the study

The population of the study was 1,831,255 parents' residents in selected Local Government Areas in Anambra State, Nigeria. This figure was obtained using National population census (2006) figure which is 1,831,255 and Population projection figure which is **492,618.** The researcher knew there was increase in population figure since last census and accommodated that increase in population up to 2022 by using the United Nations Development Programme (UNDP) Population projection formular cited in Owuamalam (2012) as follow:

$Pp = Gp \times P_1 \times T$

Where;

Pp = projected population.

Gp = Given Population as at last Census.

P_1 = Population increase Index.

T = Period between the given population and year of study.

$Pp = ?$

$Gp = 1338635$

$P_1 = 2.28\% = 0.0228 = 0.023$

$T = 2022 - 2006 = 16$

$Pp = 1338635 \times 0.023 \times 16$

$Pp = 492, 617.68$

Since the population is all about human being, approximation will be applied.

$Pp = 492,618$

Table 1. Population Distribution of selected Local Government Areas in Anambra State

LGA	NPC (2006)	Population Projection (2022)	Population for the Study
Ayamelum,	158,152	58,199.936	216352
Awka North	112,192	41,286.656	153,479
Ogbaru	223.317	82,180.656	305498
Anambra West	167,303	61,567.504	228871
Anambra East	152,149	55,990.832	208140
Oyi,	168,201	61,897.968	230099
Orumba North	172,773	63,580.464	236354
Orumba South	184,548	67,913.664	252462
Total	**1338,635**	**492,617.68 = Approx. 492,618**	**1,831255 approx.**

Source: National Population Census (2006)

Sample size

The sample size for the study is three hundred and eighty-four (384), obtained using Krejcie and Morgan (1970) table for sample seize determination. The researchers used Krejcie and Morgan (1970) table for sample seize determination because the population of the study (1,831,253) is known and it is definite. This conformed to Krejcie and Morgan (1970) that when a finite population is between 1000000, the required sample size at 5% margin of error and 95% confidence interval is 384.

Sample frames

The sample frames are: Anambra East: 45, Anambra West: 32, Awka North: 64, Ayamelum: 48, Ogbaru: 44, Orumba North: 48, Orumba South: 50 and Oyi: 53 respectively. The researchers documented the selected Local Government Areas in alphabetical order and applied Bourley's proportional statistical formula (nb = $\frac{n}{N} \times ñ$) to obtain the above sample frames. This conformed to Owuamalam (2012) who maintained that proportionate allocation helps a researcher to select sample from a given population documented in an orderly list. Below are the computations.   Bourley's formula: nb = $\frac{n}{N} \times ñ$

Where; Nb = required sample for select Local Government Area. n = Individual Local Government Areas' Population N = Population of the Study, ñ = Total Sample Size

Table 2. Sample Frame Distribution

Select LGA	Population	Computation	Sample Frame
Anambra East	216352	$S = \frac{216352}{1,831,255} \times 384 = 45$	45
Anambra West	153479	$S = \frac{153,479}{1,831,255} \times 384 = 32$	32
Awka North	305498	$S = \frac{305497.656}{1,831,255} \times 384 = 64$	64
Ayamelum	228871	$S = \frac{228871}{1,831,255} \times 384 = 48$	48
Ogbaru	208140	$S = \frac{208140}{1,831,255} \times 384 = 44$	44.
Orumba North	230099	$S = \frac{230099}{1,831,255} \times 384 = 48$	48
Orumba South	236354	$S = \frac{236354}{1,831,255} \times 384 = 50$	50
Oyi	252462	$S = \frac{252462}{1,831,255} \times 384 = 53$	53
Total	**1831255**	**384**	**384**

Source: Field Survey 2022

Sampling technique

The researchers used multistage sampling technique to select the respondents because it gave the researchers room to vary the sampling techniques at each point. Specifically, the researchers used purposive sampling technique to select the Local Government Areas where child marriage is prevalent in Anambra State, Again, random sampling without replacement was used to select one town and one village from each Local Government Area. (Anambra East→ Igbariam→ Eziama, Anambra West→ Oroma-Etiti→ Umuche, Awka North→ Mgbakwu→ Uruaku, Awka North Mgbakwu Uruaku, Ayamelum→ Umuerum→ Ayigo, Ogbaru→ Amiyi→ Ibelenta, Orumba North→ Ndiowu→ Umudiabo, Orumba South→ Akpu→ Uhuana and Oyi→ Awkuzu→ Umueri. The researchers further used purposive sampling technique to select parents who were willing to attend to the copies of the questionnaire. Thus, the researchers produced a total of 382 copies of questionnaire and distributed them according to the sample frames. See table 3 for questionnaire distribution and retrieval.

Table 3: Questionnaire Distribution and Retrieval

LGA	Population	Select Town	Select Village	No. Distributed	No. Retrieved
Anambra East	152,149	Igbariam	Eziama	45	39
Anambra West	167,303	Oroma-Etiti	Umuche	32	30
Awka North	112,192	Mgbakwu	Uruaku	64	61
Ayamelum,	158,152	Umuerum	Ayigo	48	43

Ogbaru	223.317	Amiyi	Ibelenta	44	42
Orumba North	172,773	Ndiowu	Umudiabo	48	46
Orumba South	184,548	Akpu	Uhuana	50	48
Oyi,	168,201	Awkuzu	Umueri	53	51
Total				**384**	**360**

Sources of data

Data for this study were generated through primary sources and secondary sources. The primary source is the questionnaire while the secondary sources include journals, internet, bulletins, newspaper and the internet.

Instrument for data collection

In this study, questionnaire is the instrument for data collection. The researchers structured the questionnaire based on the set objectives. Three hundred and eighty-four (384) copies of the questionnaire were given out to the respondents. The questionnaire was divided into two sections (A and B). Section A investigated respondents' demographic data while section B investigated the research variables. The Open-end and closed-end pattern of the questionnaire facilitates elicitation of authentic responses from the respondents other than 'yes' or 'no' answers.

Validity and reliability of instrument

The questionnaire was subjected to face validation. The researchers after preparing the questions, gave them to two different reviewers in their institution for scrutiny. The corrections and amendments given by the reviewers were effected for improve validity of the questionnaire. This conformed to Mohajan (2017) who posits that face validation tests the appropriateness of the questionnaire items. This is because face validation determines extent to which the questionnaire is relevant to the objectives of the study.

The reliability of the instrument was measured using test re-test method. The researchers administered the instrument to ten respondents from Uhuana village in Akpu town in Orumba south Local Government, Anambra state and used the result as pre-test. After a period of two weeks, same instrument was administered to same sample as a post-test. The outcome of the pre-test was compared with that of the post-test and a similar result was obtained. This comparative result indicated a good reliability nature of the questionnaire.

Administration of instrument

The copies of the questionnaire were administered to respondents on face to face value and on the spur. This increased the authenticity of responses and reduced the questionnaire's mortality rate. While 360 (94%) copies of questionnaire were retrieved and found usable, 22 (16%) mortality rate was observed. The study analysis was based on the 360 respondents who were considered well enough for objective analysis.

Method of data analysis

For data analysis, the researchers used Statistical table with frequency and mean ($\underline{X}$) to provide answers to the research questions. Determination of a decision point was depended on the cutoff point. The cutoff point for regarding an item as agree was determined using the following formular:-

$$V = \frac{SA + A + U + D + + SD}{N}$$

Where

V = Decision Point
SA = Strongly Agree = 5
A = Agree = 4
U = Undecided = 3
D = Disagree = 2
SD = Strongly Disagree = 1
N = Number of Response Unit

(X̲) = Mean

Therefore (X̲) = $\frac{5+4+3+2+1}{5}$ = $\frac{15}{5}$

(X̲) = $\frac{15}{5}$ = 3

(X̲) = 3

Decision rule: After analysis, any item with mean value "3" and above was accepted while any mean value below "2.9" was rejected.

Result and discussion

Data analysis

Table 4. Demographic representation

Sex	Frequency	Percentage
Male	132	37
Female	228	63
Total	**360**	**100**

The table 4 above showed the gender distribution of the respondents. It revealed that both male and female were found in the residential buildings of selected villages representing the selected Local Government Areas in Anambra state. Majority of the respondents were females, representing 63% while the males represented 37% of the total study population.

Table 5. Assessment of Respondents' Ages

Age	Frequency	Percentages (%)
19-30	64	18
31-40	96	27
41 and above	200	56
Total	**360**	**100**

The above table 5 revealed that different age brackets were observed among the respondents. The dominate age bracket was between 41 and above, representing 56% of the respondents.

Answers to research questions

Research question one

Research question one bothered on determining whether the respondents know about the psychosocial impacts of child marriage as contained in "Education cannot wait" campaign messages. The researchers' question in the questionnaire that brought out responses for the survey is: Are you aware of psychosocial impacts of child marriage?

Table 6. Mean Distribution of Questionnaire on Respondents' Awareness/Exposure to Psychosocial Impacts of Child Marriage

	CLUSTER A ITEMS Are you aware of psychosocial impacts of child marriage?	F	5 SA	4 A	3 U	2 D	1 SD	Total score	X̄	Remark
			FREQUENCY SCORE							
1	I have heard about psychosocial impact of child marriage.	360	180 (900)	40 (160)	10 (30)	80 (160)	50 (50)	1300	4	A
2	Psychosocial impact of child marriage affects both the girl child and her community.	360	85 (425)	74 (296)	16 (48)	102 (204)	83 (83)	1056	3	A
3	It is about the negative behaviours child brides exhibit due to what they pass through in life	360	120 (600)	64 (256)	6 (18)	89 (178)	81 (81)	1133	3	A

			5	4	3	2	1			
4	We are encouraged to stop child marriages.	360	65 (325)	180 (720)	32 (96)	48 (96)	35 (35)	1272	4	A
5	I don't know anything about psychosocial impact of child marriage.	360	1 (5)	10 (400)	5 (15	90 180)	164 (164)	1416	4	A

Under the remark column, letter "A" stands for acceptance while letter "R" stands for rejection. Again, all the figures in parenthesis inside the table stand for the alternative response scale values.

The table above revealed items in cluster 'A' for research question one which investigated the respondents' awareness/exposure of psychosocial impact of child's early marriage. The mean score for item one was 4, showing that most of the respondents agreed they have heard about psychosocial impact of child marriage. The mean score for item two was 3; showing that most of the respondents were in agreement that psychosocial impact of child marriage affects both the girl child and her community. For item three, the mean score was 3, revealing that most of the respondents agreed that psychosocial impact of child marriage is about the negative behaviours child brides exhibit due to what they pass through in life. For item four, the mean score was 4, indicating that most of the respondents agreed that we are encouraged to stop child marriages child bride and for item five, the mean score was 4, showing respondents' agreement that actions of child brides increase the menace in rural and urban cities by increasing the population of commercial sex workers. Since the above mean scores were within and above the decision point "3", the researchers accepted them. Thus, it is safe to say that most of the respondents were not only aware but were exposed to the psychosocial impact of child marriage on both the child's bride and the society she lives in.

Research question two

The second specific objective of the study was to determine the respondents' attitude toward the psychosocial impacts of child marriage. The research question that evoked survey responses is "How disposed are you towards the psychosocial impacts of child marriage? The considerations of the respondents from the study areas were sought.

Table 7. Mean Distribution of Questionnaire on Respondents' Attitude Responses

CLUSTER A ITEMS How disposed are you towards the psychosocial impacts of child marriage?	F	5 SA	4 A	3 U	2 D	1 SD	Total score	X̄	Remark
			FREQUENCY SCORE						
1 am favourably disposed towards the psychosocial impacts of child marriage	360	35 (175)	40 (160)	17 (510	138 (276)	130 (130)	792	2	R
I am not favourably disposed to the psychosocial impacts of child marriage.	360	102 (510)	100 (400)	16 (48)	59 (118)	83 (83)	1159	3	A
I have mixed feelings toward towards the psychosocial impacts of child marriage	360	40 (200)	34 (136)	6 (18)	139 (278)	141 (141)	773	2	R
I cannot define my disposition towards the psychosocial impacts of child marriage.	360	50 (250)	66 (198)	70 (210)	12 (24)	162 (162)	844	2	R

Under the remark column, letter "A" stands for acceptance while letter "R" stands for rejection. Again, all the figures in parenthesis inside the table stand for the alternative response scale values.

Analysis from the table 7 above revealed responses for items in cluster 'B' for research question two which investigated the respondents' attitude towards the psychosocial impact of child's early marriage. The mean score for item one was 2, showing that most of the respondents disagreed having favourable disposition towards the psychosocial impact of child marriage. The mean score for item 2 was 3, showing that respondents agreed that they are not favourably disposed to the psychosocial impact of child's early marriage. For item 3, the mean score was 2, indicating that respondents disagreed having mixed feelings toward the psychosocial impact of child marriage. The mean score for item 4 was 2, showing that most of the respondents disagreed the the the statement that they cannot define their disposition towards the psychosocial impacts of child marriage. Since the mean scores for item 1, 3 and 4 were below the decision point '3 and above', they were rejected while only the mean score for item 2 in the 'B' cluster was accepted because it was up to the decision point. It is therefore safe to say that majority of the respondents were unfavorably disposed toward the psychosocial impact of child marriage.

Research question three (3)

The third specific objective of the study was to determine the respondents' perceived actions that can help to mitigate the psychosocial impacts of child marriage? The research question that evoked survey responses is "To what extent do you believe that the following measures can ameliorate the psychosocial impacts of child marriage in your community? The opinions of the respondents from the study areas were investigated.

Table 8. Mean Distribution of Questionnaire on Respondents' Perceived Actions

	CLUSTER A ITEMS To what extent do you believe that the following measures can ameliorate the psychosocial impacts of child marriage in your community?	F	5 SA FREQUENCY SCORE	4 A	3 U	2 D	1 SD	Total Score	X̄	Remark
1	Parents should join hands with government, willing private sectors and multilateral Institutions to fund girl child's education to achieve education first before marriage.	360	122 (610)	115 (460)	3 (9)	70 (140)	50 (50)	1269	4	A
2	Parents should join hands with other stakeholders to provide emergency support for runaway girls	360	200 (1000)	103 (412)	7 (21)	30 (60)	20 (20)	1513	4	
3	Parents should brave the stigma of supporting runaway child wives	360	112 (560)	96 (384)	11 (33)	90 (180)	51 (51)	1208	3	
4	Parents should seek support from both government and traditional institutions to avoid operating counseling support systems in secrecy.	360	130 (650)	120 (480)	19 (57)	48 (96)	43 (43)	1326	4	
5	Parents should join in public education campaign by providing advocacy at household and community levels	360	180 (900)	113 (452)	5 (15)	34 (102)	28 (28)	1497	4	

Under the remark column, letter "A" stands for acceptance while 15letter "R" stands for rejection. Again, all the figures in parenthesis inside the table stand for the alternative response scale values

The tables 8 above revealed items in cluster 'C' for research question three which investigated the respondents' perceived measures that can ameliorate the psychosocial impacts of child marriage in their community. The mean score for item one was 4, showing that most of the respondents agreed that parents should join hands with government, willing private sectors and multilateral Institutions to fund girl child's education to achieve education first before marriage. For item 2, the mean score was 4, showing that respondents agreed that parents should join hands with other stakeholders to provide emergency support for runaway girls. The mean score for item 3 was 3 showing that respondents agreed that parents should brave the stigma of supporting runaway child wives. For item 4, the mean score was 4, indicating that respondents agreed that parents should seek support from both government and traditional institutions to avoid operating counseling support systems in secrecy. The mean score for item 5 was 4, pointing to respondents' agreement that parents should join in public education campaign by providing advocacy at household and community levels. Since all the mean scores for the 5 items in cluster c were within and above the decision point, it is safe to say that most of the respondents agreed that parents should join hands at different levels to help amilorate the psychosocial scorch of child marriage.

Result and discussion

The study aimed at evaluating parental perception of psychosocial impact of child marriage in Anambra state Nigeria. The demographic findings enabled the researchers to determine the extent the respondents represented the population of the study. It revealed that both male and female adults were found in the residential buildings of selected villages representing the selected Local Government Areas in Anambra state with majority, 63% respondents as males. The dominate age bracket was between 41 and above, representing 56% of the respondents, indicating that majority of the respondents were parents residing in Anambra state. This conformed to one of the propositions of selective exposure theory: that media audience is made of different people with different characteristics. In this research, different characteristics were revealed in terms of varied gender and age range. Thus the respondents were true representative of the study population.

Research question one investigated the respondents awareness of psychosocial impact of child marriage. Survey findings revealed respondents' awareness and exposure to psychosocial impact of child marriage with positive mean scores of 3 and above (3 as decision rule). This was evident in the number and mean scores of the surveyed parents from the study area that affirmed positively to the items in cluster A of the questionnaire used for eliciting awareness/exposure responses. This finding conformed to previous work of Mehra et at. (2018), which revealed that respondents were aware and exposed to one of the core intervention strategies of the project (YICs) and this led to a reduction of early marriage among youths in Uttar Pradesh (UP) and Bihar in India. The above findings can also be linked to one of the propositions of perception theory: that media audience must be aware/exposed to media messages that aligned with their pre-existing characteristics before the message will have direct effect on them. Here, parents are aware and exposed to the psychosocial effect of child marriage which gave the researchers leverage to measure other variables of the research objectives.

