

Examining the use of methodological pluralism in Library and Information Science empirical research produced by Pakistani authors

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ABSTRACT

Methodological pluralism or plurality is considered as the employment of more than one method in an inquiry. Methodological pluralism can be categorised into mixed methods and multi-method. The current study explored the use of methodological pluralism in Library and Information Science (LIS) research produced by Pakistani authors. Qualitative content analysis was used to explore latent and manifest use of methodologies in research articles authored by Pakistani published between 2001 and 2016 in national and international journals. Multiple searching strategies were used to identify the articles published in international journals. Findings show that high majority of Pakistani authors did not use the terms mixed methods and multi-method in the description of methodology. Nearly one third (30%) research articles used more than one method. The share of multi-method research (16%) is slightly higher than mixed methods research (14%). In multi-methods articles, combining of quantitative methods was less prevalent as compared to qualitative methods. Multi-method quantitative was used in only six articles. In case of multi-method qualitative design, interviews, personal communication and discussion with experts, literature review and content analysis are the most popular methods. In mixed methods research, interview and questionnaire are the most used methods. Growth in methodological pluralism is half than growth of articles with single method. Knowing and elaboration of the differentiation in mixed methods and multi-method can help in the education and use of methodological pluralism among LIS researchers. Authors should use and explore methodological plurality by treating multi-method designs as separate from mixed method designs.

Keywords: Mixed methods; Multi-method; Methodological plurality; Library and Information Science; Research design.

INTRODUCTION

Gathering knowledge of a certain topic is dependent upon the research methodology adopted by the researcher (Blaxter, Hughes and Tight 2006). Anybody, interested in any aspect of an issue or thing about the world, decides the method or methods of investigation, and the choice of method or methods is dependent on assumptions, hypothesis or research questions of the study (Cecez-Kecmanovic and Kennan 2013; McNeill and Chapman 2005). Every method has a different line of sight revealing different

meanings of the same social and symbolic reality. In an increasingly interdisciplinary, complex, and dynamic world, researchers complement one method with another to provide superior research (Johnson and Onwuegbuzie 2004). Mixing of quantitative and qualitative methods enriches research results (Muijs 2004) and this combination or mixing of quantitative or qualitative methods is considered as methodological pluralism (Matusiak, Bright and Schachter 2022). Methodological pluralism or plurality is considered as the employment of more than one method in an inquiry. Post-positivist researchers advocate methodological pluralism for its role in richness and comprehensiveness of results (Wildemuth 1993).

There are two major types of methodological pluralism. On the basis of combination and mixture of methods and procedures, methodological pluralism is divided into mixed methods and multi-method. Mixed methods design is the systematic mixing or integration of two or more qualitative and quantitative data sets within a single study (Creswell and Plano Clark 2017; Tsvuura 2022). Johnson and Onwuegbuzie (2004) defined mixed methods research as “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (p.17). Mixed methods design is the third research paradigm that mixes both the qualitative and quantitative methods (Fidel 2008; Johnson, Onwuegbuzie and Turner 2007). Multi-method research design is quite different from mixed methods because it collects, analyses and mixes multiple forms of either qualitative or quantitative data. Multi-method designs are considered as the designs in which the research questions are answered by utilizing two or more data collection procedures or research methods either from qualitative or quantitative traditions (Tashakkori and Teddlie 1998). This design collects data from two or more either qualitative or quantitative means in a single study (Creswell and Plano Clark 2017). Research design which combines data from two or more qualitative sources may be termed as “multi-method qualitative” and “multi-method quantitative” if data is converged from two or more quantitative sources. Combining of qualitative observation and interview is an example of multi-method qualitative design (Mardis 2011). Similarly, combining data from quantitative content analysis and questionnaire is considered as an example of multi-method quantitative design.

Application of methodological pluralism in a discipline can be examined by measuring “the degree to which the overall intellectual production of the discipline reflects a variety of research methods and approaches” (Payne, Williams and Chamberlain 2004, p. X). According to Chu (2016), “in recent decades, several authors have paid particular attention to studies that employ mixed or multiple methods for data collection and analysis” (p. 36). The awareness about methodological pluralism gained momentum during the current century but the dominant majority of researchers examined the prevalence of methodological plurality in Library and Information Science (LIS) research by only exploring the use of mixed methods research. Exploring the application of multi-method designs remained a less focused area.

