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REVIEW OF THE STATE OF METHODOLOGICAL TRENDS IN OPEN AND DISTANCE LEARNING LITERATURE 2009-2018

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Abstract

Methodological trends are a key to the development of research in open and distance learning as a cognitive field. The purpose of this study was to review the methodological trends in the open and distance learning scholarly communication literature. It is important that research strategies are reviewed often to ensure the production of quality research output in a cognitive discipline. The study adopted qualitative content analysis to a sample of 1,393 articles published in five open and distance learning (ODL) journals from 2009 to 2018. The main findings of the study indicated that qualitative and quantitative methodologies were used more often than mixed methods research methodology, which was underrepresented. This implies that research in ODL relied heavily on positivist and interpretivist epistemologies, rather than pragmatist ones. Survey research approaches dominated in the research articles published in the ODL journals during the period under study. The main data analysis techniques were statistical and narrative techniques. Having ascertained that there is a gap in the use of mixed methods research in ODL, there is a need to set the future direction for open and distance learning research to focus on mixed methods research to minimise the weakness inherent in using only one method.
Keywords: *data analysis technique, methodological trends, open distance learning, research paradigm*

Introduction

The continuous evolution and development of distance education are dependent on research (Asdaque, 2019), which is the vehicle through which knowledge is spread and made accessible. Research is a search for knowledge and a discovery of hidden truth, and through research, progress is made in a specific field (Gounder, 2012). Open and distance learning education (ODL) has grown tremendously around the world (Kundu, 2014); it is one of the most rapidly growing fields of education in recent times (Oladejo & Gesinde, 2014) and universities across the world are increasingly adopting it in order to increase access to university education (Chawinga & Zozie, 2016). Since the mid-1990s, the digital transformation has changed the face of open and distance education as we had known it (Zawacki-Richter & Qayyum, 2019). This growth is attributed to changes brought about by information and communication technologies which have kept pace with these developments (Gökmen, et al., 2017). There is no doubt that different subject areas continue to emerge in the ODL field, which has contributed to the growth of the discipline.

Research that may produce dependable and valid knowledge should be systematically and methodologically sound (Ngulube & Ukwoma, 2019). Selecting the best set of theoretical

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approaches, data collection methods, and analysis techniques for a project is critical to the success of any research (Galport & Galport, 2015). Choosing the appropriate methodology contributes a lot to the dependability of the study. The methodology covers the entire organization of research activity, any research must be methodologically substantiated (Lamanauskas, 2020). Although no methodology is superior to another, different methodologies merely aim to reach different goals and produce different types of data (Basson & Prozesky, 2015). Therefore, researchers should be mindful of the methodology to adopt in a research considering the wide array of research methods that are available. Conducting research requires a systematic approach, from presenting the problem statement and the research questions, to selecting the appropriate research design. Research design is an important aspect of the research procedure into problem solving and the discovery of new knowledge. Although the type of research design to adopt in a work depends on the nature of the study. Scandura and William (2000) recognised that differences in researchers' training may affect their choice of research design. This explains why different disciplines adopt different research designs. Basson and Prozesky (2015) expressed concern that, within the discipline, an over-emphasis on one type of method could be indicative of a lack of skill in other types of methods, leading to certain topics being ignored or explored inappropriately. This implies that researchers may tend to rely mostly on the methodologies they are conversant with, irrespective of its appropriateness.

Research methodology explores the research phenomenon and covers the rationale in choosing the methods and research strategies (Ngulube & Ukwoma, 2019). Some studies may use more than one methodology (Berge & Mrozowski, 2001) because all research methods have strengths and weaknesses (Ngulube, 2019). Quantitative, qualitative, and mixed methods research are the three major methodologies that are associated with positivism, interpretivism and pragmatism, respectively (Ngulube & Ukwoma, 2019; Zawacki-Richter et al., 2009). Quantitative research is based on the measurement of quantity or amount while qualitative research is concerned with a qualitative phenomenon involving quality (Gounder, 2012). A methodological review of ODL research will establish field-specific theoretical bases, produce policies, develop applications, and enhance the quality and functionality of distance education systems (Gökmen et al., 2017). It will also contribute to the body of knowledge in the discipline and research development in general.