Research question two investigated respondents' attitudes toward psychosocial impact of child marriage, survey results revealed mean scores for item 1, 3 and 4 were below the decision point '3 and above', they were rejected while only the mean score for item 2 in the 'B' cluster was accepted because it was up to the decision point with also negative stand on disposition. Thus, majority of the respondents were unfavorably disposed to the psychosocial impact of child marriage. The above findings were in agreement with one of the findings of Intan et al. (2019) who investigated the Socio-Cultural Environment, Parental Perception, Adolescent Knowledge and Attitude toward Early Marriage Decision and revealed that respondents had positive attitude toward child marriage intervention programme. Furthermore, the findings of the present research conformed to one of the propositions of perception theory: that media audience reacts differently to same media messages they are exposed to. In this research, parents reacted differently in term of attitude, but majority of the respondents did not like the psychosocial impacts of child marriage.

Research question three investigated parental perceived actions that can help to mitigate the psychosocial impacts of child marriage. All the mean scores for the 5 items in cluster c were within and above the decision point; that all the respondents were in agreement that parents should join hands at different levels to help ameliorate the psychosocial scorch of child marriage. This also conformed to Intan et al. (2019)'s findings: that family/parents will be accountable for early marriage crimes. The above findings also conformed to the principles of perception theory: that media audience perceives things differently. While the entire media audience shares the behaviour pattern of their culture, each audience has different perceptions. In this present research, while all respondents shared in psychosocial impact of child marriage culture, some do not agree to parents being involved in all the mentioned areas but majority of the respondents perceived parental total involvement and togetherness as part of the solution to eradication of psychosocial impacts of child marriage in Anambra State, Nigeria.

Conclusion/ Recommendations

The researchers examined parental perception of the psychosocial impact of child marriage in Anambra state Nigeria. The study found that respondents were aware of psychosocial impacts of child marriage, respondents had unfavorable disposition towards the impacts and were of the opinion that parents should join hands at different levels with government and other stakeholders to help ameliorate the psychosocial scorch of child marriage.

Encouraged by the above findings, the researchers recommended:

➢ The need for more sensitization/ advocacies to encourage parents to delay consenting to child marriage until children's attainment of maturity age.
➢ Provision of accommodating laws, monitoring compliances and punishments for all citizens involved in child marriage.
➢ Further research in the areas the researchers could not cover such as evaluating the braving of parental stigmatization of accommodating run away child brides.

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ORCID

Chinwe Uchechukwu Amatu ⓘ *https://orcid.org/0000-0002-7688-141X*
Doris Ngozi Morah ⓘ*https://orcid.org/0000-0002-7854-3238*

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Environmental change as an instrument of political instability: The case of African countries

Frank Odimegwu[1]*

[1]*Department of International Relations, North-West University Mafikeng, South Africa. frank24630349@hotmail.com, https://Orcid.org/0000-0003-1653-6195*

*Corresponding author

Abstract: Environmental change is a main consideration encompassing numerous perplexing philanthropic emergency and developing political and wellbeing worldwide difficulties, with Africa perceived as one of the most weak problem area districts to the damming results of environmental change. Nations in Africa are especially presented to the outcomes of environmental change. Environment disparity exists; regardless of Africa contributing relatively little to the anthropogenic reasons for climatic change, people living in this landmass face the most exceedingly terrible unfriendly impacts. The reason for this study is to look at the causes and association between environmental change and political unsteadiness in the African states. To this degree, it explored where and how environmental change presents dangers to solidness in Africa. For exact investigation, temperature and precipitation information addressing environmental change, political shakiness and struggle information are utilized. According to discoveries, there is a causal relationship from environmental change to struggle and political precariousness in African states. Consequently, observational outcomes support the presumption that environmental change goes about as a danger multiplier in African nations since it sets off, speeds up and develops the ongoing hazards.

Keywords: Environmental change, Political unsteadiness, African nations, Struggle, Impacts

Introduction

Environmental Change as an Instrument of Political Insecurity: the investigation of African Nations. Environmental change is an essential patron in numerous mind boggling compassionate emergencies as well as developing political and wellbeing overall worries, with Africa being distinguished as one of the most weak area of interest districts to environmental change's staggering impacts (Kula, Haines & Fryatt, 2013). African nations are especially powerless against the impacts of environmental change (Figure 1) (Evans & Munslow, 2021).

Figure 1. Projected Climate change effect in Africa
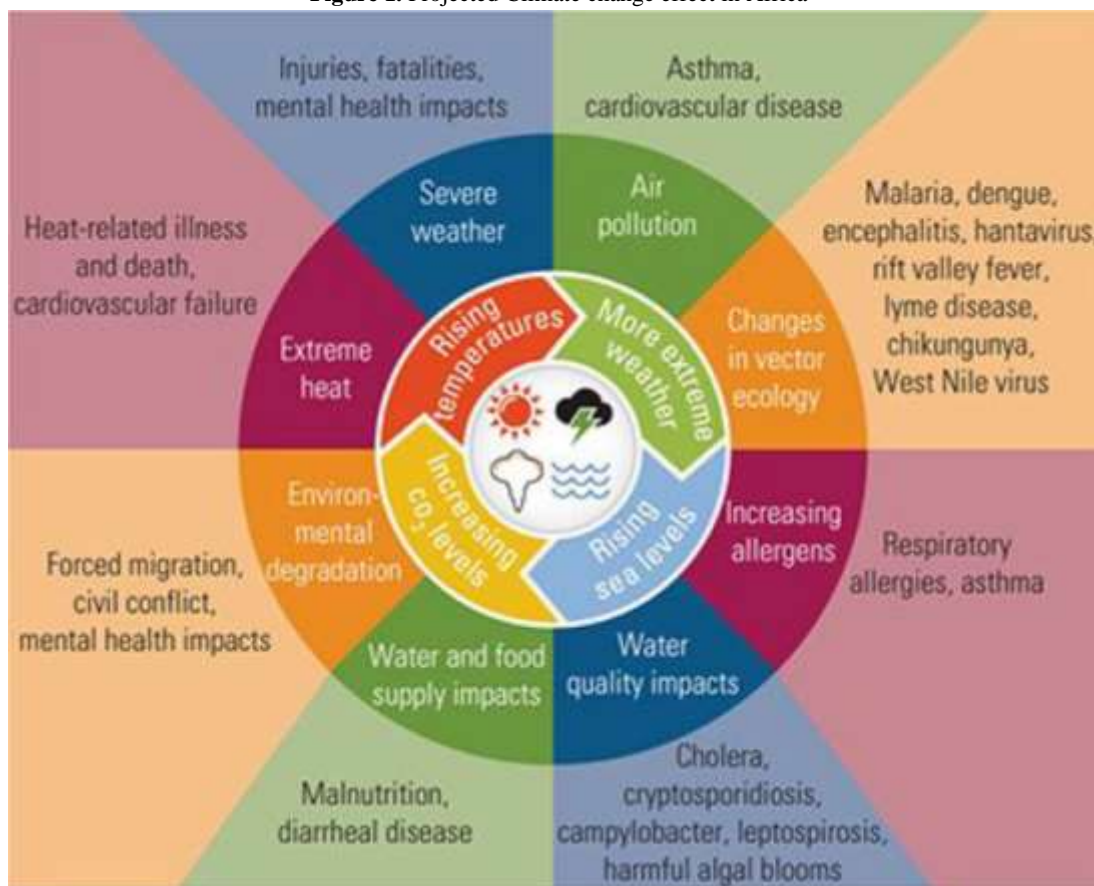
Source: Evans and Munslow (2021)

There is an environmental difference; albeit contributing similarly little to the anthropogenic reasons for environmental change, Africans endure the most extreme side-effects (Park & Roberts, 2006). While there is no agreement in the exploration of the best way to portray political unsteadiness, various examinations have various definitions. To evaluate the variable of political flimsiness, scientists utilized different boundaries. Hurwitz (1973), a spearheading scientist on the made-up background of political flimsiness, communicated it along these lines:

- the shortfall of hostility;
- the size of government workplaces;
- the presence of a legitimate protected framework;
- the shortfall of actual change; and
- high level social way of behaving.

Furthermore, there are some scientists who incorporate various variables to the possibility of political precariousness including revolts, overthrows, and political deaths (Barro 1991), tendencies of progress of government through legal or unlawful frameworks (Alesina, Özler, Roubini & Swagel, 1996). It additionally incorporate public issue, separating of strategy making technique, and political race acts of neglect (Carmignani 2003), fight contrary to government rules to common clash (Gleditsch, Wallensteen, Eriksson, Sollenberg & Strand, 2002) and defilement (International Country Risk Guide (ICRG, 2016). Political shakiness, then again, happens in just as well as in oppressive legislatures (Anlsoy & Kök 2010). Political shakiness is remembered to influence the way of behaving of the financial, money related and monetary people pulling the strings because of these changes, and subsequently be a conclusive calculate financial choices and items (Chawdhury, 2016; Arslan, 2011).

Environmental change is one of the key factors that in a roundabout way affects political shakiness because of worldwide environmental change, disastrous weather patterns, obliteration of rural food and water supplies,

new infectious sickness pandemics, and different wellbeing troubles because of biological system changes are every one of a consequence of worldwide environmental change (Huntjens & Nachbar, 2015). Environmental change has repercussions for wellbeing, job, relocation, and political steadiness, in addition to other things. Environmental change imperils human security by hurting livelihoods; risking society and character; expanding constrained relocation; and decreasing the public authority's capacity to give everything necessary to human security (Intergovernmental Panel on Climate Change (IPCC, 2014a; 2014b; 2014c). Tragically, emerging nations endure the worst part of the outcomes of environmental change (Tol, 2005; Smith & Vivenkananda, 2007).

Somalia, South Sudan, Burkina Faso, Niger, and Mali, for instance, are among the African nations generally helpless against environmental change and catastrophes, in light of their actual weakness to dangers as well as their flexibility and survival techniques for managing environment related perils (Notre Dame Global Adaptation Initiative (ND-GAIN, N.D). These African nations are in danger as a result of the political unsteadiness they are confronting and they have the biggest sending of peacekeepers all over the planet (Krampe, 2019). The stockpile of water in the North African locale makes it truly helpless against destitution because of rural ward on precipitation, and political unsteadiness which is moderately contributed by environmental change (Link, Brücher, Claussen, Link & Scheffran, 2015).

Table 1. Cycle of political flimsiness connected with environmental change

Environment change	Natural assets	Social needs	Societal Unpredictability
Heat	Earth	H_2O	Protests
Greenhouse gas concentration	H_2O	Food	Unrests
Cosmological emission	Ecological unit	Vitality	Relocation
Wind, clouds	Woodland	Health	Poverty
Weather conditions excesses	Fishery	Employment	Lack of authenticity
Water tides	Ecology	Carriage	Feeble establishments
Snow melting	Waters/shorelines	Training	Crime/metropolitan brutality
Ocean rise	Glacier/snow	Way of life	Protest
			Locality
			Coups d'état
			Psychological warfare
			Ethnic/racial clash
			Natural clash
TENSION	EFFECT		REACTION

Source: Sofuoglu and Ay (2020)

There are areas of contention between Environmental climatic condition modification and political instability that may be seen in Table 1. Temperature change actions like ocean or water level rising and greenhouse gas are known to exist. Warming and also the increase in glaciers will cause consequences on natural resources. Consistent with Forsyth and Schomerus (2013), there are planned, untended and quarrelsome impact of natural climatic change to political unsteadiness, as clarified in the process for political instability in Table 1 above. Environmental change moves which incorporates sea or ocean stage rising, greenhouse gas (CO2) and temperature rise, and ice sheets liquefying, have outcomes on normal assets. Those impacts are likely to corrupt the environment in the kind of manner as to diminish the natural reach, water resources, and the effectiveness of the soil. The impacts on natural resources prompted the shortage of significant human prerequisites inclusive of water, food, and training. Lessening people pay because of weather conditions change may also be a reasonable justification for social turmoil (Food and Agriculture organization (FAO), 2012; Femia & Werrell, 2013; Gleick, 2014).

Signs and side effects of political flimsiness, like impoverishment, fights and mobs, environmental contentions, psychological warfare, and relocation, can likewise no doubt get up explicitly assuming that difficulties occurring in areas including water, agribusiness, ranger service, and fisheries proceeds unabated

(Barrett, 2013). As might be seen, albeit regular events because of environmental change may not be immediate explanation signs of political precariousness which incorporates fighting, psychological warfare, and savagery, these improvements play a fundamental capability through setting off the start of the interaction to political instability.

Emerging technology and interdiscipliary sciences

Emerging innovations have been the subject of much discussion in scholarly examination and a focal point in strategy conversations and drives. Proof of the rising consideration being paid to the peculiarity of arising advancements can be found in the developing number of distributions managing the point and news stories referencing arising innovations (in their titles or lead sections). Expanding strategy interest in arising advances, in any case, should be set against a writing where no agreement has arisen concerning what qualifies an innovation to be new. Definitions proposed by various investigations cross-over, yet in addition highlight various attributes. For instance, certain definitions underscore the potential effect arising innovations are fit for applying on the economy and society (Porter et al., 2002), particularly when they are of a more 'nonexclusive' nature (Martin, 1995), while others give incredible significance to the vulnerability related with the rise interaction (Boon & Moors, 2008) or to the attributes of oddity and development (Small et al., 2014). The comprehension of arising advances additionally relies upon the investigator's point of view. An examiner might consider an innovation developing in light of its curiosity and expected financial effect, while others might consider a similar innovation to be a characteristic expansion of a current innovation. Likewise, arising advancements are in many cases gathered under 'general marks' (for example nanotechnology, engineered science), when they may be better treated independently given their different socio specialized highlights (for example specialized challenges, involved entertainers, applications, vulnerabilities). A wide assortment of strategic methodologies have been grown, particularly by the scientometric local area, for the recognition and examination of development in science and innovation spaces (Boyack et al., 2014; Gl¨anzel & Thijs, 2012). These strategies, inclined toward, in light of the fact that they exploit developing computational power furthermore, huge new datasets and permit one to work with additional refined pointers and models, areas of strength for need to thoroughly examined ideas that one is endeavoring to gauge, an essential principle of good examination plan.

Problem statement

The motivation behind this study was to comprehend the effect of natural change on African security and political frameworks, which can prompt political insecurity. Hence, given the absence of writing audits regarding the matter's weakness and extended environmental consequences for political flimsiness, particularly in creating areas like Africa, particularly concerning alleviation and transformation techniques, this overview was led trying to close the gap that exist. Africa, as a non-modern underdeveloped nation, is overpowered by the impacts of ecological change, which have shown to be mind boggling (Odimegwu, 2022). The threat of temperature change is predicted to guide to less downfall, prompting dry spell and higher temperatures, resulting in ruinous protests which will cause instability.

For quite a long time, Africa has been the focal point of jihadist insurrection, and environmental change is a composite, strong variable: existential dangers, unnecessary strain on monetary and social frameworks, and revolutionary political impact. Moreover, the dangers to African security and political frameworks from environmental changes could ruin endeavors to foster security, and political and social steadiness, possibly sabotaging existing harmony and soundness, and at last prompting brutality and struggle. Regardless of these risks, there are relatively few inside and outside appraisals of the effect of ecological change on political shakiness in Africa concerning progress and aid projects (Hoogendoorn, Grant & Fitchett, 2016). It was this gap that motivated this review. . It was thus the objective of the assessment to contribute amazingly to the ebb and flow composing by exploring the impacts of ecological change as an instrument of political instability or unsteadiness in Africa.

Aim

The point of the review was to explore what the environmental change means for on the African social, monetary and political security framework contribution political instability.

Objective of the study

- To examine how the impacts of environmental change and advancement in Africa on human security can influence harmony and security, consequently setting off political unsteadiness.
- To look at the actions set up to embraced and relieve political fragility in Africa.
- To feature environmental change ramifications of political instability in Africa.

Literature review

There is little writing on contemporary social events, brutality and struggle connected with environmental change. A few discoveries on the mainland's political unsteadiness established that environmental change is speeding up social distress and brutality on the continent. For nations with unfortunate administration and unreasonable rural and ecological strategies, for example, Mali, Somalia and Ethiopia, the dry season has catalyzed and powered political precariousness. De Châtel (2014) upholds this peculiarity in his exploration. Dry season and poor administration somewhere between 2006 and 2010 set off an uprising in Egypt in 2011 (De Chatel, 2014). Fast economic liberalisation, decades of management of resources, the removal of subsidies and also the government's failure to handle environmental and humanitarian crises square measure the most reasons behind these events.

Monetary progression, many years of bungle of assets, the removal of grants and the public authority's inability to address natural and helpful emergencies are the fundamental explanations for these occasions. As indicated by Kelley et al. (2015), the whole geographical portions of Africa are confronting increasing temperatures from environmental change, poignant water assets and agribusiness, possibly further raising the gamble of contention. Environmental change has set off signs of political unsteadiness in numerous African nations, like psychological warfare and struggle, because of cataclysmic events that disturb the established pecking order (Aribigbola, Folami & Folami, 2013). As indicated by the review, there are numerous families who have been compelled to move for food or work. Thus, over the long haul, this present circumstance will prompt racial pressures, food deficiencies and excessive costs. Burke et al. (2009) tracked down areas of strength for a connection between nationwide conflicts and African barometrical change. Subsequently, presumably, long periods of dry spell fundamentally improve the probability of war.