Many LIS authors explored qualitative, quantitative and mixed methods designs used in published research. Majority of the LIS researchers categorised these articles which used more than one method into mixed methods (Aytac and Slutsky 2012; Hider and Pymm 2008; Gelber 2013; Ngulube 2010; Slutsky and Aytac 2014; Terril 2016; Toumaala et al. 2014). Multi-method design is also a type of methodology pluralism but previous LIS authors have not explored it except for a few. Granikov et al. (2020) examined the use of mixed methods in LIS research. Out of 65 mixed methods articles, 86 percent (56 articles) explicitly report using of “mixed methods” or “mixed methodology” while 9 percent (6

articles) referred studies as “multiple methods” or “multiple methodology”. One article used both the terms. Mardis (2011) found the combination of observation-interview as a popular choice in qualitative research but did not term it as multi-method qualitative research. Furthermore, sub-types of mixed methods (sequential or concurrent) were examined by few LIS authors but they did not examine sub-types of multi-method.

Exploration of use of methods in different geographic settings would be helpful to compare the knowledge of methods and preferences of authors for particular areas. Ullah and Ameen (2018) developed an account of methods used in LIS research through a systematic review. The use of methodologies has been explored in LIS literature originating from a country or a region such as research published in Spain (Cano 1999), Africa (Ngulube, Mokwatlo and Ndwandwe 2009; Alemna and Badu 1994), Turkey (Yontar and Yalvac 2000), Arab countries (Ibrahim 2021), China (Lou et al. 2021), and Korea (Lee 2002). In recent years, three articles have been published from Pakistan. Jan and Shehyar (2021) conducted a methodological review to explore the use of qualitative, quantitative and mixed methods. Ullah and Ameen (2022a) explored the use of statistical analysis in research articles, and in another paper, they examined the growth, research areas and the application of research methods in user studies (Ullah and Ameen 2022b) To fill the gap in national and international literature, it seems desirable to examine the application of plurality of methods in LIS research produced by Pakistani authors.

LITERATURE REVIEW

Methodological Pluralism: Differences in the Use of terms and Definitions

LIS authors have used different terms and defined methodological pluralism in different ways. Johnson and Onwuegbuzie (2004) used term eclecticism as an alternative to methodological pluralism. Chamberlain et al. (2011) equated methodological pluralism with multiplicity. Aytac (2016) used the term triangulation and methodological pluralism for mixed methods studies which used both the quantitative and qualitative methods. McNeill and Chapman (2005) considered methodological pluralism as the employment of multiple research methods by the researchers to build up a fuller and more comprehensive picture of social life. Methodological pluralism refers to “the deployment within a single paper of at least two qualitative methods to analyse the same data set” (Barnes et al., 2014, p.35). They argued that methodological pluralism in qualitative research does not encounter same level of epistemological challenges like mixed methods research. The current study treated this as a definition of multi-method qualitative.

Methodological Pluralism: Ways and Types

In research having methodological plurality, qualitative or quantitative components can predominate or both can have equal status (Muijs 2004). According to Barnes et al. (2014), methodological pluralism can be achieved in two ways i.e. triangulation and complementarity. Triangulation assumes that “variation in the findings produced by different methods represents errors associated with them [and] by contrast, complementarity treats this variation as reflecting different aspects of the phenomena, which get rendered differentially visible through the application of multiple methods” (p.36). Different authors explained types of methodological plurality (particularly for mixed methods) on the basis of different dimensions such as time ordering of phases of research, paradigm emphasize, stage and level of mixing and degree of mixture.

(a) *On the basis of times ordering of phases of research.* Morse (1991) termed methodological plurality as simultaneous and sequential triangulation. Instead of

simultaneous, Tashakkori and Teddlie (1998) used the term parallel, Creswell (1999) used convergence, Sandelowski (2000), Creswell and Plano Clark (2017), and Creswell et al. (2003) used concurrent.

(b) **On the basis of paradigms emphasize.** On the basis of dominance of status for one paradigm as compared to other paradigms, Green and Caracelli (1997) termed it as embedded or nested and Tashakkori and Teddlie (1998) termed it as equivalent and dominant-less dominant.

(c) **On the basis of merging of data.** On the basis of merging of data, mixed methods studies may take place in concurrent and sequential ways (Creswell 2009; Creswell and Plano Clark 2017).