Researchers have added knowledge to research reviews and methodological trends. Zawacki-Richter et al., (2009) presented the status of distance education, the subject areas, authorship pattern and research methodology from 2000 to 2008. Berge and Mrozowski (2001) reviewed journals in distance education between 1990 and 1999 to ascertain the research trends in the articles. Bozkurt et al., (2015) examined the trends in distance educational research using a content analysis of research articles published between 2009 and 2013. Zawacki-Richter and Naidu (2016) mapped research trends in the journal *Distance Education*. A comparative study of research articles published in 2005 and 2015 in seven peer-reviewed journals on ODL was carried out by Wong et al., (2016). Other studies on methodological trends in distance education are the review of methodological trends in the distance education theses published in Turkey from 2005 to 2014 (Gökmen et al., 2017). Asdaque (2019) explored the research trends in doctoral research in distance education in Pakistan.

Reviewing the methodological trend after the study of Zawacki-Richter et al., (2009) which covered 2000 to 2008 in five ODL journals, will be helpful to ascertain the patterns in the trends a decade later. Although, Bozkurt et al. (2015) covered 2009 to 2013 in seven ODL journals, the present study followed the line of Zawacki-Richter et al., (2009) in covering a period of ten years in five core ODL journals. It is highlighted by Scandura and William (2000) that an examination of methodological trends may provide insights into the possible future development of research methodology in a field. The findings of this study will help to ascertain if there is any new development in the methodological trends in ODL and provide insight into the methodological trends adopted in ODL journals.

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Problem Statement

Reviewing the research methods used in a discipline helps to keep researchers abreast of the trends and areas for further research. As Ullaha and Ameen (2018) stated, knowledge of methods used in a discipline is invaluable for researchers who want to choose among appropriate methods in conducting reliable and valid research. Similarly, Gökmen et al., (2017) opined that studying methodological trends of ODL research will enhance the quality and functionality of distance education systems. Although extant studies on methodological trends in ODL as highlighted above reviewed the trend in ODL theses and research literature as published in ODL journals, it is not certain if ODL literature still maintains the same methodological trend as identified by Zawacki-Richter et al., (2009) considering the period the study was conducted with the advancements and developments that have taken place in ODL as a discipline. This is also in view of the fact that ODL education has continued to grow tremendously (Kundu, 2014). To ascertain the status of the methodological trend, ODL literature must be studied, and this is the gap this study seeks to narrow. The study is significant because it provides insights into the methodological trends adopted in ODL journals, and the diversity of approaches used which will be an asset to ODL as a discipline and researchers in general.

Classification of Methodological Indicators

Employing an appropriate methodology gives credence to a study, and this informs why reviewing research methodology in any discipline from time to time is necessary to strengthen its research. In the context of management research, Scandura and Williams (2000) highlighted that it is important for researchers to assess the methods they employ for the field to progress. This is applicable to other disciplines as the choice of research methodology, appropriateness of data collection and analysis methods employed have a serious impact on the conclusion of the research.

Choosing the appropriate research design in a study is important to produce a reliable and trustworthy result, which contributes a lot to the impact of the study. Such studies are always referenced because it is believed that the proper research designs were employed. The research design model by Ngulube (2019) showed that there has not been agreement on the use of research terminologies. The author highlighted that research design comprises research paradigms, methodology, ethical concerns, research methods, and data collection and analysis methods. Saunders et al., (2016) also explained research design as a general plan of answering your research question(s). The analogy by Saunders et al., (2016) indicates that research follows a systematic approach with each stage linking to the other. There have been many misconceptions of what constitutes research methodology, and the proper use of the research methodology terms, as could be seen from writers. Daniel (2016) classifies research designs as either qualitative, quantitative research or mixed methods. Gounder (2012) attempts to differentiate between research methods and research methodology. Research methods involve conducting experiments, tests, surveys, and the like, while research methodology involves the learning of the various techniques that can be used in conducting research and tests, experiments, surveys, and critical studies. Apuke (2017) categorised quantitative methods into survey research, correlational research, experimental research, and causal-comparative research. There is a need for proper distinction of these terms in research writing and the proper terms used to avoid confusion.