Citing Biello (2011), the expansion in food costs in Egypt sped up the revolt in the nation, accentuating that environmental change is one of the elements adding to the expansion in food costs. . Rising food costs quickly prompted manifestations of hardship and political discontentedness. Johnstone and Mazo (2011) uncovered that uprisings in Algeria, Egypt, Jordan and Tunisia were related with food costs. As a matter of fact, they guarantee that high food costs are one reason individuals in these nations are compelled to riot. The unsafe impacts of environmental change are not restricted to African nations. For instance, in keeping with Fahad & Wang (2019), Islamic Republic of Pakistan is quite possibly of the most weak country in Southeast Asia to floods brought about by environmental change. Antagonistic atmospheric conditions unfavorably influence horticulture and groundwater. As detailed by United Nations High Commissioner for Refugees (UNHCR, 2019), almost 2 million individuals was dislodged in northeastern Nigeria because of environment related clashes and more than 540,000 moved to Cameroon, Chad and Niger. Dupont (2008) likewise predicts that in emerging nations, individuals will change positions in light of a declining climate. These relocations will increment with financial occasions because of environmental pressure, political precariousness, military struggles and unfavorable environment influences. Waha et al. (2017) states that 70% of farming in the African district is water driven, and changing environment conditions altogether affect this area. This is fundamental for the nation's economies, as the most noteworthy work is tracked down in the rural area of numerous African nations. Loss of farmers' pay because of decreased rural efficiency will add to movement streams to

metropolitan regions (Waha et al., 2017). This present circumstance will involve different financial, political and humanistic issues. Every one of these nations depends vigorously on agribusiness for money (65% of laborers in this area), and the environment danger to their agrarian area will actuate precariousness, conceivably lead to political instability (Verisk Malecrodt Logical Reports, 2014). For instance, Nigeria is one of the nation's hardest hit by the presence of Boko Haram in specific locales. As noted by the report, brutality in the locale might be connected with financial circumstances impacted by environment peculiarities. Finally, the report highlights that the Arab Spring was additionally preceded by food value volatility and food insecurity, significantly in Egypt and Tunisia. These examples show that temperature change plays a crucial role in sure social events, protests and terrorist activities by acting as a threat number.

At last, the report features that the Arab Spring was likewise preceded before by food value unpredictability and food frailty, especially in Egypt and Tunisia. These models show that environmental change assumes a significant part in specific social event, protest, riots and psychological warfare, by acting about as a risk multiplier.

Theoretical framework

The importance of a theoretical framework is to make it accessible as a premise for a proposed study. A direct assessment of climate change as an instrument of political destabilization in Africa recommends using some approach to mental theory as a construct of insight. According to Higgins and Moore (2000: 180), "the theoretical framework helps to explain the relationship between the characteristics and the factors necessary for the research problem". It defines relationships between features to better understand theoretical connections. This implies that theory is always the basis for the researcher to analyze existing information and its reality and how it can help improve people's lives. For any scholarly research, a survey of the theories involved is essential to allow for a thorough examination of the subject under discussion. Qualitative and presumptive comparative analysis of critical theories such as green theory and others' crisis theory is at the heart of his method, which offers a suitable form of depth. to analyze the effect of environmental change on political instability in Africa.

Local area environment senitivity

Nations, for example, Somalia, Mali, Niger, Burkina Faso and even Nigeria have been the focal point of jihadist rebellion for a really long time, with environmental change as an improving strong variable: threatening livelihoods, inserting undue strain on economic and social structures with radicalizing political implications (Evans & Munslow, 2021). The level of the Niger Waterway has diminished by a third in the beyond thirty years (UN, 2016). Farmland is diminishing quickly as the populace builds (Snorek et al., 2014). Subsequently, most ranchers never again utilize fallow land, disrupting the historic passage through their land by post-harvest oxen herders currently herders area unit destroying crops on recent routes and conjointly ever-changing migration patterns, that has a bearing on different farmers (Michel & Passarelli, 2014).

States focus on farmers over herders, making a peaceful enrolling ground for jihadists, for example, among the Tuareg and Fulani populaces (Hansel et al., 2019). Basically environmental change works with the converging of laborers' complaints with jihadist legislative issues (Fulton & Nickels, 2017). Weak states, artificial borders, and pastoral sustenance systems facilitate the growth of militia influence on the far side state borders (Assanvo, 2019). In the Western Sahel in 2019, assaults expanded by 86% year-on-year, leaving 5,000 dead and 5.1 million needing humanitarian help with the type of sustenance, medical care and safe house (European Union External Action Service, 2020). Weak states leave a void at the fringe, created worse by an unsuccessful suburbanised strategy that has undermined services and security (Banjaminsen, 2016). As revolutionary powers get initiates, military counters against neighborhood networks have made further discontent (ICRC, 2019), working with the enrollment of jihadists-Fulani. The jihadists present law and order

where none exists and an alternate sustenance strategy where environmental change and unfortunate administration preclude different choices.

Climate and conflict in Africa

Whether or not the Globe arises in another time, the effect of fast ecological change on natural resources should be represented in how we might interpret the delicacy of the state, state privileges and the world request in view of that sway This incorporates rising ocean levels and an expansion in the recurrence and seriousness of outrageous climate occasions, which will increment strain on basic assets that help public safety structures on water, food, transportation and energy. Left uncontrolled, these strains can obliterate livelihoods and add to a scope of provocative improvements inside states, including populace dislodging, relocation, political unsteadiness (McElroy & Pastry, 2012), state delicacy, inner turmoil, and potential state breakdown (Femia & Werrell, 2017). The transboundary idea of some environment influences, for example, ocean ice dissolve and fish movement into challenged waters (Patrick & Cronin, 2012), can likewise improve the probability of contention between nations. (Neil Adger et al., 2014). The danger, consequently, does not come from environmental change itself, yet from how these progressions communicate with the current security scene - including the capacity or powerlessness of states to successfully oversee it because of quick changes, to guarantee the security and prosperity of people in general and to keep up with legitimacy.

In different cases, water is both the spells almost certain doom for war. An extended struggle at present pits individuals from the semi-nomadic Muslim Fulani clan against overwhelmingly Christian ranchers in Nigeria's Middle Belt, an environmentally different yet progressively parched locales between the moderately calm Niger Delta and the arid northeast. The primary driver of the contention is rivalry for access to degraded grasslands (Akpodiogaga, 2010). The foundations of the fight originate from the cross-over of the middle belt's most extreme productive horticultural terrains with the conventional relocation way of the Muslim Hausa-Fulani herders, an immense ethnic association unfurl all through northern Nigeria and adjoining states. (Oduah, 2016). The yearly quest for brushing land for their animals infringes on dry farmland. The food security of ranchers, including individuals from the Christian Yoruba clan, is progressively compromised (Okoli & Atelhe, 2014). At the point when dairy cattle polish off or stomp on crops, reprisal might include killing of domesticated animals or direct harming of water sources. Hausa-Fulani herders now and then endeavor to settle. Notwithstanding, they face an arrangement of land residency and legacy privileges that give exceptional acknowledgment and social administrations to generational landowners (Sayne, 2012). These elements, joined with shared disappointment brought about by scanty financial know-how, has made a contention twisting seemingly forever.

The contention in the Middle Belt is minimal perceived and has not received widespread media attention. The 2015 Worldwide Psychological warfare index detailed that "Fulani-aggressors" alone were the fourth most dangerous terrorist organization on the planet, liable for the killing of 1,229 individuals in 2014 (Nigeria Investigate Massacre, 2010). In 2016, herder killed a bigger number of Nigerians than Boko Haram, the fanatic gathering generally thought to be the essential danger to Nigerian security (Council on Foreign Relation (CFR), 2012). Notwithstanding, there is an unsettling linkage. Sources inside the Nigerian military charge that Boko Haram individuals are penetrating Fulani people group because of war zone mishaps (Oduah, 2016). Unhealthy national policies contribute to worsening conditions. Efforts by the Nigerian authorities to manage the conflict are ineffective and native authorities describe herders as the sole aggressors (Werrell & Femia, 2018). Failure to forestall conflict additionally creates an unstable atmosphere for effective water management policy.

Methodology

Methodology is accurate and reliable data collection. Research methodology helps to collect accurate and reliable information and explains how research is classified into units to improve data analysis (Yunos &

Ahmad, 201; Fatigun, 2002). The motivation behind the survey was to determine the impact of climate change on the political instability of African countries. The study cited the effects of atmospheric change on Africa's stability and its consequences. It also looks at different adaptation and mitigation measures to ensure that legal measures are in place to limit the impact of climate change that causes violence and protests that lead to instability in Africa. Research must apply qualitative method. Indeed, it helps to gather insights and understand the human and environmental behavior behind the phenomenon.

Research method

The selection of a qualitative method allows access to the data to ensure correct testing. This study applied qualitative research method to answer the research questions. Qualitative research methods are applied to find answers to research questions (Denzin & Lincoln, 2000:15). By applying qualitative research, the researcher achieves results that may not be possible with statistical techniques. Qualitative methods attempt to draw conclusions and derive results from the primary environment where the investigative incident occurred (AlBusaidi, 2008:13).

Thus, qualitative methods tend to derive information from "the meanings people attribute to their experiences, circumstances, and situations, as well as the meanings people give to texts and other objects." (HesseBiber & Leavy, 2011). Second, Tracy, citing Denzin and Lincoln (2005: 4), defines bricolage as "the assembly of a set of representations tailored to the specifics of a complex situation." Inference here is that the researcher is engaged in drawing opinions and using multiple perceptions to explain a particular phenomenon. Thirdly, appraising the structural semblance of a funnel, Tracy (2013) describes qualitative method as an approach that usually begins with a broader spectrum or perspective of the research question before narrowing it down to the distinctive focus.

Conclusion

The aggregate effect of weather conditions change impacts to the consumption of state legitimacy likely could be very significant than is at present esteemed. By putting stresses on the assets important for the feasibility of the country state framework and the prosperity of its populaces, and by genuinely changing key geostrategic conditions, environmental change presents a danger to worldwide security and safety. Notwithstanding such extensive ramifications, approaches intended to address environmental change cannot be completely comparable to the danger assuming they are formed fundamentally or solely in specialty foundations. Public legislatures, as well as territorial and worldwide security organizations should incorporate the impacts of environmental change into their systems, plans, and activities, and shift assets in like manner. Improving, enlarging, and perhaps in any event, establishing new administration structures for tending to environmental change may likewise be important for keeping a steady world control.

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ORCID

Frank Odimegwu ⓘ https://Orcid.org/0000-0003-1653-6195

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Rethinking gender liberation through Ubuntu relational ethics in the age of emerging technologies: Reflections from Alex la Guma's *A Walk in the Night* and Tsitsi Danbgarembga's *Nervous Conditions*

Eunice Fonyuy Fondze-Fombele[1]*

[1]*Department of English and Cultural Studies, University of Buea, Cameroon.* fonyuy.eunice@ubuea.cm
https://orcid.org/0000-0003-3898-5821

Arthur Nebengou Njume Ndeley[2]

[2]*Department of English and Cultural Studies, University of Buea, Cameroon.* arthur42moro@yahoo.com
https://orcid.org/0000-0002-6154-0356

*Corresponding author

Abstract: This study embarks on a qualitative content analysis of gender relations in Alex La Guma's *A Walk in the Night* and Tsitsi Danbgarembga's *Nervous Conditions* in order to rethink gender liberation in the age of emerging technologies. The aim was to deconstuct the one-sided feminist liberation project in Africa, the type that disempowers the boy child of the much needed humane relational values. Through a purposively sampled literary data, the analysis identified and confirmed a lapse of relational ethics within the gender liberation project. The humane Ubuntu relational values were proposed as strategic needs for the psychosocial well-being and full functionality of individuals and communities in this age of emerging technologies in Africa. The major outcome was the reconstruction of a balanced gender liberation project for the well-being of all genders in Africa so that they can connect and interrelate humanely in this age of emerging technologies. The study used a gender relations theory and the Ubuntu relational ethics to reveal the paradoxical disempowerment of both genders when the liberation project considers only the girl-child's predicaments. The emerging adult boys and girls become problems and threats in the technology emerging communities because they now lack humane relational values they need to strive psychosocially while creating and consumimg emerging technologies. In this light, the paper concluded that a shift from girl-child empowerment to girl and boy child empowerment could guarantee a safer future for both sexes as they would interconnect, interrelate and interdepend in mutual respect and confidence in the emerging technology world.

Keywords: Deconstruction, Emerging technologies, Gender liberation, Humane values, Vulnerability, Wellbeing

Introduction

For some decades now, discourses on gender in Africa have focused on the liberation of the woman and the girl child from patriarchal structures that work at her expense (Coulibaly & Aboubacrine, 2018; Nfah-Abbenyi, 1997; Ogundipe-Leslie, 1994; Chioma, 1981). The African woman of the 1950s cannot be compared to the one of today. Contemporary African women have attained a remarkable degree of liberation compared to their sisters of thirty to fifty years back. In most African nations today, women have been involved in nation building, policy-making and are emerging tehnology users and creators. This does not however imply that the

woman has completely attained freedom from male oppression, but it demonstrates that the liberation process has made much progress. However, within the context of emerging technologies where life is governed by information and communication technology use, emerging technologies like 3D printers, robotics and artificial intelligence, human spacelight, internet of things, artificial pinklight farms, sub-sonic transportation hyperloops, brain-controlled computers, there is bound to be inequality in virtual connection abilities and facilities, disruption in the production process and inequity in employability opportunities (Chukwuere, 2021; Umachandran & Dinesh, 2021; Selva, 2020). These disruptive circumstances affect boys, girls, men and women in their gender relationships. It is therefore important to rethink the gender liberation and empowerment agenda in the light of relational ethics. Reflections from *A Walk in the Night* and *Nervous Conditions* reveal psychosocial disequilibrium and dysfunction of characters, as a result of lack of relational ethics. The selected literary data are used here to rethink and deconstruct the one-sided gender liberation agenda and reconstruct ideas that demonstrate how both genders should relate positively and productively. The Ubuntu relational ethics (human intelligence), and emerging technologies (machine intelligence), are proposed in this study as means of reconstructing and restructuring a society with more psychosocially balanced and full functional beings in their interrelationships. Emerging technologies are identified in this research as practical gender interests and needs for all genders, as they can be used in various ways to enhance their learning skills, healthcare facilities, communication, productivity, employability, interconnectedness and many other uses (Chukwuere & John, 2021; Masana, 2021; Umachandran & Dinesh, 2021; Ntseme, Chukwuere & Gorejena. 2021). Besides emphasizing machine intelligence as practical gender needs, the article proposes the relational ethics of Ubuntu as strategic gender interests and needs, which if inculcated in the liberation agenda could bring about psychosocial well-being and full functionality of individuals and groups in society. These practical cum strategic gender interests and needs will accelerate attainment of the Uinted Nation's Sustainable Development Goal three, which aims to ensure healthy lives and promote well-being for all at all ages (UN SDGs Report, 2022: 10).

Research objectives and questions

The main objective of this study is to analyse selected literary data in order to demonstrate the disruption that occurs when there is lack of relational ethics, reinforced by the one-sided gender liberation struggles. The ultimate objective is to discuss how humane Ubuntu relational values are strategic gender interests and needs that can aid in promoting relations of interconnectedness and interdependencies in mutuality and confidenece for psychosocial well-being of individuals and communities in this age of emerging technologies. To achieve these objectives, the study argues for the need to shift from the girl-child empowerment agenda to girl and boy child empowerment and liberation programmes in order to benefit from both practical and strategic gender interests and needs in the emerging technology age. The study asks the following questions:

1. How do some contemporary African Literature by men and women reflect gender liberation?
2. What are the consequences of the lack of relational ethics in the gender liberation agenda as reflected in the literary data selected?
3. How can psychosocial balance and full functionality of individuals and groups in their gender relations be re-established in this age of emerging technologies?

Background

For about half a century, gender studies, discourses and projects have focused on the female gender only. Most African countries presently have established and well-funded institutions that focus on liberating the woman from chauvinistic structures and practices that work at her expense (Assie-Lumumba, 2006). Cameroon for example has a Ministry of Women Empowerment and the Family. Most Universities also have Departments of Women and Gender Studies all aimed at empowering and liberating the women from the shackles of patriarchy and male dominance (Kwachou & Fielding, 2014). Globally, there are many scholarships offered exclusively to the female sex alongside countless privileges. Again, there have been countless conferences across Africa and the globe restricted to women and the girl child with the aim of giving them values, economic

stability and education needed to bridge the void created by patriarchy (Morna, Tolmay & Makaya, 2021; TDR, 2021; AAU, 2006). The man only appears in these documents as a potential suspect and threat who will be punished severely by the law if caught perpetuating any sort of violence or abuse against the woman, the girl child and the community.

The neglect of the boy child has caused him to become vulnerable to drug abuse, terrorism, and countless vices. The tendency is that he has developed a lack of humane values, which in this age of emerging technologies results in serious disequilibrium in the essence of being and belonging. That is why we support the view that the consistent campaign for awareness of girls' empowerment seems to be working but at the expense of the boy child's well-being (Nyangena, 2018: 16). This paradoxical situation makes it difficult for the supposed equity to be rife among both sexes because one party (the male sex) is left in lack of values and eventually becomes psychosocially imbalanced and a thorn in the flesh of the empowered women, either through violence, crime, abuse or other forms of oppression as seen in La Guma's *A Walk in the Night* (1968) and in Danbgarembga*'s Nervous Conditions* (2004). The Ubuntu humane values are added advantage to the technology driven age population and policy needs to consciously inculcate them in male and female individuals for them to function fully in this emerging technology driven world.