Classification and Percentage of Methodological Plurality in LIS Research

To analyse research articles, some authors selected empirical research while others selected both the empirical and non-empirical research. Three authors (Chu 2016; Hider and Pymm 2008; Terril 2016) explored the use of more than one method. Hider and Pymm (2008) and Terril (2016) classified methodological plurality as both qualitative and quantitative methods but Chu (2016) termed it as two or more than two methods. Majority of authors examined the prevalence of plurality of research methods in LIS research by classifying research into qualitative, quantitative and mixed methods. They did not use multi-method as the fourth category. For classifying research which cannot be placed in three categories, Tuomaala, Järvelin and Vakkari (2014) and Malliari and Togia (2016) used “Not applicable” as a fourth category and Vakkari (2008) used “analytical” as fourth category without explaining it. One study used the multi-method as a category of methodological pluralism. Ullah and Ameen (2022b) examined subject areas, and methods of user studies articles produced by Pakistani authors. They categorised methods into quantitative, qualitative, mixed methods and multi-method.

Review of 18 relevant published studies revealed that in nine studies, the share of mixed methods approaches was between 15 to 30 percent. The results of seven studies were different where they found that the use of more than one method is less than 10 percent. In two recent studies, the use of mixed methods was only 1 percent and 2 percent respectively. These studies are listed in Table 1.

Phases and Types of Mixed Methods Research

Authors have identified phases in mixed methods research however ignored those in the multi-method research. In mixed methods studies of Sub-Saharan Africa, Ngulube (2010) found an unequal weightage of qualitative and quantitative studies with tendency of the latter element. They also found that all the studies were sequential as the data collection and mixing took place in two sequential phases. Quantitative phase was done earlier than qualitative. VanScoy and Fontana (2016) investigated the empirical literature in Reference and Information Service (RIS) for type of analysis and found that evaluation methods (57%) and non-evaluation methods (43%) were two approaches of mixed methods studies. Matusiak (2017) explored that mixed method studies (5%) are conducted in two sequential phases. Ngulube and Ukwoma (2019) found that the triangulation of methods in PhD dissertations was not prevalent in mixed methods research. Granikov et al. (2020) has explored the use of mixed methods in LIS research articles published between 2017 and 2018 in core LIS databases. They found that 86 percent (56 out of 65) articles explicitly reported their study as mixed methods, 9 percent referred their study as multiple methods or multiple methodology and one study was reported by author as “mixed methods and multiple methods”. Nearly 32 percent studies were sequential and 14 percent convergent

(concurrent). According to them, almost half (46%, 30 out of 65) of researchers stated their methodology as type of mixed method design.

Table 1: Classification and Percentage of Methodological Plurality in LIS Research

No	Name of Authors	How did authors classify plurality of methodology?
1	Hider and Pymm (2008)	15.5% (Both qualitative and quantitative)
2	Vakkari (2008)	22% (Mixed methods) 15% (Analytical) as 4 th category
3	Ngulube, Mokwatlo & Ndwandwe (2009)	5.2% (Mixed methods)
4	Ngulube (2010)	7.0% (Mixed methods)
5	Mardis, (2011)	21% (Mixed methods)
6	Aytac and Slutsky (2012)	18% Mixed (Triangulation or methodological pluralism)
7	Gelber (2013)	18% (Mixed approaches)
8	Tuomaala, Järvelin, & Vakkari (2014)	3% (Mixed methods) 24% (Not applicable) as 4 th category
9	Malliari & Togia (2016)	20% (Mixed methods) 24% (Not applicable) as 4 th category
10	Terril (2016)	30% (Both qualitative and quantitative)
11	VanScoy & Fontana (2016)	20% (Mixed methods)
12	Chu (2016)	20% (Two or more than two methods)
13	Matusiak (2017)	5% (Mixed methods)
14	Ngulube & Ukwoma (2019)	9.6 % (Mixed methods)
15	Jan & Shehyar (2021)	7.3% (Mixed methods), 9.84% others
16	Lou et al. (2021)	2.3% (Mixed methods)
17	Donthu et al. (2021)	1.2% (Mixed methods)
18	Ullah & Ameen (2022b)	9.7% (Mixed methods), 4.30% Multi-method

Methods used in multi-method research

Mardis (2011) conducted an analysis of International Association of School Librarians (IASL) research forum papers presented between 1998 and 2009. According to this study, “many qualitative studies used more than one qualitative method to collect data (n=33) with observation-interview (n=8) and questionnaire-interview (n=7) being two popular choices” (p.15). The total share of qualitative research was 87 (48%). These methods should be classified as multi-method qualitative but Mardis did not use the fourth category to classify these articles as qualitative. It was further observed that “no researcher used more than one method in a quantitative study” (p.15).