Research methodology deals with the explanation of why a research study is undertaken, how one formulates a research problem, what types of data were collected, what method has been used and why a specific technique of data analysis was used (Gounder, 2012). Following the line of argument of Ngulube (2019), research design, as used in the context of this study,

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comprises the totality of the research processes starting from the philosophical assumptions. Research methodologies are qualitative, quantitative, and mixed methods research, which translates into the qualitative, quantitative, and mixed methods research approaches/strategies such as survey, case study, and grounded theory, and so on. Research techniques include data collection methods and samples, the data collection method to be adopted depends on the nature of the research. It is necessary to define these methodological indicators as used in this study because one of the major problems that arise when conducting methodological trends is the fact that the indicators are presented in a wide variety of ways.

Different phenomena may require the use of different methodologies. The methodology employed must match the phenomenon of interest (Krauss, 2005). Qualitative research methods are commonly used when there is little current understanding of a complex phenomenon or if current knowledge is fragmented (Kyngäs, 2020). They are highly appropriate for questions where pre-emptive reduction of the data will prevent discovery (Ochieng, 2009). Qualitative researchers use phenomenological techniques and their worldviews to extract meaning, and quantitative researchers use an array of statistical procedures and generalisations to determine what their data mean (Onwuegbuzie & Leech, 2005). Quantitative research deals with quantifying and analysing variables in order to get results (Apuke, 2017; Rana & Sharma, 2016). Positivists (i.e., quantitative) believe in a single reality that can be measured reliably and validly using scientific principles, and interpretivists (i.e., qualitative) believe in multiple constructed realities that generate different meanings for different individuals, and whose interpretations depend on the researcher's lens (Onwuegbuzie & Leech, 2005). Any research method chosen will have inherent flaws, and the choice of that method will limit the conclusions that can be drawn (McGrath, 1982; Scandura & William, 2000). The realisation that quantitative and qualitative methodologies have advantages and disadvantages led to the emergence of mixed methods (MM) first in the form of triangulation or multi-methods leading to mixed methods research (MMR) (Ngulube & Ukwoma, 2019).

Each methodology is associated with a specific research approach. Quantitative approaches include survey, experimentation, and case study. Creswell (2013) highlighted that researchers may choose several qualitative approaches, such as narrative research, grounded theory, case study, ethnography, and phenomenology. Mixed methods research approaches include basic (i.e., sequential, and concurrent) and advanced (i.e., multistage) approaches. The research approach employs various data collection methods. Qualitative data instruments such as observation, open-ended questions, in-depth interviews (audio or video), and field notes are used to collect data from participants in their natural settings (Daniel, 2016), and artefact analysis, including document reviews. These data collection instruments provide the researcher with an opportunity to probe and obtain more factual information from the respondents. In qualitative, quantitative or MMR, the corresponding data collection instruments should be employed. Surveys and scales are mostly used in the quantitative methodology while the interview method is mostly used in qualitative methodology (Gökmen et al., 2017).

Another important step in the research process is analysis of data. Data can be analysed using narrative or statistics, it depends on the nature of data and the methodology adopted. We contend that researchers need to utilise at least two types of data analysis tools in order to triangulate results (Leech & Onwuegbuzie, 2007). Descriptive statistics were the most applied data analysis tools (Asdaque, 2019). The choice of statistical or narrative data analysis depends on the research approach and the nature of data. Data can be analysed using computer assisted data analysis software; they help in manipulating the data to put them into different formats. Ngulube and Ukwoma (2019) highlight that data can be analysed manually or using data analysis software such as Microsoft Excel® and SPSS® for quantitative data, and NVivo, Altlas.ti®, for qualitative data. Silver and Lewins (2014) identify ATLAS.ti, Dedoose, MAXQDA, NVivo, QDA Miner, and Transana, as some of the computer assisted software in analysing qualitative

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data. The use of these software programs depends on the type of data to analyse and the result expected by the researcher. Although they are tools that assist in data analysis, the choice of software to use and the actual interpretation depend on the researcher (Lewins & Silver, 2009).