Methodology

The aim of this research was to use selected literary data to rethink gender liberation through Ubuntu relational ethics in the age of emerging technologies. The research therefore embarked on a qualitative content analysis of La Guma's *A Walk in the Night* (1968) and Danbgarembga*'s Nervous Conditions* (2004). This literary data was purposively sampled with the aim to select African literary texts that could yield information that can substantiate the importance of humane Ubuntu relational values in the age of emerging technologies. We intentionally selected a text written by a man and one written by a woman in order to show that both men and women African writers are concerned about gender relationships that lack humane values. Excerpts from the narratives that demonstrate gender relations between boys and girls, and men and women, were selected and broken down into small, manageable segments and were analyzed using the gender relations and the Ubuntu relational theories. The process of analysis of gender relations in this study was therefore an exploration and highlight of relationships of men and women in society, and the inequalities in those relationships. The analysis was executed with the aim to demonstrate that humane Ubuntu relational ethos are strategic interests and needs in gender relationships, especially in this age of robotic machines. Once characters lack these humane relational values, they become dysfunctional and disoriented, hence the gender liberation actors need to rethink interdependencies and interconnectedness between the genders and deconstruct the one-sided gender liberation programmes.

Literature review and theoretical considerations

Current research supports the claim that the gender liberation approach is biased and ends up victimizing both the male and female sexes (Chege & Likoye, 2015; Unterhalter & Dorward, 2013). In analyzing perceptions of teachers and parents on how schoolboys in Kirinyaga and Nairobi counties constructed masculinities as they negotiated manhood, Chege and Likoye (2015: 13) observed that boys were underperforming in school projects because they were "often left to fend for themselves at family level" and that "parents did not offer the desired support at home for boys, thus driving them to seek economic independence at an earlier age at the expense of their formal education". Other studies acknowledge the neglect of the male sex in the educational sector as statistics over decades show that many boys drop out of school (Nambiri, 2016; Koskey, 2012; Chowdhury & Patnaik, 2010; Bank, 2005). According to Chege and Likoye (2015: 13), early exit from schooling, which was found to be rampant among the boys, indicates education wastage, which is inconsistent with the spirit of ensuring gender equality within and through the educational process. Such observations necessarily call for renewed focus on the role of families working in collaboration with schools as part of community practice in supporting their sons to navigate the route to successful adulthood by embracing

schooling. However, this perspective of gender liberation has not received adequate critical attention. The present study therefore adds to existing discourses on the biased gender approach, not only to reemphasize the need for an objective approach to gender equality, but to also insist that in the age of emerging technologies, ubuntu humane relational values are needed to support life with robotic technologies. It argues that boys and men are also vulnerable and need most of the values which have been offered only to women for over fifty years in Africa. Only when this is done can we vouch for a sustainable social transformative project for both sexes with a balanced vital ethos.

To rethink the gender liberation project in the light of relational ethics, the gender relations and the Ubuntu relational theoretical approaches have been adopted for the analysis. Theorists of gender relations and Ubuntu relational ethics emphasise interconnectedness and interrelationships in mutual respect amongst individuals irrespective of sex and gender (Ngomane, 2020; Ewuoso, 2019; Marh et al., 1999). According to the gender relations theory, gender relations should be "relations of cooperation, connection, and mutual support" (March et al., 1999: 18). However, society presents us with gender relations that are "of conflict, separation, and competition, of difference and inequality" (March et al., 1999: 18). Gender relations include social relationships between men as a sex and women as a sex, concerned with how power is distributed beween the sexes. Poorly distributed power between the sexes could "create and reproduce systemic differences in men's and women's positions [and psychosocial well-being] in the society" (March et al., 1999: 19). The analysis of gender relations in this study is therefore an exploration and highlight of inequalities that arise as men and women relate with no idea of humane relational ethics. Questions about "Who does what? Who has what? Who decides? How? Who gains? Who loses?" are asked and answers help us deconstruct inequalities in gender relationships (March et al., 1999: 18). Gender relations tend to "define the way in which responsibilities and claims are allocated and the way they are given a value" (March et al., 1999: 18). Since gender relations vary according to time and place, this study insists that, in this time of emerging technologies where robotic machines and machine intelligence are taking centre stage, inculcating humane relational ethics and human intelligence in human relationships in Africa would be a positive additional advantage for the peaceful and meaningful co-existence of both sexes. That is why the gender liberation struggle needs to be revolutionalised with the Ubuntu relational ethics which says that "one's humanity is expressed through one's relationship with others, and the humanity of others is in turn expressed through recognition of the individual's humanity" (Ewuoso, 2019: 96). Richards (2018: 7) quotes an African proverb which says, "If you want to go fast, go alone. If you want to go far, go together". This is an emphasis on the African Ubuntu philosophy of interconnectedness and togetherness in community. Richards (2018: 12) opines that:

> Going together means that you will have to go outside your comfort zone to get the results we seek. … Going together means addressing—and, ideally, healing—the brokenness inside you and me that draws us toward fear instead of toward love. Going together means using every opportunity at your disposal to build bridges instead of walls. Going together means standing courageously against anything or anyone who is actively trying to divide.

The humane Ubuntu relational ethics are expressed through values of Love, care, kindness, gentleness, compassion, benevolence, civility, self-worth and social responsibility. Richards (2018: 13) translated Ubuntu to mean, "I am, because we are," and he insists that "this transcendent African philosophy represents the power of human connectedness, compassion, kindness, and togetherness unlike any single word that I have ever known". Richards (2018) intimates that Ubuntu ethics are desperately needed right now in this world characterised by violence against each other, wars, and crises of all sorts. The Ubuntu values act as "the reminder that we are all connected in this human journey [and] they might be just the way to positively change the world" (Richards, 2018: 13). Richards (2018: 14) refers to Jordan who once said "When I think of the concept of Ubuntu, I no longer feel alone." This is because Ubuntu is the essence of the clan vital, communitarian being and civility. These are values that do not automatically happen. Humane and civil societies come about because we want them to be as we consciously work together for positivity as a way of life.

Desmond Tutu in a foreword to Ngomane (2020: 8-9) summarises the essence of the humane values of Ubuntu as follows:

> one of the most fundamental aspects of living lives of courage, compassion and connection. … Almost daily we were encouraged to show it in our relations with family, friends and strangers alike. I have often said that the idea and practice of ubuntu is one of Africa's greatest gifts to the world. A gift with which, unfortunately, not many in the world are familiar. The lesson of ubuntu is best described in a proverb that is found in almost every African language, whose translation is, "A person is a person through other persons." The fundamental meaning of the proverb is that everything we learn and experience in the world is through our relationships with other people. We are therefore called to examine our actions and thoughts, not just for what they will achieve for us, but for how they impact on others with whom we are in contact. At its most simple, the teaching of this proverb and of ubuntu is similar to the Golden Rule found in most faith teachings: "Do unto others as you would have them do unto you!" But one who has ubuntu goes a step beyond that. It is not only our actions we are called to keep track of, but our very being in the world. How we live, talk and walk in the world is as much a statement of our character as our actions. One with ubuntu is careful to walk in the world as one who recognizes the infinite worth of everyone with whom he or she comes into contact. So it is not simply a way of behaving, it is indeed a way of being! … open your eyes, minds and hearts to a way of being in the world that will make it a better and more caring one.

The authors selected for this study in their works present the fact that they have been "disillusioned by the incivility and divisiveness that is currently gripping our world" and we are all called upon to look for "some strategies to help reverse this troubling trend" (Richards, 2018:14). The texts under study demonstrate that, excessive concentration on the wronged humanity of girls, without reconsidering the process and including boys as actors and victims of the gender liberation struggle causes problematic relationships, disllusionment and incivility that call for a rethinking process. Through the gender relations analysis of selected texts for this study, incivility and disillusioned lifestyles are deconstructed as we rethink life in the fashion of humane Ubuntu relational values.

Rethinking gender liberation, male vulnerability and need for relational ethics
The rethink of gender liberation, male vulnerability and need for relational ethics in a technology driven world is reflected upon using La Guma's (1968) *A Walk in the Night* and Danbgarembga's (2004) *Nervous Conditions* as primary data. Most texts that advocate gender equality represent the man as a nuisance and a hindrance to gender liberation. In *A Walk in the Night*, Constable Raalt's vandalism and lack of self-control show the effects of having a man without values handling a leadership position. His inhumaneness is demonstrated when, in a fit of anger, he commits murder with his automatic riffle. This demonstrates that he could have robotic machines and other emerging technologies helping him do an excellent job at work but with lack of humane values of relatedness, he is short of a human status and global citizenshiphood. Besides the violent, impulsive and aggressive Constable Raalt, one realizes that most of the masculine characters in *A Walk in the Night* are either drug addicts, drunks, or thugs like Sockies, Foxy, Willieboy and Micheal Adonis. Male characters like Uncle Doughty and the sailors are respectively drunk and see the woman as a sex object as they sexually exploit Nancy and her mates under Miss Gipsy's pimphood. This implies that lack of values among the male sex is a gap that needs urgent attention. It goes without saying that if men are trained on the use of emerging technologies like robotic machines and artificial intelligence without humane values cultivated, the society will become insecure because of the lack of the sense of human dignity.

Also, a feminist text like *Nervous Conditions* focuses on how the entrapped and oppressed female characters like Tambu, Maiguru and Nyasha get conscientized and fight for their rights and liberation but has little record of men partaking in this liberation process. Danbgarembga (2004) could have presented ways of empowering Nhamo and changing his mindset, rather than leaving him die in his chauvinistic attitude. Also, Jeremiah and

Takesure are not empowered either by their fellow men or by conscientized women like Lucia. They are rather seen as liabilities who cannot be reformed to partake in the goal towards female liberation. Babamukuru is better placed to transform Jeremiah, Nhamo, Chido, Takesure and other males to become valuable men who respect their Shona women. As head of family, he is very influential. Unfortunately, he lacks these expected values and ironically joins the other men to maltreat their women. Such a representation of characters like Babamukuru portrays characters with gender relations of disconnection who lack community values of interdependency and interconnectedness. Lack of humane Ubuntu values in him and the resulting tragedies around him thus show that the writer calls for the need for such values among men. Empowering such a man with Ubuntu humane values of positive relations definitely ensures the transformation of the family for a better society.

The conditions of most male characters at District Six in *A Walk in the Night* like Willie Boy, Foxy and his gang among several other blacks in South Africa illustrate the claim that boys are vulnerable and swayed into crime and other vices like drug abuse, terrorism, child soldier recruitments, violence and other juvenile acts and are arrested in most armed robbery scenes including cyber criminology. They are said to walk the night like ghosts committing armed robbery attacks for survival. Michael Adonis is also lured to join their gang after he loses his job in a white factory due to racial discrimination. It is therefore dangerous for society to assume that the boy is brave and can take care of himself unlike the girl because the man also faces depression due to state apparatuses and systems that affect his progress.

The men in La Guma's *A Walk in the Night* portray an adequate lack of Ubuntu values. First, Micheal Adonis's boss fires him from the factory when he attempts to resist dehumanizing working conditions. He says:

> Got pushed out of my job at the facktry….Answered back to an effing white rooker foreman. […] That white bastard was lucky I didn't pull him up good […] every time a man goes to piss house, he starts moaning. Jesus Christ, the way he went on you'd think a man had to wet his pants rather than take a minute off. Well, he picked on me for going for a leak, and I told him to go to hell (La Guma: 1967: 4).

Another man that exerts violence on his fellow man is Constable Raalt. He hates blacks to the point where he craves for opportunities to perpertuate violence upon them as he says: "I wish something would happen. I 'd like to lay hands on one of those Bushmen bastards and wring his bloody neck" (La Guma, 1967: 39). His pejorative description of blacks as "Hotnots", "Bastards", Bushmen" "Skollies" depicts the void of Ubuntu humane values in his attitude. As if that is not enough, Raalt goes as far as attacking the innocent. He mercilessly vents his anger on Willieboy:

> Raalt held the dusty grey eyes on him and lifting his right hand up near his left shoulder struck the olive skinned man across the mouth with the back of it, saying, spitting out each word, you don't have to smile at me, jong , I'm not your playmate […] and Raalt struck him again , so that the blood formed in a pool in the corner of his mouth and slid out and down that side of his chin , crooked trickle"(La Guma, 1967:42).

The act of killing Willieboy by Constable Raalt, and the way he puts him in the van reveals a sadistic and inhuman behavior, Raalts says to Andries: "[…] load him in the back of the van and take him down to the station. They'll fix him up there, the bloody hotnot" (Ibid: 84). Willieboy eventually bleeds to death due to such inhumane barbarism and use of a revolver. These pathetic instances of men oppressing other humans emanate from the abandonment of the man in the gender liberation goal, coupled with the lack in the Ubuntu values. The white man, like his fellow black men, are ignored to an extent, as opposed to the women. This neglect is portrayed in Willieboy's upbringing. We are told through the use of flashback that:

> His mother beats him at the slightest provocation and he knew that she was wreaking vengeance upon him for the beatings she received from his father. His father came home drunk most nights and beat his mother and him with a heavy leather belt. His mother crouched in a corner of the room and shrieked and whimpered for mercy when his father is through

with her, he turned on Willieboy, but sometimes, he managed to escape from the room and did not return until late in the night when the father was snoring drunkenly and his mother had cried herself to sleep. .His mother, unable to defend against her husband, took revenge for her whippings on Willieboy (La Guma, 1967: 84).

We realize that the home which is supposed to be a place of tranquility, a locale for balanced empowerment with humane Ubuntu values, becomes an abusive terrain. When the father figure lacks these Ubuntu values, it replicates in the mother and spreads to the children, producing a community of abusive persons and drug addicts who in turn maltreat other humans. This goes on to buttress our argument that involving men in the empowerment process can ensure the stable psyche and valuable relationships within the family, among humans, and beyond. Rather than blame the man, we should include him in the gender equality project in order to curb parental or marital cruelty and propagate mutual respect for both genders and humans as a whole.

The vulnerability in the male gender is also reflected in the way men treat women, with a sense of superiority. Such is the case in *Nervous Conditions* and *A Walk in the Night* where chauvinistic characters like Jeremiah, Takesure, Babamukuru, Nhamo, Chido and Lorenzo respectively are a thorn in women's flesh and are lacking in many values necessary for unbiased interconnectedness and interdependencies between the genders. In *Nervous Conditions*, one does not see obvious efforts proposed by Danbgarembga to add value to male existence. One may educate and empower the girl child but if she unfortunately works under a chauvinistic boss or marries a violent neglected and disempowered drug addict, she may easily be affected. So empowerment should also be redirected towards the source or cause of the woman's problem, men, and not just the victim. This rethinking will help add strategic interests and needed values to practical interests and needs like emerging technologies because "my humanity is caught up, is inextricably bound up, in theirs. We belong in a bundle of life. … I am human because I belong, I participate, I share" (Ewuoso, 2019: 96) .

In *Nervous Conditions*, Doris, the old white woman who sees Tambu selling mealies pities and helps her because she is a girl. If she were a boy, little attention would be paid to her plight because of the societal misconception that the man has been in control already and has to give way to the woman. The texts however, prove the contrary that boys are vulnerable too as most of them get involved in criminal activities. Willlieboy even gets killed when roaming the nights aimlessly. When girls are given free empowerment in vocational training centers and boys compelled to pay or roam the streets idly, it is not surprising if unempowered boys turn into armed bandits and break into the shops of empowered ladies. Such a mindset is reflected in *A Walk in the Night* where Joe and Willieboy are allowed to themselves due to their parents' inability to cater for them.

Chowdhury and Manjari (2010: 457) hold that it is impossible to promote gender equality within a patriarchal social order without the consent, mindset, and involvement of the male population. They emphasize the need to empower the boys and men in terms of their understanding, information, and capacity building with regard to equal opportunity for both sexes without which any amount of women reservation and welfare programs will be able to enhance the status of women folk. Their Indian experience is not too different from the African scenario where a majority of the policy makers are men who create and use emerging technologies excellently, but lack the humane values of interrelationship and interdependence in conviviality. In *Nervous Conditions*, Jeremiah drinks with his friends all day while his wife, Ma'Shingayi works in the farm all day with a baby on her back and cooks for him every evening. Nhamo, Jeremiah's son claims to study all day and boycotts farm work while his sisters, Tambu and Netsai spend all day in the farm feeding cattle and watering vegetables. Takesure also lazies around on the pretext that his hardworking wife, Lucia, will provide for the home. Babamukuru, the head of the family, restricts his wife from visiting her family, uses all of her salary every month as he pleases and uses cruel methods to discipline his daughter, Nyasha which makes her end up in a neurotic disorder. These are signs of a lifestyle that produces disillusionment and incivility and the writers

reveal these circumstances in order to shock the readers to the realization of how far they have moved from the humane relational values.

Koskey (2012: 187) sees mentorship as a formadable way of empowering the male sex in pursuit of female liberation when he asserts that, 'There is need to identify and recognize successful professional men within the District who can act as role models or mentors to the boys. Reading through both texts under study, one sees which male characters are worth emulating. Joe and Andries in *A Walk in the Night* are symbolic of morality and male conscientisation. They use friendship and career as platforms for male empowerment respectively. They both advice their friends, Michael Adonis and Constable Raalt against crime and violence respectively. The deaf ears they receive show that male empowerment is a process that entails persistence and repetition before the expected results are achieved. If family heads like Babamukuru in *Nervous Conditions* see this institution as a platform for building fellow men, the female/male approach to gender liberation will yield better fruits in this world of emerging technologies.