Methods used in mixed methods research

Ngulube, Mokwatlo and Ndwandwe (2009) examined prevalence of mixed methods designs in LIS research published from South Africa. Questionnaires and interviews methods were dominantly used by authors of articles for collection of data. Mardis (2011) examined the methods used in mixed methods research and found that the most used mixed methods were survey-interview (n=20), survey-content analysis (n=7) and survey-focus group (n=5). Usage data, user surveys, and interviews with staff were the most common methods used in evaluative mixed methods studies (VanScoy and Fontana 2016). According to Ngulube and Ukwoma (2019), basic mixed method research designs were used in PhD dissertations. Questionnaires and interviews were commonly used by authors for data collection.

Impact of Time Period on Mixed Methods Research

Gelber (2013) examined the impact of time period on the use of qualitative, quantitative and mixed methods. The qualitative studies were progressively increasing during the period 2007 (n=20) to 2011 (n=32). The number of studies using qualitative (from n=11 to n=14) and the mixed approach (from n=6 to n=7) also demonstrated an increase during 2007 and 2011 with some fluctuations.

Chu (2016) examined the impact of time on the use of methodological plurality and compared the use of more than one method in research published in three journals between the time span of 2001–2002 and 2009–2010. There is an increase in the use of more than one research method in the *Journal of Documentation* (from 18% to 23% i.e., increase of 5%) but in contrary, a decrease is also observed in the *Journal of American Society of Information Science and Technology* (from 24% to 13% i.e., decrease of -11%) and *Library and Information Science Research* (from 21% to 18% i.e., decrease of -3%). Terril (2016) in an attempt to determine the extent of cataloguing literature that can be classified as research and what research methods were used, found that mixed methods articles decreased from 2010 to 2014 in cataloguing research.

RESEARCH QUESTIONS

To spark debate about multi-method research, the current study addresses the following research questions to present a comprehensive picture of methodological pluralism.

- a) How did Pakistani authors label or reported their mixed methods and multi-method designs?
- b) What percentage of LIS empirical research produced by Pakistani authors did adopt methodological pluralism?
- c) What kinds of methods are popular in mixed methods and multi-method designs?
- d) What types of combinations are used for both the multi-method and mixed methods?
- e) Is there any difference in phases (sequential or concurrent) of multi-method and mixed methods articles for collection and merging of data?
- f) What is rate of periodic growth in multi-method and mixed methods articles as compared to single method (qualitative or quantitative) articles?

METHOD

Content analysis is the best empirical method for “topics that involve the content of messages in cultural communication” (Neuman 2007, p. 237). It can be used systematically to search for patterns and trends (Alajmi and Alshammari 2020). Due to flexibility in this method, it allows researchers to analyse the meanings of narratives objectively (Lin and Jeng 2017) or subjectively or in both ways. Therefore, content analysis can be used in either qualitative or quantitative or in both ways. It extracts and evaluates manifest and latent meaning of text in a systematic manner through classification, lexical and propositional analysis which may be qualitative or quantitative (Rochester 1995). It can be used through coding and conceptualization of qualitative data (Zhou, Ying and Wu 2021). Qualitative content analysis is defined as “a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns” (Hsieh and Shannon 2005, p. 1278). Krippendorff (2012) stressed that “all reading of texts is qualitative, even when certain characteristics of a text are later converted to numbers” (p. 16). Jones (2020) considers

content analysis as mixed approach that codes and interprets text data. The current study used both the qualitative and quantitative content analysis. Both the manifest and latent meaning were derived to identify methodological pluralism.

Sample of Articles

Sequential search process was used to specify the sample for the current study. LIS research articles published by Pakistani authors in two national journals and various international were selected. The current study was confined to research articles published in current millennium from the year 2001 to 2016 to facilitate comparison with retrospective research and future studies. Books, book chapters, reports and conference papers were excluded. Only two local LIS journals are recognized by the Higher Education Commission of Pakistan (HEC). *Pakistan Journal of Information Management and Libraries* is an annual journal published by Institute of Information Management, University of the Punjab, Lahore, Pakistan. *Pakistan Library and Information Science Journal* is a quarterly journal published from Karachi by Library Promotion Bureau.