As in the case of previous studies, Berge and Mrozowski (2001), Bozkurt et al., (2015), Wong, et al., (2016), Zawacki-Richter and Naidu (2016) and Zawacki-Richter et al., (2009), the current study used articles in peer-reviewed journals for analysis. Article is one of the forms of introducing and making public the results of research activities (Lamanauskas, 2019), the articles are published in peer reviewed journals. Peer-reviewed journals are important channels for the dissemination of the products of research and scholarship (Zawacki-Richter & Anderson, 2011). Journals and articles are key resources for the diffusion of scientific knowledge Bozkurt (2019 b), because they are subjected to some degree of vetting for quality (Ngulube & Ukwoma, 2019). Hence, the choice of reviewing methodological trends in journals over theses and dissertations. In ODL, there are several journals that publish peer-reviewed articles. These journals have been publishing core ODL research over the years; they are indexed in prominent educational databases and have made tremendous contributions to the field of ODL. The goal of ODL is to make learning open and accessible to everyone (Van der Merwe & Van Heerden, 2013).

Research Questions

The general purpose of the research was to review the methodological trend of ODL research literature from 2009 to 2018 while the specific research questions were as follows:

1 What research methodologies were employed, and which methodology was the most prevalent in the ODL journals within the period under study?
2 Which research approach is most prevalent in the research articles in ODL journals, and what is the trend in the use of the research approaches?
3 Which data collection techniques were commonly employed in the research articles published in ODL journals?
4 What data analysis technique is employed, and which data analysis software was mostly used from 2009 to 2018?

Research Methodology

General Background

The study adopted a qualitative content analysis technique of the research articles published in five major ODL journals (see Çakıroğlu et al., 2019) from 2009 to 2018. Content analysis is the most significant method used to examine methodological and publication trends (Umer & Razi, 2018). The choice of ten-year period is necessary to ascertain the methodological trends in ODL research journals. Berge and Mrozowski (2001) covered a period of ten years, Umer and Razi (2018) covered a period of 28 years, Henry et al, (2016) covered a 30-year period. Therefore, studies cover varying periods to determine the trends in scholarly communication, and the changing pattern of scholarly communication can be measured in five-year periods (Stansbury, 2002). Since this study is using the lens of Zawacki-Richter et al., (2009), which covered 2000-2008, it implies that the starting point of 2009 should be adopted for this study with a cut-off date of 2018, to determine the trend for at least a decade.

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Sample

The core ODL journals studied were, *The American Journal of Distance Education (AJDE), Distance Education (DE), The European Journal of Open, Distance and e-Learning (EURODL), Open Learning: The Journal of Open, Distance and e-Learning (OL)* and *The International Review of Research in Open and Distributed Learning (IRRODL).* These journals were identified by Çakıroğlu et al., (2019) as core ODL journals, which publish core open and distance education literature. In addition, their articles are written in English language. Since the study done by Çakıroğlu et al., (2019) is still a recent study and these journals are internationally recognised journals, searchable in leading educational databases such as the Social Sciences Citation Index (SSCI), Scopus, Education Resources Information Center (ERIC), Directory of Open Access Journals (DOAJ) and Elton B Stephens Co. (EBSCO), this study also adopted those journals as the sample frame.

Instrument and Procedure

The research articles were downloaded from the journal home page, excluding book reviews, reflections, and editorial comments. The data were cleaned up and relevant information needed for the study, including the methodology, research approach, data collection techniques, and method of data analysis and data analysis software used, was extracted. This phase lasted for a period of three months (August to October 2019). Out of 1,393 articles, 1,119 (80%) were empirical articles, while 20% were non-empirical articles (opinion papers). The study was limited to 1,119 articles that were empirical.

For the intercoder reliability, a sample of 25 articles, five randomly selected from each of the five journals, were coded by an independent coder (the articles were coded separately by the two authors, they later exchanged their coding for crosschecking) to ensure that it was not based on the personal decision, although no statistical test was done for intercoder reliability. There were some cases where the descriptions were not correct; such errors were corrected. The elements identified from the articles for the study were: the methodologies, research approaches/ strategies, data collection techniques, data analysis method and data analysis software used such as such as Microsoft Excel® and SPSS® for quantitative data, and NVivo, Altlas.ti®, for qualitative data.