The fifth of the *United Nations Sustainable Development Goals* (UNSDGs) 2030 is geared towards achieving gender equality and empower all women and girls (SDGs Report 2022). This goal, unfortunately paints the gloomy picture of a biased gender liberation project. The goal shows that whenever the subject of gender equality comes up, what stakeholders have in mind is the woman and girl child whom they consider are the only ones vulnerable. For over fifty years, this has been the approach and it has not yielded much fruit. It is ironical to target only the oppressed in a liberation battle or conflict resolution process –they should target the 'oppressor' too. In *A Walk in the Night,* the case is not dissimilar. Men of valour are hard to trace in the text. Lorenzo keeps impregnating his wife, Grace and refuses to yield to her family planning appeal. They have five children who barely have a mattress to lay their heads on, yet she is pregnant with the sixth. Due to excessive oppression from Lorenzo, "her body had become worn and thickened with regular childbirth. Her face had the boniness and grandeur of an ascetic saint, and her eyes were dark wells of sadness mixed with joy" (La Guma, 1968: 36). Lorenzo cannot even provide the family with two meals a day but sees his wife as a sex object baby-making machine. Likewise, we learn from a flashback that Willieboy's father beat up his mother regularly while he was a kid and the mother would sometimes transfer aggression to the innocent child. She beats him up until he runs away and chooses the streets. Michael Adonis ends up joining armed bandits like Foxy. Lack of men of substance and with humane values worth emulating in both texts shows the dire need for men of value, self-worth and cultural integrity who should be part and parcel of the gender liberation project. There is need for both genders to be empowered with both practical needs like emerging technologies and strategic needs like the ubuntu relational ethics.

As earlier mentioned, the man is one of the key threats to the woman's liberation, so the best way to liberate the woman is not to give her a shield to defend the blows or bullets from the man's rifle but to disarm him strategically teaching him core values that will deter him from maltreating the woman. African folklore is a formidable storehouse of such values that can help the man see the woman as a reliable partner, helper and assistant who deserves his respect, care, and solidarity, not violence, battering, abuse and brutality as has been the case. If these folk stories are revolutionalised by using technology to turn them into cartoons for world consumption, the Ubuntu values in their relational nature will animate human values generally.

Again, the family unit has a great role to play. Nyangena (2018: 19) posits that a "parent with two teenagers of both sexes will be more protective over the girl and completely ignore the boy to take care for himself. This forces boys to engage in criminal activities such as drug abuse and terrorism. Consumption of illicit brews by young men is common". Willieboy goes through these experiences and ends up being a street gangster who is ironically killed on the day he commits no crime. The gender liberation project should be one where boys and girls alike can be reformed, rehabilitated with spiritual emphasis, moral values and basic ethics that will positively affect their perception and treatment of each other for quality liberation.

Lastly, state structures should accommodate programs aimed at empowering both sexes. Ministries of Social Affairs, Ministries of Women Affairs, and Departments of Gender Studies in universities should intentionally incorporate the male sex alongside the female sex with the purpose of entrusting lasting values in boys and girls that will positively affect their interrelationships and interdependency with each order in conviviality. Seminars, conferences, radio and TV programs and emerging technologies like information, communication technology, robotics and artificial intelligence, internet of things, artificial pinklight farms and brain controlled computers should be organized in such a way that they empower both boys and gilrs in their relationships. Churches, mosques, cultural groups, local community leaders and family heads are not left out of this collective effort towards inclusive gender liberation in the age of emerging technologies.

Conclusion

This study observed and identified lapses in the one-sided approach towards female emancipation for over half a century in Africa. Its objective was to use the gender relations and Ubuntu relational ethics to rethink this lapse by portraying the effects of one-sided gender empowerment as enacted in Alex la Guma's *A Walk in the Night* and Tsitsi Danbgarembga's *Nervous Conditions* and so reconstruct a balanced gender liberation project in the age of emerging technologies. The study submitted that empowering the male sex is good, empowering the female sex is better, but empowering the female and male sexes is added advantage, a vital force that brings about peaceful and meaningful co-existence in this age of emerging technologies. If the girl child is empowered alongside the boy child, it will guarantee a safer future for both sexes and the society. Empowering the woman and leaving out the man is paradoxically disempowering the woman because the unempowered man may remain a threat to the 'liberated' woman in spite of the life transforming and usefulness of robotic machines. Female and male empowerment is a remedy to female marginalisation, not solely female empowerment which has been more of a weapon for resistance. The male sex is also vulnerable and has the right to psychosocial balance in this ever constantly changing technology driven world.

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ORCID

Eunice Fonyuy Fondze-Fombele 🆔 https://orcid.org/0000-0003-3898-5821
Arthur Nebengou Njume Ndeley 🆔 https://orcid.org/0000-0002-6154-0356

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Premium times release of "Pandora's papers": Problems and prospects of investigative reporting in Nigerian

Mwansat Satkyes Samuel[1]

[1]*Mass Communication, University of Jos / University of Jos, Nigeria. mwansatss@unijos.edu.ng*

*Corresponding author

Abstract: The practice of investigative journalism in Nigeria is dealing with a number of issues that seriously jeopardize the advantages that come with this important facet of the journalism industry. People rely on the media as watchdogs to expose errors and wrongdoings by those in authority since they are considered the fourth estate of the realm, which obliges them to monitor and report on the actions of the government. However, it is required that the media conduct in-depth research while keeping in mind the press's corporate social duty to only present true and truthful news. The Pandora Papers and the impact of a prominent online daily, Premium Times, on Nigeria's political elite are two examples of how this study explores how the paradigm shift of online journalism has impacted professional journalistic practice in Nigeria. The study used quantitative analysis, and survey research approach, the work is predicated on the press's social responsibility theory. A structured questionnaire is used to collect data from the 300 members of the Plateau State chapter of the Nigerian Union of Journalists (NUJ). A sample of 100 journalists was randomly taken and examined. According to the study's findings, investigative journalism is done in Nigeria, albeit at a pitifully low level because of issues that plague the field. With the Freedom of Information (FOI) Bill becoming law in 2011, there are more opportunities for its application. The article therefore urges media outlets to take a proactive approach to investigative journalism. To advance the field of investigative journalism in Nigeria, journalists should participate in events like symposia and seminars.

Keywords: Pandora's Papers, Investigative Journalism, Problems, Prospects, Mass Media

Introduction

The insatiable nature of man to communicate beyond the interpersonal level led to the development of modern means of communication called the mass media. The term mass media according to McQuail (2000: 39) is described as means of communication that operate on a large scale, reaching and involving virtually everyone in society. The relationship between mass media and society was examined by scholars on the functions of the media in society. For instance, Miroshnichenko (2016: 52) while extrapolating Mcluhan's explorations on the contributions of the impact of the media to the society and culture submitted that communication media extend man's senses and have a greater capacity to the extent that the structure of the society is fundamentally altered by their existence. Similarly, Daramola (2005) sums up the societal impact of the media as setting agenda for discussion, facilitating change as well as acting as a means of spinning propaganda. In the same vein, other earliest scholars in the field of communication such as Joseph Klapper, WilbrumScrham, Paul Lazarsfeld, and Robert K. Merton described the media as agents of social control which mobilizes the society for a singular cause (Daramola 2005: 97). Schramm cited by Daramola (2005: 97) simplified Lasswell's postulation by describing the media as a watcher forum.

Both the mouthpiece of society and the link between the government and the governed is the media. All society's media professionals have a fundamental responsibility to act as a civic watchdog whose goal is to unearth hidden problems and keep the government answerable to the people. On the one hand, investigative journalism has a reputation for being a specialized, "non-profit," and "fact-based" vocation. Journalists who work in this field are expected to routinely investigate and expose wrongdoing, corrupt behavior, and other types of occurrences that are purposefully kept secret and could potentially harm the public interest. According to Itule and Anderson (2007: 397), accomplishing this frequently necessitates investigation and in-depth work, which calls for researching, delving thoroughly, speaking with people, and writing. The advent of the Internet has redefined how Investigative Journalism and the gatekeeping mechanism are done as it is now clear that the internet has made almost everyone a content generator. Investigative journalism, to put it briefly, is the discovery, reporting, and presenting of news that other people attempt to conceal (www.journalism.eu).

Despite the term's relative strangeness, investigative journalism has evolved over time into a powerful weapon for critically and completely exposing social injustices and secrets that governments, institutions, organizations, or people would naturally try to keep from the public. This study examines investigative journalism using the Premium Times Newspaper's recent publication of Pandora's papers and their links to 'corrupt' government and private individuals in Nigeria. The premium times in its publications dished out stories about some government officials who were alleged to be exposed to some corrupt practices through an offshore data tsunami called Pandora's papers. Importantly, fact-finding and fact-giving are pivotal to mass media practice, therefore, it is necessary to identify any questionable matter that must also be made public. However, Ugwu (2010: 77) notes that despite the promising future of investigative journalism in a developing country like Nigeria, it is frequently challenged by a number of difficulties that are almost debilitating its method of coping.

Problem statement

There are allegations that investigative journalism has declined since the 1970s, when it was at its peak, and that many media professionals are now more focused on entertainment than fact-finding and information sharing (Harcup, 2009: 110). Investigative journalism appears to be inefficient or barely conducted in Nigeria, despite its promising future, as a result of a number of issues. Without conducting a thorough investigation, journalists in Nigeria frequently publish stories that are half-truths, misrepresented facts, and outright lies. As a result, they frequently misinform the public and foster rumors, unsupported assertions, and negative feelings that are bad for the profession's ethics. Some of these problems served as the impetus for our investigation. The study aimed to identify the effects of investigative reporting and the obstacles.

Research questions

The following research questions will serve as a guide for the researcher's findings and analysis in this study:

1. What are the chances for investigative journalism in Nigeria now that the Premium Times Newspaper has published the Pandora's papers?
2. What are a few of the challenges faced by investigative journalism in Nigeria?
3. What were the effects of the Premium Times report on Nigeria's Pandora's papers?
4. What are the purported advantages of investigative journalism to Nigerian citizens?

Objectives of the study

The basic objective of this study is an attempt by the researcher to establish the prospects and problems of investigative reporting in Nigeria using the Premium Times release of the pandora's papers investigation as the focal point. Specifically, the study seeks to examine:

1. To examine the prospects of investigative journalism in Nigeria after the publication of the pandora's papers by Premium Times Newspaper.
2. To find out the problems of investigative reporting in Nigeria.

3. To examine the fallout of Premium Times report of the pandora's papers in Nigeria.
4. To determine the perceived benefits of investigative journalism to the people of Nigeria.

Significance of the study

Pressure, news subjectivity, and subpar reporting are just a few of the studies that have been done on investigative reporting. Considering how little research has been done on the topic, this study will be very helpful to institutions and media professionals that engage in investigative reporting.

This is true because every society's basis rests on its capacity for excellent administration, which in turn supports the advancement of the economy and industry. As a result, maintaining a stable social, political, and economic environment is imperative. However, this demonstrates the crucial role investigative reporting has developed to hold in the grand scheme of things. When used appropriately, the use of investigative reporting to unearth stories can aid in meeting the desired objectives.

Literature Review

Premium times and the Pandora's papers

The Premium Times Centre for Investigative Journalism (PTCIJ), one of Nigeria's most renowned online publications, is a voluntary organization that was founded in 2014. It is dedicated to conducting innovative investigations into abuses of authority, human rights violations, and corruption. The Centre has received funding from the Human Rights program in the past and has developed a reputation for specializing in investigative reporting and exposing corruption in politics and business. With the help of this grant, PTCIJ will conduct a number of in-depth investigations on money, safety, and terrorism. Additionally, it will construct civic technology that will enable citizens and journalists to learn together and publish multimedia reports. The Centre is working together with additional Foundation grantees to carry out the project. The prize is a part of a collection of prizes with the overall goal of enhancing Nigeria's potential for investigative and data-driven journalism. Premium Times has recently released the Pandora Papers, the world's largest investigation on exposing corrupt government officials.

The investigation into the Pandora Papers reveals the interconnectedness of political influence and covert offshore funding on a worldwide scale. The investigation discloses the covert dealings and hidden assets of over 330 politicians and high-level public officials in more than 90 nations and territories, including 35 country leaders, based on the largest leak of tax haven papers in history. The files included names of ambassadors, mayors, ministers, presidential aides, generals, and a governor of a central bank.

The International Consortium of Investigative Journalists, a nonprofit newsroom and network of journalists based in Washington, D.C., acquired more than 11.9 million financial records from 14 offshore service providers, businesses that create and oversee shell companies and trusts in tax havens all over the world. These records contained 2.94 terabytes of private information. The documents make public the offshore holdings of much more than 130 billionaires from 45 different nations, including 46 oligarchs from Russia. 100 billionaires have a combined wealth of more than $600 billion in 2021, according to Forbes. Bankers, significant political donors, arms traffickers, international criminals, music stars, espionage leaders, and sports titans are among the other clients. The files were distributed by the ICIJ to 150 media partners, including the publication Premium Times, beginning the largest partnership in journalism history. (Premium times Oct.3rd, 2021).

Overview of investigative journalism

Investigative reporting no doubt can be traced to the early existence of man. Scholars in the media and communication discipline have worked assiduously over the years to create a better comprehension of the purpose, importance, and prospect (s) of investigative reporting in Nigeria and the world at large. Investigative

reporting, for instance, refers to the study and disclosure of all relevant data to the public, making the discipline essential to democratic government as it is represented in the role that media play as a watchdog. For this reason, Lee (2012) argued that investigative journalism is essential to the sustainability of a nation's democracy. Asemah and Asogwa (2012) also corroborated the indispensability of investigative reporting toward a democratic system of government. They believe it is key to democratic institutions for national development in third world countries, adding that investigative reporting has over the years helped uncovered some corrupt conducts and transform the credibility of many media outfits. Moreso, Anyadike (2013), who provided support for this claim, media professionals have a fundamental duty to the public to act as a civic watchdog with the mission of disclosing hidden concerns and ensuring that the government is always liable to the general public. Speaking further on the importance of investigative reporting in society, Athanasius (2017) notes that investigative journalism is a tool of initiatives, reconfiguration, and advancement as it informs, enlightens, captivates, and enriches both the leaders and their subjects, demonstrating the versatility of investigative reporting in creating a society that is suitable for habitation. Investigative journalism has been defined as the research of disclosure that was inspired by a lifestyle of strong disagreement and fostered by laws that protect main criticisms and ensure access to public records. Unlike other straight news stories, which are typically completed quickly under the pressure of a deadline, research has demonstrated that the investigative reporting strategy goes outside the typical reportage of happenings, media interviews, and other events. Investigative reporting, scholars have come to discover, is to unearth secret facts concerning social evils, malfeasance, and other offenses that could harm society (Armao, 2000; Kovach & Rosenstiel, 2007; Anyadike, 2013). Ufuophu and Biri (2008), opine that, investigative journalism goes beyond simply reporting on obvious facts because it entails delving deep to uncover previously unrevealed information.

Although Chambers (2000: 89) claims that investigative journalism in the UK thrived in the remaining three decades of the 20th century, Dorril (2000) contended that the field only "enjoyed a brief bloom in the seventies, flowered for a short period in the seventies, severely witted in the eighties and is now practically dead." Hanna (2000: 2) contends that investigative journalism was not just alive but also declining. The researcher identifies systematic changes in the media as factors behind the drop. The practice of investigative reporting has achieved huge successes in recent times- for example, Chinese publication Caixin disclosed in 2011 that county officials in a southern region were abducting infants and selling them on the black market, which sparked an official inquiry and garnered attention worldwide. Journalist Hu Shuli, who pioneered investigative journalism in China after completing a 1998 Knight Fellowship at Stanford University, launched the magazine, which is renowned for delving into buried stories. The Bosnian Center for Investigative Reporting revealed Nedzad Brankovic's acquisition of a nearly free apartment through a shady government privatization deal in 2007 by using public data. Brankovic is the prime minister of Bosnia and Herzegovina's Republika Srpska. Following the investigation, Brankovic was charged, which finally resulted in his resignation. The Philippine Center for Investigative Journalism conducted an eight-month investigation into Joseph Estrada's hidden assets in 2000, revealing how Estrada had accumulated a number of mansions and had covert ownership interests in a number of businesses. The television show incited the Philippine media to take action, helped shape the main accusations in an impeachment trial, and precipitated Estrada's resignation months later. These case-specific details have one thing in common: they were all the outcome of thorough investigations conducted by journalists in democratic and developing nations. Also, in Western nations in which the practice seems to be well, it has always been difficult to support devoted teams and individual reporters to conduct in-depth investigations because it is costly, hazardous, and frequently contentious. There are frequently laxer or, in some circumstances, nonexistent laws protecting investigative journalists in developing nations and democracies. Investigative reporting has managed to secure a distinctive and prestigious niche in media practice despite these difficulties. Because they are frequently more trained, pursue more difficult topics, and have a bigger impact than beat and daily news reporters, investigative journalists are sometimes referred to as the "special forces of the profession." Investigative journalism is most recognized in developed regions for deposing current presidents and other political, public, and office holders for misuse of authority and other

social vices. By confronting dishonest government, structured crimes, theft by deception, and corporate wrongdoing, these crusading journalists have contributed to establishing a standard for demanding, in-depth reporting in the public interest.