In respect of international journals, multiple searching techniques such as searching of databases, and tracking citations were used to ensure comprehensiveness in search of literature (Matteson, Salamon, and Brewster 2011). Library, Information Science and Technology Abstract (LISTA) and Library and Information Science Abstract (LISA) were searched initially. Following Khurshid (2013), Boolean search operators OR and AND were used between Pakistan and with at least one of the words including information, library, librarian, and librarianship. Subject searches were also conducted in online journals such as those published by Emerald, Elsevier, Sage and Science Direct to identify LIS research output produced by Pakistani authors.

Organizational affiliations and biographical details given in articles were used to verify the nationality of authors. After this verification, author searching was conducted in Google Scholar to expand the sample by identifying articles of a particular author. Online archiving platforms such as Academia and Research Gate (RG) were also perused to substantiate the sample. Citations of each article was perused to track further articles. Out of 600 articles, 288 are published in two national journals and 312 in 81 international journals. Out of 81 international journals, one fourth (20) are impact factor journals i.e. those indexed by the Web of Science, and the remaining journals (61) are peer reviewed indexed by Scopus and other indexing and abstracting services recognized by HEC.

Taxonomy Used for Identifying Empirical Research

The current study initially categorised research into empirical and non-empirical. The taxonomy used for exploring statistical analysis (Ullah and Ameen 2022a) and for examining research methods in user studies (Ullah and Ameen 2022b) is used for the study. Dominant majority of research articles (518 out of 600) were categorised as empirical research. Different categories of the taxonomy used for separating empirical research are given as under:

- a) Empirical research strategy
- b) Verbal argumentation / Discussion paper/ Opinion papers/ Criticism/ Concept analysis
- c) Mathematical or logical
- d) System/software analysis/design
- e) Literature review
- f) Others

Taxonomy Used for Examining Methodological Pluralism

For examining methodological pluralism, the empirical research produced by Pakistani authors was categorised into four categories. Review of LIS literature revealed that different LIS authors (e.g. Aytac 2016; VanScoy and Fontana 2016) categorised methodologies into qualitative, quantitative and mixed methods. The current study used classification scheme developed by Ullah and Ameen (2021) for examining methodology trends in LIS research. Ullah and Ameen (2022b) used this scheme for examining research methods in user studies. Multi-method, as an essential category of methodological plurality, is added as the fourth category in addition to three categories (quantitative, qualitative and mixed methods). Mixed methods and multi-method are further sub-categorised into concurrent and sequential. Four main categories and two subcategories of methodological plurality articulated and used for the current study are given as under:

1. Quantitative
2. Qualitative
3. Mixed Methods
 - i. Sequential
 - ii. Concurrent
4. Multi-method (Multi-method qualitative and multi-method quantitative)
 - i. Sequential
 - ii. Concurrent

Coding, Data Collection and Analysis

According to Wheeler (2009) coding frame is “a tool to aid the sorting and analysis of qualitative data” and this frame enables a researcher “to classify data into categories and sub-categories” (p.114). Coding frame for the current study was created in MS Excel for the above taxonomy. Coding categories were created in different columns and data was entered for tabulation, quantification and analysis. Content of an article contains the maximum amount of information (Xu, Li and Wang 2020), hence analysis of all the content was used to discover coding methodological pluralism. Initially data was coded into quantitative, qualitative, mixed methods and multi-method. Then further coding for two types of methodological pluralism was done. Methods used in each type of methodological pluralism were also coded. The entire coding was done by the first author, so the question of intercoder reliability does not apply. The qualitative themes were then converted into numbers. The process of quantification “involves creating codes and themes qualitatively, then counting the number of times they occur in the text data” (Creswell, 2009, p. 237). The periodic growth in the use of methodological plurality was examined by cross tabulation of quantified themes.