Data analysis

The coded data were entered on an Excel spreadsheet and analysed. Descriptive statistical methods comprising frequency and percentage were used to present the results. Tables were used in presenting the results based on the research questions.

Research Results

Research methodologies employed and most prevalent in the ODL journals within the period under study are presented in Table 1.

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Table 1
Research Methodologies Employed in the ODL Journals in the Period under Study

Name of journal	No. of articles *n*/(%)	Non-empirical articles *n*/(%)	Empirical articles *n*/(%)	Qualitative *n*/(%)	Quantitative *n*/(%)	MMR *n*/(%)
The American Journal of Distance Education (AJDE)	175	30 (17)	145 (83)	82 (57)	55 (38)	8 (5)
Distance Education (DE)	207	36 (17)	171 (83)	87 (51)	80 (47)	4 (2)
The European Journal of Open, Distance and e-Learning (EURDOL)	165	38 (23)	127 (77)	80 (63)	45 (35)	2 (2)
The International Review of Research in Open and Distributed Learning (IRRODL)	676	108 (16)	568 (84)	283 (50)	271 (48)	14 (2)
Open Learning: The Journal of Open, Distance and e-Learning (OL)	170	62 (36)	108 (64)	58 (54)	49 (45)	1 (1)
Total	1393	274 (20)	1 119 (80)	590 (53)	500 (44)	29 (3)

It can be seen that out of the 1,393 articles that formed the research framework, 1, 119 (80%) were empirical while 20% were non-empirical. ODL research employed qualitative (53%), quantitative (44%), and mixed method research (3%) within the period under study. Looking at the trend in each of the journals studied, it is clear that qualitative, quantitative, and mixed method research methodologies were employed.

Qualitative and quantitative methodologies were prevalent. The use of mixed method research has not made much of an inroad into ODL research. It is believed that the researchers rely on using scientific principles in gathering their data and interpreting them, which is more like the principles of positivist and interpretivist. This could account for why they were prevalent in ODL research. Similarly, in the individual journals, qualitative and quantitative approaches were prevalent. It is only in *AJDE* that mixed methods were recorded as 5% and the others were recorded as 2% and 1%.

The research approaches most prevalent in research articles in ODL journals and the trend in the use of the research approaches are illustrated in Table 2.

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Table 2
Prevalent Research Approaches Employed in the Period under Study

Year	2009	2010	2011	2012	2013	2014	2015	201 6	2017	2018	Total
Approach	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	
Survey	19 (3)	20(3)	29(5)	38(6)	86(14)	88(15)	68(11)	80(13)	95(16)	75(13)	598
Case study	28(11)	17(7)	27(11)	42(17)	14(6)	17(7)	18(7)	32(13)	23(9)	26(11)	244
Content analysis	8(7)	6(5%)	9(8)	10(9)	6(5)	11(10)	20(18)	15(14)	10(9)	16(14)	111
Experimental	15(17)	3(3%)	3(3)	10(11)	8(9)	10(11)	10(11)	12(14)	11(13)	7(8)	89
Design-based study	-	1(5%)	4(20)	3(15)	1(5)	1(5)	3(15)	-	5(25)	2(10)	20
Ethnographic	1(6)	1(6)	1(6)	-	3(19)	4(25)	1(6)	3(19)	-	2(13)	16
Action research	-	1(7)	1(7)	3(20)	-	2(13)	2(13)	-	5(33)	1(7)	15
Bibliometric study	1(10)	2(20)	-	-	-	-	2(20)	-	3(30)	2(20)	10
Phenomenological study	-	-	1(11)	-	-	2(22)	3(33)	1(11)	1(11)	1(11)	9
Grounded theory	-	3(43)	-	-	-	-	-	-	3(43)	1(14)	7
Total	72	54	75	106	118	135	127	143	156	133	1 119

Note: * Decimal points were rounded off to the nearest to get a round figure

The trend in the use of research approaches over the years shows that survey, case study, content analysis and experiments were employed in ODL research articles each year. It can be seen that 15 research approaches were identified, out of which four were prevalent. The prevalent research approaches employed in ODL research literature within the study period were survey (53%), followed by case study (22%), content analysis (10%), and experimental (8%). Although other research approaches were employed within the period, they were not high in frequency. This shows that the use of qualitative and quantitative research approaches was prominent in ODL research literature.