The history of Nigeria and its democracy cannot be fully understood without noting the media's contributions, which were crucial to the country's struggle for independence and the maintenance of its democratic system. Investigative reporting has continued to be more significant in Nigeria over time in the magazine sector of the print business than in other areas of the media. Newswatch magazine was instrumental in redefining the investigative and interpretative practice Duyile (2011). Only recently have more media outlets joined the fray. As a result, Nigeria's investigative reporting reached its pinnacle under the military administrations, particularly that of General Ibrahim Babangida and afterwards General Sanni Abacha. Investigative journalists, such as Dele Giwa, Ray Ekpu, Dan Agbese, and Yakubu Mohammed, among others, did not hesitate to point out and criticize dangers to the advancement of the nation. Their writing was quite effective. Together, these journalists gave investigative reporting a serious component and paved the way for a new method of journalism in Nigeria (Okon, 2017). Since Nigeria's return to democracy in 1999 following a protracted period of military rule, according to Uwakwe (2015), media professionals in Nigeria have taken practical actions to confront or expose corruption in government. He claimed that numerous alleged and verified corrupt political activities were made public by the press. One of the well-known incidents was when Alhaji Saliu Buhari, the then-House of Representatives speaker, was exposed in 1999 for making fraudulent claims about his age and education. Others involve former governors Joshua Dariye, Ayodele Fayose, and Diepreye Alamieyeseigha. Due to claims of improper behavior, "the upper legislative House has likewise become a laughingstock." On June 4, 2001, The News stated that three governors, including one from the South West who purchased a home in Florida in the United States of America and the other who had more than $100 million in his account, were reeking of corruption. According to an article in Tell magazine on November 20, 2001, certain members of the House of Representatives to quicken the process of removing the speaker Umar Ghali Na'Abba. Former President Olusegun Obasanjo and Mr. Peter Odili, the former governor of Rivers State, were named in the report as the report's sponsors. Ex-Governors Orji Uzor-Kalu, Ladoja, and others are accused to have stolen 52 billion naira, according to an article in the Tribune on July 10, 2009. However, Odunewu (2008) expressed grave concern that the field of investigative journalism appears to have been marginalized at a time when it is most necessary for the advancement of the practice in Nigeria. This was further supported by Assay (2009), who noted that in contrast to their counterparts in developing South Africa and Ghana, the Nigerian mass media continued to move at a snail pace in the area of robust investigative reporting. This claim was supported by Athanasius (2017), who claimed that the once-thriving Nigerian media has now been demoted as a result of the practitioner's priority to one-sided reportage, journalism of blackmail, and character assassination orchestrated by ownership influence and the preference for news commercialization.

Investigative journalism is no longer practiced by Nigerian reporters in the way that it has traditionally been conceived, according to Okon's (2017) study on the subject. He noted that many Nigerian reporters who identified as investigative journalists lacked the necessary expertise, and that such features are often overlooked, which tends to constrain the tradition and effectiveness of investigative practice in Nigeria today. On this note, Ugwu (2010) attributed the military's intrusion into governance, which had a significant impact on Nigeria's journalists, to the hibernation of the country's media toward investigative reporting. The researcher also claimed that the pathological fear the military government had instilled in media professionals through repressive laws was severe. The media professionals' perception of this growth has been clouded by fear, laziness, and a severe inferiority complex, which has made the discipline appear ineffective. Asogwa and Asemah (2012) The application of investigative reporting to combat graft in Nigeria is also hampered by a number of other factors, such as press laws, official secret acts, constitutional issues, journalistic corruption, ownership influence, unprofessionalism, and a lack of ethical standards on the part of the reporters. In a

workshop in Abuja, Media Right Agenda (MRA) (2011) attested to this as well by citing reasons for the lack of investigative reporting, such as threats to life and limb, private political agendas, and the government's overall concealment policy. The works of Okon (2017) emphasized impeding issues, such as a deficit in institutional finance, an accommodating business conditions, and a compensation and benefits, that are to blame for the unserious manner in which the practice is now addressed.

Prospects of investigative reporting

Investigative reporting has significantly benefited in the improvement of journalists; but, in order for them to keep practising their craft and contribute to the general macroeconomic progress of Nigeria, it is necessary to arm them with the relevant information. It is important to promote knowledge expansion so that journalists may report with objectivity. (Nigeria Infoguide, February 28, 2017) Investigative reporting is crucial to democracy, according to academic research, hence conducive environments should be developed to support it. where attacks against reporters' lives will be discouraged in order for them to properly perform their societal obligations.

Theoretical framework

The Social Responsibility Theory of the Press serves as the foundation for this study. In 1956, Fred Siebert, Theodore Peterson, and Wilbur Schramm developed the social responsibility theory after reading the influential report of the Hutchins Commission, which was led at the time by Robert Hutchins, the president of the University of Chicago.

According to the Social Responsibility thesis, the press's social obligations to inform the public, advance democracy, protect individual liberties, etc., should take precedence above those of an economic system-serving institution (Oloyede, 2005). Additionally, according to the Hutchins Commission (1947), one of the responsibilities of the press under the social responsibility paradigm is to provide "complete access to the day's intelligence." The main focus of this hypothesis is self-regulation.

The social responsibility theory is suitable for this research because premium times, which reports political corruption with such freedom, has an obligation to serve the public good and is constantly worried about the safety and well-being of the populace by giving a factual, thorough, and erudite account of each day's occurrences in a perspective that provides purpose to the people.

Methodology

The research methodology used in this study was quantitative research. Quantitative research is concerned with facts, reasoning, and an impartial viewpoint. It emphasizes precise, cohesive reasoning over divergent reasoning and emphasizes numerical, static data.

Research method

It was determined that survey research was most suitable for this investigation. When conducting a survey, the respondents must either be interviewed or given a self-administered questionnaire in order to collect data. The researcher's study area is located in Jos North, more specifically in the Nigerian Union of Journalist (NUJ) Plateau state chapter. This is owing to the area's proximity to the researcher's location as well as economical limitations. It will also allow the researcher to receive feedback promptly. 300 journalists from the NUJ, Plateau State branch make up the study's sample. Using Morgan's table of sample size determinants, the sample size for this investigation was determined to be 100. The 5-point Likert scale questionnaire was the tool utilized to obtain the data. Data gathered for the study was presented and analyzed using a straightforward table, frequency, and percentages.

Result and discussion

Simple percentage analysis and table presentation were used to analyze the questionnaire data gathered from the respondents. 100 questionnaires were distributed to the respondents for this study, and 100 of them were duly filled out and returned. The discussion of findings will be based on the copies of the questionnaire that have been returned.

Result and discussion

Table 1: Percentage sex distribution of respondents

	Frequency	Percent%	Cumulative Percent%
Male	58	58.0%	58.0%
Female	42	42.0%	42.0%
Total	100	100%	100%

Source. Field survey 2022

Table 1 shows that 42% of respondents were female and 58% of respondents were male, respectively.

Table 2. Percentage distribution of respondents conversant with the Pandora Papers by Premium Times

	Frequency	Percent%	Cumulative Percent%
Yes	94	94.0%	94.0%
No	6	6.0%	100%
Total	100	100%	

Source. Field survey 2022

Using the above table, it can be shown that 94% of respondents are familiar with the Pandora papers, while only 6% of respondents are not.

Table 3. Investigative journalism is practiced in Premium Times

	Frequency	Percent%	Cumulative Percent%
Strongly Disagree	6	6.0%	6.0%
Disagree	8	8.0%	14.0%
Undecided	14	14.0%	28.0%
Agree	42	42.0%	70.0%
Strongly Agree	30	30.0%	100%
Total	100	100%	

Source. Field survey 2022

Table 3 shows that 30% of all respondents strongly agreed with the statement that the Premium Times newspaper engages in investigative journalism. 42 percent of respondents agreed, 14 percent were unsure, 8 percent disagreed, and 6 percent strongly disagreed with this argument. This suggests that the majority of respondents agree that investigative journalism is done in Premium Times. Using percentage analysis, the viewpoint is as a result **(ACCEPTED)**.

Research Question One: What Are The Prospects Of Investigative Reporting In Nigeria After Publishin The Pandora's Papers?

Table 4. Are there prospects for Investigative reporting in Nigeria

	Frequency	Percent%	Cumulative Percent%
Strongly Disagree	6	6.0%	6.0%
Disagree	8	8.0%	14.0%
Undecided	14	14.0%	28.0%
Agree	42	42.0%	70.0%
Strongly Agree	30	30.0%	100%
Total	100	100%	

Source. Field survey 2022

According to table 4, 30% of all respondents strongly agreed that after Premium Times published the Pandora's Papers, investigative reporting in Nigeria has a very bright future. 42 percent of respondents agreed, 14 percent were unsure, 8 percent disagreed, and 6 percent strongly disagreed with this argument. This suggests, based on percentage analysis, that the majority of respondents share the belief that investigative reporting has promising futures in Nigeria. The claim is hereby **(ACCEPTED)**.

Research Question Two: Challenges Of Investigative Journalism

Table 5. Challenges to the practice of investigative journalism includes Fear of death, poor renumeration and media ownership

	Frequency	Percent%	Cumulative Percent%
Disagree	14	14.0%	14.0%
Undecided	8	8.0%	22.0%
Agree	52	52.0%	74.0%
Strongly Agree	26	26.0%	**100%**
Total	**100**	**100%**	

Source. Field survey 2022

Table 5 revealed that 26% of all respondents strongly agreed with the statement that media ownership, low pay, and fear of death are obstacles to the conduct of investigative journalism. None of the respondents significantly disagreed with this assumption, according to the results of the survey, which showed that 52% of respondents agreed, 8% were unsure, 14% opposed, and 0% were in agreement. This suggests, based on percentage analysis, that the majority of respondents believed that media ownership, fear of getting killed, insufficient pay, and dread of being maimed are all obstacles to the practice of investigative journalism. The viewpoint is **(ACCEPTED)**.

Research Question Three: What Was The Fallout Of Premium Times Report Of Pandora's Paper

Table 6. There was no backlash and punitive measures after the release of the pandora's papers

	Frequency	Percent%	Cumulative Percent%
Disagree	6	6.0%	6.0%
Undecided	9	7.0%	15.0%
Agree	41	37.0%	56.0%
Strongly Agree	44	50.0%	**100%**
Total	**100**	**100%**	

Source. Field survey 2022

From table 6 above, it can be shown that 50% of all respondents strongly agreed with the statement that those named in the Pandora files received no retribution and no penalty. 41% of respondents agreed, 9% were undecided, 6% disagreed, and 0% of respondents overall strongly disagreed with this premise. This suggests, based on percentage analysis, that the majority of respondents concur that there was no reaction and no punishment meted out to those named in the Pandora papers. The viewpoint **is (ACCEPTED)**.

Research Question Four: Prospects Of Investigative Journalism

Table 7. There are huge prospects of investigative journalism in Nigeria

	Frequency	Percent%	Cumulative Percent
Disagree	4	4.0%	4.0%
Undecided	6	6.0%	10.0%
Agree	36	36.0%	46.0%
Strongly Agree	54	54.0%	**100%**
Total	**100**	**100%**	

Source. Field survey 2022

According to table 7 above, 54% of all respondents strongly agreed with the statement that investigative reporting has huge potential in Nigeria. 36 percent of respondents agreed, 6 percent were unsure, 4 percent disagreed, and 0 percent strongly disagreed with this premise. This suggests, based on percentage analysis, that the majority of respondents share the belief that investigative reporting has enormous potential in Nigeria. This viewpoint is **(ACCEPTED)**.

The study looked through pandora's pieces published by the premium times in order to analyze the opportunities and issues of investigative reporting in Nigeria. To gather information for the research, research questions were developed, quantitative analysis was employed, and questionnaires were used as the tools. Due to their expertise in the field of investigative reporting, the survey was undertaken among active journalists who are members of NUJ in Plateau state. It's important to note that there have been claims that investigative journalism has been on the decline since the 1970s, when it was at its height. Many investigations today are focused more on entertainment than information, so it's unusual to find highly organized investigative findings in journalism, such as those found in the Pandora Papers. It is discovered that the obstacles of investigative reporting in Nigeria include media ownership, low pay, and fear of being killed, among other things. Investigative reporting has also been found to have promising futures and to promote nation-building.

Recommendations

Using the research's findings as a baseline, the researcher suggests the following:

- The Nigerian government should ensure the security of reporters who conduct investigations.
- Journalists should regularly attend symposia, workshops, and other forms of training to be grounded in investigative reporting.
- The truth shouldn't be sacrificed by media proprietors in the name of politics, money, or any other self-serving goals at the expense of exposing societal evils.

Conclusion

According to the study's findings, the following conclusions were made: First of all, even though investigative journalism is not a particularly new discipline in journalism, it is acknowledged and used in Nigeria, particularly by the premium times publications. Despite there being many media outlets in the nation, the level of investigative journalism practice is also quite low and uninspiring. Although there are a lot of media outlets in the nation, investigative journalism is not widely practiced. Most media professionals are more interested in covering entertainment, sports, and other activities than serving as society's watchdog. However, there are no security or insurance options for reporters who wish to pursue investigative journalism in Nigeria because death threats have significantly weakened the field. The successful use of investigative journalism in Nigeria offers some intriguing potential for the media in Nigeria, especially in light of the passage of the Freedom of Information Bill (FOI).

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Corporate organizational culture and employee engagement: An empirical study of South-East Nigerian firms

Calistus Chika Abokigbo[1*]

[1]*Department of Business Administration and Management, Grundtvig Polytechnic, Oba, Anambra State, Nigeria.* abokigbochika@gmail.com, https://orcid.org/0000-0002-8762-5251

*Corresponding author

Abstract: The general objective of this study is to determine the relationship of corporate organizational culture and employee engagement. Among others, the study seeks to determine a relationship between collaborate organizational culture and emotional engagement ; to evaluate hierarchy organizational culture and cognitive engagement relationships. Questionnaires are structured using 5 point Likert scale. A sample size of 500 out of 5000 staff was selected for this study. In analyzing the data, simple percentage was used while Pearson correlation was used as the statistical tool to test the hypotheses. Due to cross-cultural differences, leadership behaviors and environment it was noticed that both the independent and dependent variables used in measuring organizational culture varied from one organization to another . However, there is significant relationships between collaborative culture, hierarchy culture, adhocracy culture, market culture, achievement culture and emotional engagement, cognitive engagement, physical engagement, solidarity engagement and priority engagement. It is however, recommended amongst others that, managers should promote policies that encourage collaborate and hierarchy organisational culture, a function of which will attract emotional and cognitive engagement of competent workforce.

Keywords: Corporate organisational culture, Collaborate culture, Hierarchy culture, Employee engagement, Cognitive engagement

Introduction

This study focused on the relationship of corporate organizational culture and employee engagement in selected firms within South-East Nigeria. Organizational progress is usually dependent on the engagement nature of its employees, and as it were, employee engagement is usually driven by organizational culture (Yavirach, 2018). May, Gilson and Harter (2017) opined that an improvement on the engagement level of employees could be determined by Culture of reinforcement positively, sufficient resources and communications, innovation, top management trust, enhancement of skills, autonomy and teamwork. This scholar reiterated that a firms competitive advantage is a function of strong organizational culture. Employee behavior is substantially influenced by management behavior which invariably affects the relationship between employee engagement and organization outcomes. Employees are usually empowered and satisfied with the work environment on the enthronement of efficient work culture, which makes them feel better engaged with their job. Every organization requires a healthy work environment which should ultimately involve engaging organizational culture. A high energy levels and and enthusiastic workforce characterize engaged employees. The major priority of every organizational management is to be consumer focused, effective communication and employees well being to achieve the desired result. To work together towards a common objective as a social unit, organizations need to pull together individuals of different backgrounds. These individuals with diverse values, backgrounds and beliefs come into the organization and adopt ways of

doing things. Shantz, Alfes, Truss and Soane (2013) believe that every individual has a unique feeling, action and thought that were acquired as life progresses. They exist in organizations that have set values, beliefs, ways of organizational actions and many more. To achieve their common goals, organizations therefore, must define an acceptable culture and endeavor to impact it to its workforce. Culture is described to exist in seen and prevailing practices and how people identify with activities within their organization (Shantz et al., 2013). It is possible to interpret the culture within a particular organization by reading documents and observing how things are done within the organization. An organization is an association of people working and executing together to attain common goals and objectives. Organizational work is done by employees and employee output depends on organizational environment.

Problem statement

Idris et al. (2015) asserted that performance of organizations and reduction in return on investment for shareholders is a function of deficient culture as well as poor cultural integration. in organizations. Erdorf, Hartmann-Wendels, Heinrichs and Matz (2013) noted that while expanding the scope of a business is perceived as a business growth essentials, it however, emphasizes the essence of profitability as a critical factor for any business existence. In Eaton and Kilby (2015), corporate leaders etimated at 72% identified with the necessity of culture to performance in organizations while effective culture was observed by about 25% of corporate leaders in their organizations.

Objectives of the study

Relationship between corporate organizational culture and employee engagement formed the general objective while the following specific objectives were formulated:
1. To determine collaborate organizational culture and emotional engagement relationship.
2. To evaluate hierarchy organizational culture and cognitive engagement possible relationship.

Research questions

The following questions may help the researcher towards identifying those effective organizational culture put in place through management actions which leads to organizational productivity. They are:
1. To what extent is collaborate organizational culture related to emotional engagement?
2. To what extent is hierarchy organizational culture related to cognitive engagement?

Hypotheses

H1: Collaborate organizational culture is significantly related to emotional engagement.
H1: Hierarchy culture is significantly related to cognitive engagement.

Significance of the study

This study will assist captains of industries, entrepreneurs and business managers at all levels to develop a comprehensive policy framework that will foster good working relationship in the business environment of the organizations for societal economic development. Behavioral, value and attitudinal change among members of the organization are functions of organization's cultural changes.

Scope of the study

The context of this research study is the Nigerian manufacturing firms. Some of these manufacturing firms located in the Southeastern Nigeria, were carefully chosen for this study in order to verify whether a relationship exist between corporate organizational culture and employee engagement among selected manufacturing firms. So, this study seek to ascertain the relationship between collaborate culture, hierarchy culture, emotional engagement and cognitive engagement. Only 50 staff who have worked in these selected firms for more than five (5) years were allowed to participate.

Limitations of the study

Several issues were encountered by the researcher during the course of this study, which are; inaccurate responses from the respondents, distant information access from respondents since the staff are scattered across the Southeast, delay in returning the questionnaires by the respondents and lastly the clear inability of some respondents to willingly return their questionnaire which greatly affected the sample of the study. Again, to overcome or rather minimize these challenges, respondents were properly oriented, and website created for ease of transmission of completed questionnaires, while encouraging those who can not access the internet to return their questionnaires on time after filling in their responses.