RESULTS

Use of the Terms Mixed Methods and Multi-method by Pakistani Authors

With respect to usage of term multi-method and mixed methods by Pakistani LIS authors, one study used the term multi-method although the study was mixed methods. In multi-method articles (n=81), one study used the term hybrid qualitative and the other used the term triangulation. With respect to mixed methods studies (n=71), three were named by the authors as sequential mixed methods. One study was labeled sequential exploratory and the two others as sequential. One mixed methods study was labeled as triangulation. One mixed methods study was labeled as quantitative.

Frequency of Mixed Methods and Multi-method Designs

Slightly more than two third of empirical research used a single method. In research which used single method, more than half articles (57%) used quantitative and 13 percent used qualitative methods for data collection. One third of the articles used two or more than two methods. In 29.34 percent research which used more than one method, multi-method design has a higher share (15.63%) as compared to mixed methods design (13.70%). Out of the 152 articles with methodological plurality, 81 (53%) are categorised as multi-method research articles. Share of mixed methods research is less (47%) as compared to multi-method research (see Table 2).

Table 2: Methodological Pluralism and its Types

Methodological Pluralism	Frequency	Percentage
Single method (Quantitative-293, Qualitative-73)	366	70.7
Mixed methods and Multi-method	152	29.3
Total	518	100.0
Types of Methodological Pluralism	Frequency	Percentage
Mixed methods	71	46.7
Multi-method (MultiQual-75, MultiQuan-6)	81	53.3
Total	152	100.0

Types of Multi-method/Mixed Methods Designs

Out of the 81 multi-method articles, 77 (95%) can be classed as concurrent in which data was collected simultaneously in a single phase. Only four (5%) used sequential approach and were conducted in two phases with subsequent phase based on results of the first phase. In mixed methods articles, the sequential approach had a slightly higher percentage (55%) as compared to concurrent (45%). With respect to the articulation of types of mixed methods, only three studies termed their approach as sequential and one named it as concurrent. One mentioned that qualitative data is embedded in quantitative data and one author labeled mixed methods as multi-method (Table 3).

Table 3: Types of Multi-method/ Mixed Methods Designs

Categories of Multimethod	Frequency	Percentage
Concurrent	77	95.0
Sequential	4	5.0
Total	81	100.0
Categories of Mixed Methods	Frequency	Percentage
Sequential	39	55.0
Concurrent	32	45.0
Total	71	100.0

Methods used in Multi-method Qualitative Research

Categories of different methods used to collect data in multi-method qualitative research were developed from the description made by authors themselves. Data is presented by grouping similar methods in one category. Frequency for each method in the group is given to show the diversity in naming by the authors. Each of content analysis and literature review was used in 64 percent articles. Interview was used in 57 percent articles and

personal communications or discussions in 44 percent articles. Observation was used in more than one third of multi-method articles.

Authors used their experience and interactions with study subjects or participated in research phenomenon to enrich the research findings in 26 percent articles. Websites were perused to explore data by nearly 18 percent studies while open-ended questionnaire was used to collect qualitative data in 2 percent articles. Workshop evaluation and research analysis were used only once, while focus group is an important qualitative tool, it was never used in multi-method qualitative research (see Table 4).

Table 4: Methods used in Multi-method Qualitative Research

Methods used in multi-method qualitative	Frequency	Percentage
Content Analysis (Content-21, Document-18, Reports-7, Feedback-1, Comments-1)	48	64.0
Literature Review	48	64.0
Interview (Interview-38, Survey-5)	43	57.3
Personal Communication with experts-16/Informal or Formal Discussion with experts-17	33	44.0
Observation-27/Guided Tour-2/Interaction-1	30	40.0
Experience-18/ Practicum-1/ Participation-1	20	26.7
Website Analysis (Perusal/Survey/Surfing/Visits)	14	18.7
Historical Analysis-11/Historical Development-1	12	16.0
Questionnaire (open ended)	2	2.0
Table Talk	2	2.7
Research Analysis	1	1.3
Workshop Evaluation	1	1.3
Total	75	-

Methods Used in Multi-method Quantitative Research

Table 5 shows that only four quantitative methods were combined in multi-method quantitative research. Out of six studies, questionnaire, observation and content/document analysis were used in four. Two authors used discussion with experts for collection of quantitative data.