Data collection techniques commonly employed in the research articles published in ODL journals are presented in Table 3.

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Table 3
Data Collection Techniques Employed Within the Period

Data collection / Journals	Questionnaire *n*/(%)	Interview *n*/(%)	document analysis *n*/(%)	Obser-vation *n*/(%)	Online group chat and discussion *n*/(%)	Datasets *n*/(%)
AJDE	76 (13)	39 (11)	43 (15)	7 (10)	9 (15)	5 (13)
DE	120 (20)	73 (21)	47 (16)	7 (10)	9 (15)	2 (5)
EURDOL	74 (12)	44 (12)	31 (11)	15 (22)	19 (33)	3 (8)
IRRODL	269 (45)	158 (45)	142 (48)	30 (44)	16 (28)	28 (72)
OL	59 (10)	38 (11)	31 (11)	9 (13)	5 (9)	1 (2)
Total	598	352	294	68	58	39

The results on Table 3 is a case where the percentage is more than 100% because many articles used more than one data collection technique. It shows that 53% of the articles used questionnaire as data collection technique, followed by interview (31%), and document analysis (26%). Others were observation (6%), chats and discussions (5%), and data sets (3%). Similarly, in the individual journals, questionnaires and interviews were predominantly used more than other data collection techniques; in *IRRODL* questionnaire scored 269, interview 158, and document analysis 102; in *DE* questionnaire recorded 120, interview 73, and document analysis 33; in *AJDE* questionnaire recorded 76, interview 39 and document analysis 23; in *OL* questionnaire recorded 59, interview 38, and document analysis 17; In *EURDOL* questionnaire recorded 74, interview, focus group recorded 44, and document analysis 22.

Data analysis techniques employed and the most data analysis software used since 2009-2018 are illustrated in Tables 4 and 5 respectively.

Table 4
Data Analysis Techniques Employed in the Study Period

Year / Data analysis method	2009 *n*/(%)	2010 *n*/(%)	2011 *n*/(%)	2012 *n*/(%)	2013 *n*/(%)	2014 *n*/(%)	2015 *n*/(%)	2016 *n*/(%)	2017 *n*/(%)	2018 *n*/(%)	Total
Statistical analysis	59 (7)	42 (5)	60 (7)	69 (8)	110 (12)	110 (12)	100 (11)	115 (13)	128 (14)	98 (11)	891
Thematic analysis	20 (8)	17 (6)	21 (8)	31 (12)	19 (7)	28 (11)	27 (10)	35 (14	25 (10)	36 (14)	259
Phonological analysis	-	-	-	-	-	1 (50)	-	1 (50)	-	-	2
Total	79	59	81	100	129	139	125	151	153	134	1150

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To analyse the results of the data analysis techniques employed in the ODL research as presented on table 4, articles that employed inferential, descriptive, social network analysis, factor analysis, regression in data analysis irrespective of those that used software and those that did not, were grouped under statistical analysis. Content analysis, narratives and thematic analysis were grouped together. In addition, there were some studies that employed both narrative and statistical analysis in data analysis. The results indicated that the majority (72.4%) of the articles employed statistical analysis and 25.3% employed narrative in data analysis, although many of them did not mention the software employed in data analysis. The presence of different statistical analyses in ODL literature helps in manipulating and presenting the research results using different formats.