Literature review

Through the help of the research questions and objectives, this chapter has been able to deal with several burning issues raised in the statement of the problems and satisfactorily provided the best possible route for organizational productivity. This literature outlined the conceptual and other underlying factors which constitute a proper organizational culture, and specifically reviewed its ability to assist in the achievement of organizational goals and objectives. It drew attention and knowledge from authors on organizational culture and employees' engagement whose research focused more on how proper display of management skills by modern day managers, through the evolution of proper organizational culture, led to employees' engagement. The researcher was guided by arguments, though contradictory as well as empirical evidence in observing the best organizational practices for overall productivity.

Conceptual review

This conceptual review defines all the components of organizational culture and employee engagement as the independent and dependent variable respectively.

Organizational culture

Schneider et al. (2013) identified organizational culture as work settings and norms experienced by organizational workforce. Employee behaviours and orientations to achieve results in the organization is shaped by such norms. According to Simoneaux and Stroud (2014) Culture of organisations refers to employees' way of interactions with each other as well as other stakeholders. Ortega-Parra & Sastre-Castillo (2013) described Organizational culture as difference between one organization and another in terms of set of values, beliefs, and behavioral patterns. The drive of people towards choice and decision making both subconsciously and silently in the organization which occurs as a result of value system defines organizational cultutre (King, 2012). Interchangeably, organizational and corporate culture are used by business managers. According to Childress (2018), they were both considered as similar substantive phenomenon. From the beliefs of the founders according to Martínez-Cañas and Ruiz-Palomino (2014) and Schein (2010) organizational culture may spring from different sources. Learning experience of Group membership experience in terms of learning, assumptions and fresh belief of fresh members and relatively new managers as opined by Uddin, Luva and Hossian (2013) may include sources of organizational culture. Organizational founders at commencement stage may be priviledged to unveil organizational strategy and direction. Andish, Yousefipour, Shahsavaripour and Ghorbanipour (2013) indicated that ways organizations operates is significantly determined by founders.

## Strong and weak organizational culture

Flamholtz and Randle (2011) pointed out that employees of organizations have similar views in a strong culture, and which remains the basis for which they consistently relate with organizational values. Simoneaux et al. (2014) opined that a strong culture that affect work attitudes cum performance of the workforce is displayed by business managers due to the fact that culture engages and motivates employees. Kotter and Heskett (1992) insisted that organizational goals and values are inculcated among employees and these values are equally and quickly adopted by new employees.

As explained by Denison (1990), there is an indication that culture and business performance of organizations are positively related . A strong culture was indicated for performance as a motivating factor, as shown by a study results (Simoneaux et al., 2014).

Employee engagement

Everyone benefits when employees are engaged because they feel that their their talents may used to develop successful relations and their efficiency increased through created relationships (Parent & Lovelace, 2015).The invention drives which moves the organizations forward as opined by Van Allen (2013) is a function of level of consistency of engaged employees' performance. It was found that 30% and 20% of any organization's workforce are effectively engaged and disengaged respectively, according to the survey conducted at Gallup, reported in the Harvard business review as stated by Sanford (2002).

Wherever employees work and express themselves emotionally, mentally and physically when they perform their roles as asserted by Khan (1990) is referred to as employee engagement. He continues to infer that Disengaged employees according to this scholar usually exhibits withdrawal tendencies during role performance and as well endeavours shielding themselves emotionally, mentally and physically. Engaged employees are psychologically present at work. A job related positive and fulfilling mind set characterized by absorption, dedication and vigor, in the job, to the job and at the work according Shaufeli, (2007) defines employee engagement.
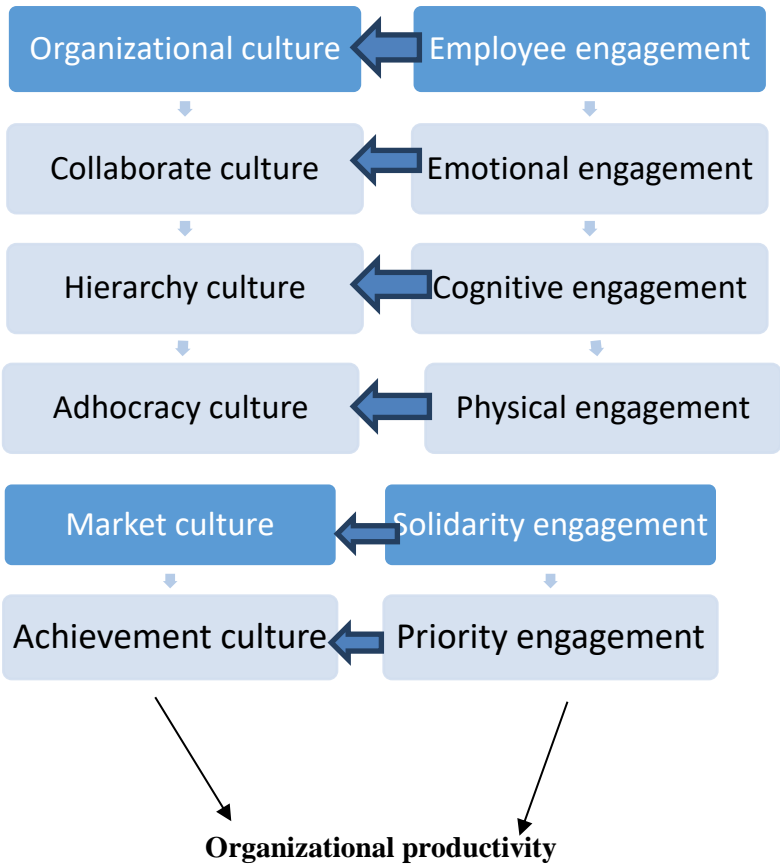
Source: Researcher's Conceptualization

The diagram above shows that all the five (5) dimensions of dependent variable (Employee Engagement) have direct relationship with all the five (5) dimensions of independent variable (Organizational Culture). This activation is made possible only when there is supportive organizational culture and which can lead to employee engagement.

Summary of literature

Although several authors hold diverse opinions and beliefs about organizational culture, in the Nigerian setting, especially in the Southeast, it is a common belief that a culture based on a extensively shared set of beliefs that are supported by strategy and structure is a key to successful organizations. Three things will probably happen: Employees are acquainted with a response pattern to any situation as anticipated by top management, to the employees, the expected response as anticipated by management from them is the appropriate one, and so, expect rewards to have demonstrated the values of their organizations. With these thought rooted firmly in the minds of the employees, productivity is easy to achieve.

Gap in knowledge

In the course of literature review, an observation was made about business managers failure to recognize "cross-cultural differences" as one of the vital components of organizational culture. However, an improved understanding of the role of cross-cultural differences as one of the ingredients of collaborative organizational culture for enhanced productivity may acquired by business managers through the effective use of the result of this study. Raza, Anjum, Shamsi and Zia, (2019) posited that adjustment to cultivate effectual culture within the system is a function of thorough comprehension of an organizations' culture. Childress (2018) suggested that an effective organizational culture is a function of outstanding business strategy. Globally, most manufacturing organizations choose to single out one of the organizational culture and effectively utilize it for the growth and profitability of the organization. It is however encouraged that Nigerian business, especially those within the SouthEast, should identify and incorporate the tenets of a known organizational culture in all organizational activities as this will enable them to achieve those set goals and objectives of the organization.

Methodology

This research used different analytical procedures such as Research Design, Instrument, Data Collection Method, Sampling Method and Data Analysis in creating a better understanding of organizational culture and employee engagement in selected firms in the Southeastern Nigeria.

Research design

The context of this research is the Nigerian manufacturing companies. Survey research design was used for this research because according to Tewksbury (2009), it focuses on testing the strength and persistence of relationships between distinct variables. It also specifies exactly how two (or more) very narrow, limited concepts/variables concepts is of value, but often of value only for very exact measurements of narrowly defined issues, and variables.

Population of the study

A total of five thousand (5000) employees from five (5) manufacturing firms in the South-East Nigeria namely; JUHEL Pharmaceuticals Industries Limited Awka; Tonnimas Nigeria Limited Aba; Elizade Nigeria PlcOwerri; Innoson Vehicle Manufacturing Company Limited Emene; SIWO Chemical Industries Limited Abakiliki were used. Out of this total population of five thousand (5000) employees, two hundred (200) employees comprised the management staff while four thousand eight hundred (4800) are the junior staff of the organization. However, both senior and junior staff of the organization was targeted for data collection.

Sources of data

Data for this study originated from Primary and secondary sources. Reason was to ensure accurate source of data.

Sample size/techniques

A sample size of 500 out of 5000 employees (350 males and 150 females) were used for this research. SRS technique was adopted for respondents' selection. Selected firms located in South-East Nigeria were chosen

for this research due to their convenience. This research tapped into the junior employee feelings and garnered responses on how they feel about the culture of the organization.

Instrument for data collection

Questionnaire was used for this research. It was used because it is relatively quick to collect data from a group of respondents and is more objective. It was also used because the researcher expectedly used quantitative methodology which involves numerical data (statistical analysis). The questionnaire was constructed by the researcher. Development of the questionnaires was based on the identified dimensions of organizational culture put together from the existing literature.

Distribution and retrieval of instrument

A total of five hundred (500) copies of the questionnaires were administered to five hundred (500) respondents working in these selected manufacturing firms and only five hundred (500) copies of the questionnaires were retrieved. The questionnaire was personally distributed to the sample size by the researcher through the heads of the unit and through the same channel retrieved the questionnaire.

Validation of the instrument

The instrument designed for this study was subjected to expert validation. These experts were Professors and lecturers in the department of business administration. The instrument was also properly examined by the supervisors.

Method of data collection

Survey questionnaire retrieved from five hundred (500) staff of these selected firms participating in the study was method used to collect data.

Method of data analysis

Data generated for this research was analyzed using simple percentage. In testing the hypotheses, Pearson Correlation was used as a statistical tool.

Presentation and analysis of data

Analyzing and interpreting of data collected through questionnaire usage is the main thrust here . Percentage analysis was used as the statistical instrument to analyze the data.

Data presentation and analysis

Table 1. Showing gender distribution

OPTIONS	RESPONDENTS	PERCENTAGE
Male	350	70
Female	150	30
TOTAL	500	100

Source. Field survey, 2022

The above table indicates that 70% (350) of the sample size are male employee while 30% (150) are female employee. It is however clear that the greater number of employee in active service are male.

Test of hypotheses

Test of hypothesis 1

Ho: Collaborate culture is not significantly related to emotional engagement.

H1: Collaborate culture is significantly related to emotional engagement.

Table 2. Descriptive Statistics

	Mean	Std. Deviation	N
Collaborative Culture	1.9130	1.24418	500
Emotional Engagement	1.9348	1.25596	500

Table 3. Correlations

		Collaborate Culture	Emotional Engagement
Collaborate Culture	Pearson Correlation	1	.944**
	Sig. (2-tailed)		.000
	N	500	500
Emotional Engagement	Pearson Correlation	.944**	1
	Sig. (2-tailed)	.000	
	N	500	500

**. Correlation is significant at the 0.01 level (2-tailed).

As indicated in table 2 a descriptive statistics of the collaborate culture and emotional engagement show 1.9130 and 1.24418 as mean and Std. Deviation respectively for Collaborate Culture while 1.9348 and 1.25596 are shown as mean and Std. Deviation respectively for Emotional Engagement, thus 500 respondents shown. The standard deviation values, if observed carefully, differed insignificantly in terms of scores implying an equal variance with respect to data points among the variables (dependent and independent).

The Pearson product moment coefficient of correlation for collaborate culture and emotional engagement is indicated in table 3. The correlation coefficient shows 0.944. This shows a correlation significance level of 0.05 (2tailed), indicating that collaborate culture is significantly related to emotional engagement (r = .944). The table value of r = .195 with 34 degrees of freedom (df. = n-2) at alpha level for a two-tailed test (r = .944, p< .05) of the computed correlations coefficient is greater. Since the table value of .195 is less than the computed r = .944, the null hypothesis is however rejected indicating that collaborate culture is significantly related to emotional engagement. (r =.944, P<.05).

Hence, the findings of hypothesis 1 is that collaborate culture is significantly related to organisational engagement, It is therefore implied that improvement in collaborate culture spurs organisational engagement. This may be cause of poor organisational engagement in southeastern Nigeria firms because empirical studies of this work shows poor collaborate culture in this regional part of Nigeria. This is consistent and in line with the opinion of Simoneuux et al (Simoneuux et al., 2014).

Test of hypothesis 2
Ho: Hierarchy culture is not significantly related to cognitive engagement.
H1 : Hierarchy culture is significantly related to cognitive engagement

Table 4. Descriptive Statistics

	Mean	Std. Deviation	N
Hierarchy Culture	1.8261	1.16043	500
Cognitive Engagement	1.9065	1.26713	500

Table 5. Correlations

		Hierarchy Culture	Cognitive Engagement
Hierarchy Culture	Pearson Correlation	1	.955**

	Sig. (2-tailed)		.000
	N	500	500
Cognitive Engagement	Pearson Correlation	.955**	1
	Sig. (2-tailed)	.000	
	N	500	500

**. Correlation is significant at the 0.01 level (2-tailed)

.

Table (4) indicates a descriptive statistics of the hierarchy culture and cognitive engagement of 1.8261 and1.16043 as mean and Std. Deviation respectively for hierarchy culture and 1.9065 and 1.26713 as mean and Std. Deviation respectively for Cognitive Engagement in the face of 500 respondents. The standard deviation values, if observed carefully, differed insignificantly in terms of scores implying an equal variance in terms of data points among the variables (dependent and independent).

Pearson product moment correlation coefficient for hierarchy culture and cognitive engagement is indicated in table (5). The correlation coefficient of 0.955 is shown indicating a significant level at 0.05 (2tailed) of correlation and thus demonstrating that hierarchy culture is significantly related to cognitive engagement. (r = .955). The table value of r = .195 with 34 degrees of freedom (df. = n-2) is less than computed correlations coefficient for a two-tailed test (r = .955, p< .05) at alpha level The null hypothesis is rejected, confirming and concluding that hierarchy culture is significantly related to cognitive engagement (r =. 955, P<.05).

Hence, the findings of hypothesis 2 is that hierarchy culture is significantly related to cognitive engagement, implying that improvement in hierarchy culture spurs cognitive engagement. This may be the brain behind discouraging cognitive engagement in southeastern Nigeria firms because empirical studies of this work indicate poor hierarchy culture in this geopolitical region of Nigeria. This is consistent and in line with the opinion of Kotter et al. (1992).

Summary of findings

This study examined corporate organizational culture and employee engagement in South-East Nigerian firms. The following findings were summarized.
1. There is significant relationship between organizational collaborate culture and emotional engagement.
2. There is a significant relationship between organizational hierarchy culture and cognitive engagement.

Recommendations

1. Managers should promote policies that encourage collaborate organizational culture, a function of which will attract competent workforce for successful engagement.
2. A cognitive employee engagement, hierarchy organizational culture which emphasizes on deep-rooted stability, coherent structure and shared values across the whole organization should be encouraged by organizational managers.

Conclusion

Although there have been just few researches conducted on organizational culture and employee engagement, no research has ever been conducted on this subject matter particularly in South-East Nigerian firms. So, this research has specifically explored the relationship of corporate organizational culture with employee engagement in South-East Nigerian firms. The used instrument was appropriate, hence it covered existing culture in manufacturing firms which in turn brings about the needed employee engagement for the organizations. In the opinion of Childress (2018), the most competent strategy to sustain productivity,identity, performance, integrity, profitability, and adopted in the 1950s by business managers was corporate organizational culture . Performance cum productivity improvement according to Eaton et al. (2015), requires proactive maintenance of effectual culture. This study among others explored meaningful strategies that could

be useful by management team for organizing an effective organizational culture for performance improvement in the corporate group.

ORCID

Calistus Chika Abokigbo ⓘD https://orcid.org/0000-0002-8762-5251

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Theme 4:

Emerging Technologies in Agriculture (ETA)

Effect of some mechanical parameters of a shea butter oil extractor on the oil yield

Ibrahim Mohammed Gana[1*], Abubakar Musa Hassan[2], Abubakar Alhaji Shehu[3]

[1,2&3]*Department of Agriculture & Bioenvironmental Engineering, Federal Polytechnic Bida, Nigeria.* ganaibro74@yahoo.com[1], abubakarmhassan2@gmail.com[2], shehuaa2000@yahoo.com[3]
https://orcid.org/0000-0003-4555-6494[1]

*Corresponding author

Abstract: Shea butter is extracted mostly using conventional methods, which are complex, inefficient, time-consuming, and expose the product to contamination. The development of a mechanical shea butter mixer was carried out to remedy this shortcoming. This study established the mechanical parameters of the machine that is capable of producing the optimum oil yield. The blade type, mixing speed, and container diameter were the mechanical parameters under investigation. Each of the parameters was changed on a scale of one to five, with blade types ranging from one to five, mixing speeds of 93, 100, 110, 120, and 123 rpm, and container diameters of 33, 40, 50, 60, and 69 cm. Testing revealed that an interaction between a container diameter of 50 cm, 5 blades, and speed of 110 rpm yielded the highest oil yield of 39.43 percent, while an interaction between a container diameter of 33.2 cm, 3 blades, and speed of 110 rpm yielded the lowest oil yield of 26.52 percent. The blade type was discovered to have a greater impact on shea oil extraction. The best mechanical parameters of the mixer capable of increasing the oil yield are established. This will increase the extraction of shea oil to meet the demand for nutritional food and ensure its commercialization by supplying a significant amount to the market. This will also have a positive effect on the economy of the country by providing employment to a large number of people, reducing post-harvest losses through processing, and ensuring higher processing efficiency.