Table 5: Methods Used in Multi-method Quantitative Research

Methods used in multi-method quantitative	Frequency	Percentage
Questionnaire	4	66.7
Observation	4	66.7
Content/document analysis	4	66.7
Experts discussion	2	33.3
Total	6	-

Methods Used in Mixed Methods Research

Table 6 shows that interview (83%) and questionnaire (80%) were the most commonly used method for data collection in mixed methods design. Content/document analysis was used in one third of the articles. Website surfing, experience, observation and focus group scored modestly with nearly 15 percent share of each method. Literature review was less used (8%) in mixed methods research as compared to multi-method research. Software

analysis, historical analysis and bibliometrics were used rarely in mixed methods research. Content analysis was used in both the quantitative and qualitative way.

Periodic growth in Mixed Methods and Multi-method Articles

Periodic growth occurred in articles with more than one method but it was lower in multiple methods articles as compared to single method articles. From 2001 to 2008, single method articles and articles which used more than one method were 56 and 57 respectively. During next eight years (2009-2016) single method articles were increased to 366 (six times higher) and mixed methods and multi-method articles were increased to 152 (three times higher). It shows that growth in single method articles was two times higher than articles which used two or more methods.

Table 6: Data Collection Techniques Used in Mixed methods Research

Methods used in mixed methods research	Frequency	Percentage
Questionnaire	57	80.28
Interview	51	71.83
Content analysis (Content-8, Document-14, Report-1)	23	32.39
Website Analysis (online/internet surfing)	11	15.49
Experience-8/ Participation-2	10	14.08
Observation	10	14.08
Focus group	9	12.67
Personal Communication-4/Discussion-04	8	11.26
Literature review	6	8.45
Software analysis	2	2.81
Historical analysis	1	1.23
Bibliometrics	1	1.23
Total	71	-

DISCUSSION

With respect to reporting of mixed methods and multi-method, dominant majority of Pakistani authors did not use the terms mixed methods and multi-method during the description of methodology. Out of 152 studies with more than one method, less than ten studies termed their studies as multi-method or mixed methods. According to Granikov et. al. (2020), multi-method were only 9 percent and they asserted that this lower frequency may be due to lack of usage of term multi-method among the researchers. They searched mixed methods articles but also used the term multi-method and multiple methods for searching articles which applied more than one method. Similar is the case with Pakistani authors with respect to the use of term “multi-method” in articles analysed in the current study. None of the authors used the term multi-method. One study labeled it as “hybrid qualitative” (Khan et al. 2011) and another study named it as “triangulation” (Ali and Khalid 2015).

The majority of empirical research was quantitative (58%) followed by qualitative (12%). The share of multi-method and mixed methods research was nearly one third (30%). Findings of the current study are similar to that of Terill (2016) and Hider and Pymm (2008). The percentage of using more than one method in the current study was higher as compared to 18 percent found by Aytac (2016). Results for mixed methods research are extremely lower for some studies for example only 7 percent in Ngulube (2010), 3 percent in Ngulube, Mokwatlo and Ndwandwe (2009), 3 percent in Toumaala et al. (2014) and 7

percent in Matusiak (2017). There are two possibilities for these findings, that firstly, the authors may have categorised multi-method qualitative under qualitative and multi-method quantitative under quantitative and have not explained the reasons. Secondly, the studies selected by authors for analysis have not used multi-method.

Multi-method articles have higher share (16%) as compared to mixed methods articles (14%) in the current study. The results are different from Granikov et al. (2020) study which found that multi-method designs were used much lesser (9%) as compared to mixed methods (86%). The purpose of Granikov et al. (2020) study was to examine mixed methods research in LIS and this focus may have resulted in fewer shares of multi-method articles and higher share of mixed methods articles. Furthermore, all prior studies except Mardis (2011) categorised research into mixed methods and did not use multi-method as a type of methodological pluralism. Due to the absence of multi-method in prior studies, the comparison with other earlier studies was not possible. Ullah and Ameen (2022b) used multi-method as the fourth category for exploring methods in user studies. In case of user studies, the share of methodological plurality was almost half (14%) as compared to the current study (30%). Moreover, the share of multi-method is one fourth (4%) in user studies as compared to this study (16%). But, the share of mixed methods articles in user studies is slightly lower (10%) as compared to this study (14%). It may be due to the over dependence of user studies on questionnaire.

In multi-method research articles, concurrent approach (93%) was used dominantly while sequential was used in only 4 percent articles. In case of mixed methods research, sequential approach (54%) was more popular than concurrent (44%). It shows that qualitative data was collected and analysed in concurrent manner but the qualitative and quantitative data in a single mixed methods study was collected by majority of authors in sequential phases. Granikov et al. (2020) found that convergent approach was popular in mixed methods research as compared to sequential and the findings of the current study are contrary to their results.