Table 5
Trends in the Use of Data Analysis Software

Year / Data analysis software	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
	n/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	*n*/(%)	
SPSS	7 (3)	9 (4)	11 (5)	19 (9)	30 (14)	34 (16)	20 (10)	34 (16)	27 (13)	17 (8)	208
NVivo	2 (5)	2 (5)	3 (7)	1 (2)	1 (2)	9 (21)	3 (7)	10 (24)	5 (12)	6 (14)	42
Atlas ti	1 (9)	-	2 (18)	1 (9)	3 (27)	-	1 (9)	2 (18)	1 (9)	-	11
Excel	1 (17)	1 (17)	1 (17)	-	1 (17)	2 (33)	-	-	-	-	6
MAXQDA	-	-	-	-	-	1	-	-	-	2	3
SAS JMP	-	-	-	-	-	-	1	-	-	-	1
AMOS	-	-	-	-	-	-	-	-	-	1	1
Total	11	12	17	21	35	46	25	46	33	16	272

The results (Table 5) indicated that out of the 1,119 empirical articles, 272 (24,3%) articles mentioned the software used in data analysis. Although many of the studies used different statistical methods in analysing their data, they failed to mention the software employed in data analysis. This accounted for the low number of software as identified from the study. From the results, it could be seen that most of the studies in ODL research prefer SPSS data analysis software followed by NVivo. These are the quantitative and qualitative data analysis software.

Regarding the data analysis software used, the highest number of studies that used data analysis software was recorded in 2014 and 2016 with 46 each, followed by 2013 and 2017 with 35 and 34, respectively. The lowest number was recorded in 2010 (12). Further analysis of why 2010 recorded the lowest frequency in the research approaches and data analysis software used indicated that the number of articles for 2010 was lower when compared to other years. In addition to that, over the years, there has been an increase in the use of SPSS and NVivo data analysis software, except in 2015 and 2018 where SPSS had a decrease and NVivo in 2015, 2017 and 2018 there was a decrease in the number of articles that used it in data analysis.

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Discussion

The choice of qualitative and quantitative methodologies in ODL research could be attributed to the multidimensional interaction of the discipline with living and non-living entities Bozkurt (2019b), and the use of interactive communication technologies forming the learning environment in ODL (Çakıroğlu et al., 2019). Knowledge of these technologies and users' attitudes towards them are important for effective implementation and success in the field, as they are required in predicting the future. Hence the predominant use of qualitative research methodology, which is commonly used when there is little current understanding of a complex phenomenon (Kyngäs, 2020), quantifying and analysing variables in order to find results Apuke (2017). Positivists believe in a single reality that can be measured reliably and validly using scientific principles, and interpretivists believe in multiple constructed realities that generate different meanings for different individuals, and whose interpretations depend on the researcher's lens (Onwuegbuzie & Leech, 2005). There are few articles that employed pluralist ontologies. ODL cuts across many disciplines, as such, mixed method research would be helpful to the discipline. Mixed methods research is a dynamic option for expanding the scope and improving the analytical power of studies (Sandelowski, 2000), combining the saving grace of both quantitative and qualitative methods (Taipale & Fortunati, 2014). Some scholars don't acknowledge the richness of both traditions, both qualitative and quantitative research can be used to address almost any kind of research question (Ochieng, 2009). The prevalence of qualitative and quantitative methodologies in ODL was also discovered in the study of Bozkurt et al., (2015) and the Brazilian distance education publications between 1992 to 2007 were predominantly qualitative (Dutra De Oliveira Neto & Santos, 2010).

Qualitative and quantitative research approaches such as survey, case study, document analysis, and experiments, were prevalent in the research literature studied. Survey seems to be a dominant research approach in many disciplines, the use of survey was noted in (Asdaque, 2019), other studies noted the dominance of the survey approach in research (Gökmen et al., 2017; Ngulube & Ukwoma, 2019; Rana & Sharma, 2016). Although one may be tempted to accept the statement of Basson and Prozesky (2015) on the reason for over-reliance on one approach, it may be difficult to accept that conclusion from this study. Using different approaches in research ensures reliability and gives credence to the result. Case study is mostly used in qualitative and mixed methods research (Gökmen et al, 2017). In the study of the use of the case study research method for analysing MOOCs, the quantitative research method was more prevalent than the interpretivist paradigm (Montes-Rodríguez et al, 2019). Berge and Mrozowski (2001) highlighted that correlational research was seldom utilised in distance education, although it was employed in a negligible number of articles, as identified in this study. Ascertaining the perceptions and interest of the user community is key to the development of ODL programmes and to making informed decisions. Therefore, questionnaires and interviews are the easiest techniques to use to interact and collect reliable information. Daniel (2016) stated that they are used to collect data from participants in their natural settings. No wonder Lamanauskas (2020) stated that Questionnaires and tests are probably the most common types of instruments used in quantitative research.