Keywords: Blade, Container, Mixer, Mechanical parameters, Shea butter, Yield

Introduction

The Shea tree (*Vitellaria paradoxa*), which grows widely and naturally in West and Central Africa, is valued because of the shea butter extracted from the shea nut. It is a perennial and deciduous tree which grows naturally throughout the Guinea Savannah region. It thrives in areas of the Savanna where, due to low rainfall, oil palm cannot grow (Rose-monde & Se'bastian, 2015). The major producing countries are West African countries, including Nigeria, Burkina Fasso, Benin, Ghana, Ivory Coast, Senegal, and Cameroon. In Ghana and Nigeria, it occurs within 50 km of the coast (Nikiema & Umali, 2007). In Nigeria, about 45 percent of the land area is suitable for the growth of shea trees. It currently grows in the wild in many states, including Niger, Benue, Plateau, Nassarawa, Kogi, Bauchi, Jigawa, Kano, Kaduna, Yobe, Taraba, Kebbi, Sokoto, Borno, Zamfara, Edo, Oyo, Ekiti, and FCT (Shehu, 2016). According to United States Agency for International Development (USAID) (2010), shea butter trees are mostly abundant in the middle belt areas of Nigeria (Benue, Kwara, Niger and Abuja) where they are found growing wild. Shea butter is the most important source of fatty acids, glycerol in the diet. Also, it is a commonly used moisturizer, salve, and lotion in cosmetics (Gana, 2016). It is a slightly yellowish or ivory-colored fat. Shea butter is used in Africa as a cooking oil, a wax, for creating candles, for hair styling, and as an ingredient in topical medications. It is used for treating

the following conditions: burns, rashes, severe dry skin, dark spots, skin discoloration, chapped lips, stretch marks, and wrinkles. It provides natural protection from ultraviolet rays. According to Warra (2011), it is sometimes used as a substitute for butter made from cocoa. Shea nuts are the primary source of income for rural females and kids in Northern Ghana involved in their gathering. In addition to a number of unsaponifiable components, shea butter extract includes the following fatty acids: oleic acid (40–60%), stearic acid (20–50%), linoleic acid (3–11%), palmitic acid (2–9%), linolenic acid (1%), and arachidic acid (1%).

The increase awareness of shea butter's socio-economic and health benefits, as well as its increase demand globally as an important ingredient in personal care and edible products has contributed immensely in increasing the number of its processors both at household and small-scale levels (Bello- Bravo, Lovett & Pittendrigh , 2015; Gana, 2016). According to Shehu, Gana and Balami (2018), Nigeria and other West African nations are looking into the shea export market as a result of rising demand for shea products in the European Union (EU) and the United States of America (USA). In most of the developing countries like Nigeria shea butter is mostly processed using traditional manual method. Basically, due to low extraction efficiency (high losses) and poor butter quality obtained from these techniques, the Nigerian shea butter market is currently underutilized. This might be explained by the absence of modern processing techniques and the dominance of small-scale processors with production capacities of less than 0.1 ton per day in the industry (Saba et al., 2018). Shea butter is generally prepared by hand using conventional techniques in most underdeveloped nations, including Nigeria. According to Aviara, Oluwole and Haque (2005), this ancient method of extracting shea butter from the kernel entails a number of separate procedures. These procedures include cracking the nuts' shells with a stone or using a mortar and pestle to gently pound the nuts, followed by mixing or oil extraction. The most challenging step in the production process is mixing. The process entails the following steps: combining the paste with water; vigorously pounding the paste with the palm of the hand; adding further small amounts of water; and gathering the floating fat. According to Shehu (2016), mixing by hand is a laborious process. The paste container is often set on the ground, and the processor stands over the bucket while bending at the waist. Hand mixing takes a lot of time, is tiresome, and strains the back. This process leaves the product open to contamination. However, the few modern imported mixing machines are exclusively found in large-scale enterprises since they are too complex for local processors to operate and maintain (Gana, Shehu & Balami, 2019). The issues listed above led to the development of a shea nut mixer at Federal Polytechnic Bida in Niger State, Nigeria. The goal of the current study is to investigate the effects of the developed mixer's mechanical parameters in order to determine its optimum parameters capable of maximizing oil yield.

Methodology
Shea paste samples preparation
The shea kernels from the shea tree (Vitellaria paradoxa) of the family Sapotacea were used in this study. It was obtained from Zhigichi village in the Lavun Local Government Area of Niger State, Nigeria. The kernels were cleaned manually by hand to remove all foreign materials. The cleaned shea nuts were then crushed, roasted, and milled using a crusher, roaster, and extractor. For this experiment, forty kilograms of shea paste were used. The shea paste was divided into twenty samples of 2 kg each. The samples were processed using the developed mixer in accordance with the design matrix in table 1 (Gana, Agidi, Idah & Anuonye, 2017), with the centre point being replicated six times. The experiments were carried out at the Agricultural and Bioenvironmental Engineering Departmental Workshop of Federal Polytechnic, Bida, Nigeria on the 23rd and 24th of March 2021.

Equipment
A shea oil mixer (Figure 1) developed by Shehu (2016) was used in this study. The machine was made up of the following components: these are interchangeable sets of blades made up of stainless-steel sheets of 5 mm each. These are blades attached to the shaft inside the mixing container. The blades have the same number of cutting edges but a different orientation. The blades are: 2-blade assembly, 3-blade assembly, 4-blade

assembly, 5-blade assembly, 6-blade assembly. The mixing tank had dimensions of 0.39 m x 0.30 m and it was mounted on the machine frame made up of a 0.50 m angle iron assembly. The boiler tank is made with dimensions of 0.35 m x 0.41 m, and it was mounted on the machine frame made up of a 0.50 m angle iron assembly. A shea butter delivery pipe was fitted to the bottom side of the drum in order to allow the flow of extracted shea oil. The stirring arm is made up of a 0.30 m diameter circular pipe, a length of 0.24 m and an arm length of 0.129 m. It was attached to the stirrer arm through a gear system. The burner is fitted inside an enclosure which is square in shape with a height and width of 0.40 m each. Between the burner and the enclosure, insulating material was fitted in order to prevent heat loss.

Figure 1: The Shea Oil Mixer

Experimental setup and plan

A Response Surface Methodology was employed in this study using a central composite rotatable design (CCRD). It consists of three factors, which vary at five levels (Gana et al., 2017). The CCRD is made up of 20 experimental runs (2k + 2k + m, where k is the number of factors and m is the number of replicated center points), with eight factorial points (2k), six axial points (2k), and six replicated center points (m = 6). k is the number of independent variables, and the axial point has a value of 1.68. Results from preliminary studies were used to establish the centre point of the CCRD for each factor. The three factors (machine functional parameters) are blade type, container diameter, and speed of mixing. The blending blade mixes the shea paste with water. It was varied in configurations of 1, 2, 3, 4, and 5-blade assemblies. The mixing container influenced the extraction and varied from 33, 40, 50, 60, and 69 cm in diameter. The other variable used is the mixing speed of the blade. This influences the speed of rotation of the blade. It varied from 93, 100, 110, 120, and 123 rpm. The experiment was conducted based on the design matrix shown in Table 1. The machine functional parameters were the independent variables while the yield of shea butter oil was the dependent variable (response).

Working procedure of the machine

The mixing blade was fixed on the shaft inside the mixing tank or container. The milled shea paste was fed into the machine mixing tank. Cold water was added intermittently to the paste. As the machine blade rotates, it mixes the paste with water. This process was continued until fat began to form and float on the surface of the solution. The fat was skimmed off into another pot. The water draining valve was then opened and water with less density than the oil drained out of the machine. After draining the water, the oil valve was opened

and oil flowed out into the heating unit. The oil is heated to remove particles and mucilage. The melted oil is filtered and then left to cool and solidify into shea butter.

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Testing of the mixer

In the testing of the extractor, the effects of mixing container diameter, blade type, and speed of mixing on the yield of the shea butter were examined. The experiments were carried out at the Agricultural and Bioenvironmental Engineering Department of the Federal Polytechnic Bida, Nigeria.

Determination of yield of the shea butter oil

The yield of the shea butter was determined as reported by [8], and is given as;

$$Y_{sb} = \frac{A}{M} \times 100 \qquad\qquad (1)$$

Where Y_{sb} is the yield of the shea butter (%), A is the amount of shea butter oil obtained (kg), M is the total weight of the shea paste feed into the mixing drum (kg)

Result and discussion

The yield of butter is the degree to which the oil is extracted from the paste. It was evaluated using the formula reported by Gana (Gana, 2016). The effects of independent variables; container diameter, blade type, and speed of mixing on the yield of butter are presented in Table 1. The yield of oil ranged between 26.52 % and 39.43%. The highest yield of oil of 39.43% was obtained from interaction between drum diameter of 0.5 m, 5-blades assembly and speed of 110 rpm, while the least oil yield of 26.52 % was obtained from interaction between drum diameter of 0.332 m, 3-blades assembly and speed of 110 rpm.

Table 1. Results of Effects of Mechanical Parameters on Yield of Shea Butter Oil

Std. Ord	Container Diameter (m)	Blade Type (No)	Speed of Mixing	Yield of Butter
6	0.60	2	120	31.18
8	0.60	4	120	31.98
14	0.50	3	127	28.04
20	0.50	3	110	37.77
15	0.50	3	110	37.98
10	0.67	3	110	32.18
2	0.60	2	100	30.23
1	0.40	2	100	23.73
16	0.50	3	110	38.32
3	0.40	4	100	28.44
11	0.50	1	110	33.16
12	0.50	5	110	39.43
9	0.332	3	110	26.52

13	0.50	3	93	27.44
7	0.40	4	120	29.82
4	0.60	4	100	33.23
5	0.40	2	120	28.32
17	0.50	3	110	35.05
18	0.50	3	110	37.98
19	0.50	3	110	37.05

Statistical analysis

A statistical analysis of the variance of the experimental was conducted with the aid of software (Design Expert 7.0.0). The findings of the statistical analysis of the variance of the experimentally collected data are presented in Table 2. At a 5% significant level, the significant model terms were found. There was only a 0.001 chance that noise would cause a large Model F value because the model was significant ($P \leq 0.001$). Additionally, the outcomes demonstrated that blade type and container diameter were important model parameters ($P \leq 0.05$). With a coefficient of estimate of 1.89, it is evident that A (container diameter) has the greatest impact on the production of shea oil. The lack of fit of an F-value of 0.94 means that it is insignificant in relation to the pure error. There was a 52.75% possibility that the F-value was unfit. This big value might come up as a result of noise. The insignificant unfit value is good because if it is significant, then the model equation will not be able to predict the response (Mohgir, Bup, Abi, Kamga & Kapseu, 2015).

Table 2. Regresional Analysis of Response of Yield of Shea Butter

Source	Coefficient of Estimate	Standard Error	F-Value	p-value Prob > F	R-Squared
Model	37.39	0.48	30.69251	< 0.0001	Significant
A-Container Diameter	1.89	0.32	34.58865	0.0002	
B-Blade Type	1.51	0.32	21.90526	0.0009	
C-Speed	0.49	0.32	2.312879	0.1593	
AB	-0.3	0.42	0.514061	0.4898	
AC	-0.78	0.42	3.479493	0.0917	
BC	-0.68	0.42	2.590451	0.1386	
A^2	-3.07	0.31	96.21693	< 0.0001	
B^2	-0.62	0.31	3.862982	0.0777	
C^2	-3.64	0.31	135.1949	< 0.0001	
Lack of Fit			0.93714	0.5275	not significant
R-Squared	0.9651				
C.V	3.67				
R	0.9824				
Adequate Precision	16.3				

The obtained coefficient of variation (C.V.) of 3.67 percent was modest and less than the 10% threshold. According to Gana et al. (2017), this indicates that there was not a significant difference between predicted and experimental values. The model equation was able to predict roughly 98.24 percent of the variations between the predicted and experimental values, according to the coefficient of determination R value of

0.9824. As a result, the model was unable to fully explain the variation, which was 1.76 percent. The coefficient of correlation R-Squared value of 0.9651 was very close to 1 as recommended (Xin & Saka, 2008). A minimum value of 4 was the preferred value when measuring the model precision, which assesses the ratio of signal to noise (Goyal, Sharma & Jain, 2013).

Effects of blade type and container diameter on yield of shea butter oil

Figures 2 and 3 show the response surface and contour plot for the yield of shea butter oil, respectively. When the number of blades was increased from 2 to 4 using a drum with a diameter of 0.5 m, the yield of butter increased from 35.4 percent to 38.4 percent. This might be the result of more blades being used, which would increase the agitation and mixing of the paste slurry. This was in line with the findings of a previous study by Gana (2016) that discovered that the design of the blade had an impact on how well milk slurry was mixed. The speed of mixing increases with the extent of blade contact with the paste. Furthermore, using four blades, the oil yield increased from 34.3 percent to 38.5 percent with an increase in mixing drum diameter from 0.4 m to 0.50 m and remained constant with an additional increase in drum diameter to 0.6 m.
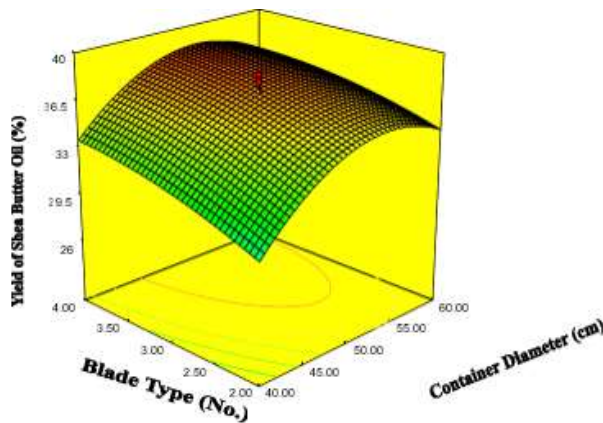

Figure 2. Response Surface For Yield Of Shea Butter With Respect To Blade Type And Container Diameter
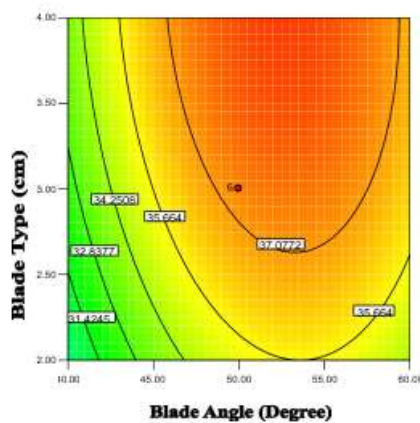

Figure 3: Contour plot for response surface of yield of shea butter with respect to blade type and container diameter

EEffects of speed of Mixing and Blade Type on yield of shea butter oil

Figures 4 and 5 explain the correlation between mixing speed and blade type. As the number of blades increased from 2 to 4, the yield of butter oil increased from 30.25 percent to 33.5 percent. Additionally, the yield grew from 30% to 35% as the mixing speed rose from 100 to 110 rpm, and it subsequently reduced to 32.90 as the speed of mixing increased even further. A higher initial rise in mixing speed may have caused the paste to be stirred up more, leading to the larger butter yield that was observed. However, the paste slurry got hotter as the mixing speed went above 110 rpm because more heat was produced at the higher speed.
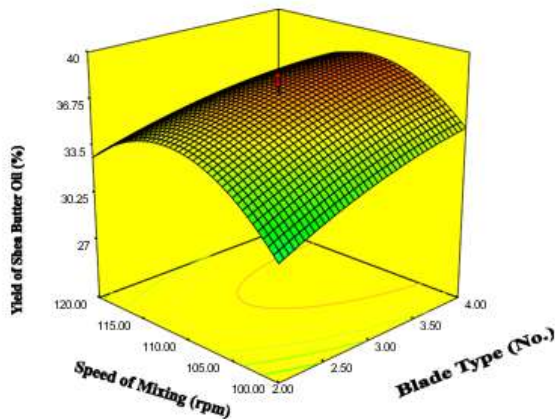

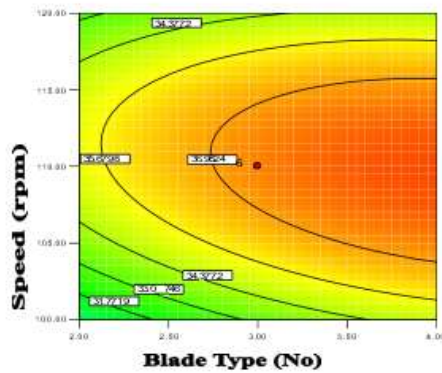**Figure 4.** Response Surface for Yield of Shea Butter with Respect to Speed of Mixing and Blade Type

Figure 5. Contour Plot for Response Surface of Yield of Shea Butter with Respect to Speed of Mixing

Conclusion

The butter yield was improved by increasing the number of blades, the mixing vessel's diameter, and the mixing rate. The impacts of all three variables on the oil yield are favorable and significant ($P \leq 0.05$). The blade number (1.51 coefficient value) and drum diameter are the two factors that have the biggest impact on the shea butter production (1.89 coefficient value). An optimum yield of 39.43% was obtained by combining 5 blades with a mixing drum with a diameter of 50 cm and speed. The results of the study are utilized to establish the machine's shea butter extraction operating parameters. This research has improved oil extraction and increased product throughput for local investors by increasing output and usage.

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ORCID

Ibrahim Mohammed Gana https://orcid.org/0000-0003-4555-6494

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