Dominant majority (69 out of 75) of articles combined qualitative methods and only six articles combined more than one quantitative method. Less adoption of multi-method quantitative was also observed by an earlier study as no researcher applied more than one method in quantitative articles (Mardis 2011). Use of single quantitative method is increasing but the use of more than one quantitative method in a single study is rare in the case of both international and Pakistani research. It may be due to lack of knowledge of mixing of quantitative methods.

In mixed methods research, interview and questionnaire-based surveys are the most commonly used tools for collection of data. Content/document analysis was used in one third of the articles. Earlier studies also revealed the use of questionnaire as the favourite method used in mixed methods articles. Survey was used in more than 90 percent articles in mixed methods articles (Mardis 2011). Website surfing, experience, observation and focus group scored modestly with nearly 15 percent share of each method in mixed methods research. Literature review, historical analysis and bibliometrics are rarely used in mixed methods research.

In case of multi-method qualitative, 64 percent articles used content analysis and literature review for combining with other methods. Other dominant methods were interview (57%), personal communication and discussion with experts (44%) and observation (40%). Mardis (2011) found dominance of interview and observation combination in multi-method

qualitative research and the current study also explored the use of observation in reasonable percentage. Only four quantitative methods were combined in multi-method quantitative research. Out of six studies, questionnaire, observation and content/document analysis were used in four. Two studies used discussion with expert for collection of quantitative data. Studies published in international journals did not explore the use of more than one quantitative method in single study.

A modest growth took place in method plurality as compared to single method articles produced by Pakistani authors during 2001 to 2016. The growth in articles with more than one method became three times in 2016 as compared to 2008 whereas single method articles increased six times during this period. Chu (2016) examined growth in three core LIS journals and found a decrease in articles with more than one method from 63 in 2001-2002 to 54 in 2009-2010 but in the case of Pakistan, growth occurred but less than single method articles.

CONCLUSIONS

Methodological pluralism is a welcome addition to the diverse options available to researchers (Barnes et al. 2014) but Pakistani authors have paid less attention toward reporting of methodological pluralism. About one-third of the studies used methodological pluralism to investigate research questions in a single inquiry. It identifies the use of different research methods in mixed methods and multi-methods research articles. The results about the application of methodological pluralism for the current study informed researchers about two distinct possibilities of combining and mixing different methods. Identification of combinations of methods in mixed methods and multi-method will create awareness for future researchers to make informed decisions about combining possibilities of more than one method in a single study. Clarity in conceptualization and theoretical understanding of research methodology is very important (Ullah and Rafiq 2021) and the current study will help researchers to gain a better understanding of types of methodological plurality. The results can serve as a guide for scholars and writers about the use of mixed methods and multi-method approaches. It may help to raise awareness of combining of different methods and help educators to make students more aware of the options available. Understanding about multi-method design as separate design from mixed methods will pave way for development of methodological guidelines and procedures for collection and merging of data for multi-method research in LIS field.

After qualitative and quantitative, mixed method designs are considered as the third research paradigm and the current study considers multi-method design quite different from mixed methods. Methodological plurality may be treated as mixed methods designs and multi-method designs and it is recommended that future research should explore methodological plurality by treating multi-method designs as separate from mixed method designs. Authors who intend to conduct content analyses or systematic reviews of published research articles should clearly differentiate between multi-method and mixed methods and treat them as separate research methodologies. Future research may also be conducted to compare the impact of multi-method designs and mixed methods designs on the quality of research. Furthermore, both the types of methodological plurality may be compared for articulation of methodology and methods, connection of phases, merging of data and explanation of procedures.

There are certain limitations which need to be acknowledged in relation to the selection of literature for a particular country, searching of literature, and to the content analysis as a methodology. The articles produced by Pakistani authors have been selected for the current study. A systematic approach was used for searching of international literature, however there exists a possibility that few authors and some articles of selected authors have not been included in the sample. Different elements and characteristics of methodological pluralism such as timing, weight, and point of integration of study components were not included in the current study. Furthermore, the type of integration (merging, connecting and embedding) and how well each study was reported with a tool was not included in this study.

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