The predominant use of statistical analysis technique could be traced to the quantitative methodology dominant in the ODL literature. The use of thematic and phenomenological analysis was predominantly low in ODL research articles studied in the period under study. Neubauer et al, (2019) stated that phenomenological research broadens the understanding of the complex phenomena involved in learning, behaviour, and communication that are germane to the field.

Comparing the results of Zawacki-Richter et al., (2009), which recorded quantitative (29.1%), qualitative (19.9%) and triangulation (mixed methods) (12.9%), with the present

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study, a shift was noted in that qualitative recorded 53%, quantitative recorded 44%, and mixed methods recorded 3%. This implies that between 2009 and 2018, qualitative and quantitative methodologies were preferred in ODL research literature. Mixed methods research was reduced to below two digits. It is worthy to mention that there is a slight change in the pattern of methodology used in ODL research. As new innovations and subject areas emerge, it will affect the methodologies and approaches of analysing them. Therefore, ODL research is witnessing a gradual change in its methodology, but pragmatist epistemology is yet to be dominant in the research literature. Although pragmatist epistemology is not yet dominant that does not mean that ODL research is not methodologically sound, different subject areas require different methodological approaches. No methodology is superior to another; different methodologies aim for different goals and produce different types of data (Basson & Prozesky, 2015). However, researchers are being called upon to use mixed methods research so that they may be able to comprehensively understand the phenomenon under study, and to answer the 'who', 'how', 'what', where', 'whom' and 'why' questions in a single study.

Conclusions and Implications

The state of the methodological trends of ODL research shows that qualitative, quantitative, and mixed methods approaches were employed in ODL research. Qualitative and quantitative methods were predominantly used in the study period. The presence of positivist and interpretivist epistemology is also reflected in the research approaches such as survey and case study that were used. Questionnaire, interview, and document analysis were the most employed data collection techniques, a greater percentage of the articles employed statistical data analysis techniques. Research methodology is an important aspect of research procedure into problem solving and discovery of new knowledge although the methodology to adopt in a study depends on the nature of the problem.

This study has implications for researchers and the ODL discipline. This study will serve as a reference for other researchers who are interested in methodological trends in ODL and provide a guide for further research.

Recommendations

Using statistical analysis helps to present and manipulate the research data in a simple format that could be read at a glance. It also helps to present the findings using varying formats. But narrative tends to probe more for an in-depth knowledge, researchers should be encouraged to use a combination of methods in data analysis.

Adopting phenomenological and thematic method in data analysis may be necessary as ODL is a multidisciplinary field. Using varied data analysis methods will give researchers the opportunity to explore the ODL phenomenon in a different context.

Research keeps on evolving and new areas continue to emerge. Adopting other research approaches apart from survey which has gained much prominence, may provide a different result and meaning to the research.

Considering that ODL is concerned with multifaceted problems, using monomethods may fail to deal with the problem effectively. It will be worthwhile for ODL researchers to adopt mixed methods more and more. Mixed methods research combines the advantages of both qualitative and quantitative methods to provide a comprehensive picture of a phenomenon.

For the researchers, using a combination of research methods will be helpful in unravelling in-depth information from the participants, which helps researchers come up with enough evidence. The prevalence of qualitative and quantitative methodology over mixed methods may be attributed to the fact that they are the earliest methodologies known to researchers. Even

though different phenomena require different methodologies, most researchers tend to adopt the method they are familiar with and have enough knowledge. Introducing researchers early to mixed methods research will be helpful.

Limitations and Further Research

As no study is without limitations, this study is not an exception. This study could not establish the reasons for the decline in research approach and data analysis software used at certain periods, as observed in the study. A different methodological approach has the potential to provide answers to these unanswered questions. The review of the methodological trend is restricted to papers published between 2009 and 2018, and the result cannot be generalised for the whole ODL research literature.

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