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Mixed Methods Research Design Concepts: Quantitative, Qualitative, Exploratory Sequential, Exploratory Sequential, Embedded and Parallel Convergent

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Abstract: The purpose of this literature research is to help future authors determine the right research design. Research article Mixed Methods Research Design Concepts: Quantitative, Qualitative, Exploratory Sequential, Exploratory Sequential, Embedded, and Parallel Convergent is a scientific literature article within the scope of research methodology. The approach used in this literature review research is descriptive qualitative. The data collection technique is to use literature studies or review relevant previous articles. The data used in this descriptive qualitative approach comes from previous studies that are relevant to this research and are sourced from academic online media such as Thomson Reuters Journals, Springer, Taylor & Francis, Scopus Emerald, Elsevier, Sage, Web of Science, Sinta Journals, DOAJ, EBSCO, Google Scholar and digital reference books. In previous studies, 1 relevant previous article was used to review each independent variable. The results of this literature review article are: 1) Quantitative is related to the Concept of Mixed Methods Research Design; 2) Qualitative is related to the Concept of Mixed Methods Research Design; 3) Sequential Exploratory is related to the Concept of Mixed Methods Research Design; 4) Exploratory Sequential relates to the Mixed Methods Research Design Concept; 5) Embedded relates to the Mixed Methods Research Design Concept; and 6) Parallel Convergent relates to the Mixed Methods Research Design Concept.

Keywords: Mixed Methods Research Design, Quantitative, Qualitative, Exploratory Sequential, Exploratory Sequential, Embedded, Convergent Parallel

INTRODUCTION

Mixed methods research designs have gained considerable traction in the social and educational research domains. This approach combines elements from both quantitative and qualitative research, thereby facilitating a more comprehensive understanding of the phenomenon under study. In this context, quantitative research is typically concerned with the

measurement and analysis of numerical data, whereas qualitative research is oriented towards an in-depth understanding of social context and individual experiences. The combination of these two approaches allows researchers to obtain data of greater richness and diversity, which in turn increases the validity and reliability of the resulting research (Azhari et al., 2023).

One of the principal reasons for the growing relevance of mixed methods research designs is the inherent complexity of the problems encountered in social research. It is often the case that social phenomena cannot be fully understood by quantitative or qualitative approaches in isolation. To illustrate, in studies examining the impact of a specific educational program on student outcomes, quantitative data such as test scores can offer a broad overview but may not fully elucidate the underlying factors influencing student motivation and learning experiences. The utilization of mixed methods enables researchers to integrate quantitative and qualitative data, thereby facilitating the acquisition of a more comprehensive understanding (Pane et al., 2021).

In the context of a mixed methods research design, many different approaches can be employed, including sequential explanatory, sequential exploratory, embedded, and convergent parallel. The sequential explanatory approach, for instance, entails the initial collection and analysis of quantitative data, which is then followed by the collection of qualitative data to elucidate the findings. This approach is particularly beneficial when researchers seek to gain a more profound understanding of the outcomes yielded by quantitative data (Hermawan, 2019). In contrast, the sequential exploratory approach commences with the collection of qualitative data to explore a phenomenon that has yet to be fully understood. This is followed by the collection of quantitative data to test the initial findings (P. C. Susanto, Yuntina, et al., 2024).

Furthermore, the embedded approach permits researchers to incorporate qualitative data into a quantitative research design, whereby the qualitative data serves as a supplement to provide additional context to the quantitative data. This approach is frequently employed in large-scale surveys where researchers seek to gain deeper insights into specific subgroups within a larger population (Purwono et al., 2019). The convergent parallel approach, meanwhile, entails the concurrent collection of both quantitative and qualitative data, which are subsequently analyzed separately and then combined to provide a more comprehensive understanding.

In practice, the application of a mixed-methods research design can confer significant advantages to researchers. These include a deeper understanding of the research context, increased validity of results, and the ability to answer complex research questions. To illustrate, research conducted by Yam, (2022) demonstrated that the utilization of mixed methods can enhance the quality of research by facilitating more robust data triangulation. Consequently, it is crucial for researchers to possess an understanding of the diverse approaches inherent to mixed methods research design and to select the most appropriate approach to align with their research objectives.

Problem Formulation

Based on the background of the problem above, the problem formulation is obtained to be used as a hypothesis for further research, among others: 1) Is Quantitative related to the Concept of Mixed Methods Research Design?; 2) Is Qualitative related to the Mixed Methods Research Design Concept?; 3) Is Exploratory Sequential related to the Mixed Methods Research Design Concept?; 4) Is Exploratory Sequential related to the Mixed Methods Research Design Concept?; 5) Is Embedded related to the Mixed Methods Research Design Concept?; and 6) Is Parallel Convergent related to the Mixed Methods Research Design Concept?.

METHOD

This research used a descriptive qualitative approach. This method was chosen because it allows researchers to understand the concept of research design thoroughly, focusing on the context and meaning contained in the research methodology. Descriptive qualitative data collection and analysis allow researchers to adapt their approach to the needs of the research and the characteristics of the subject under study.

The data used in this study comes from previous research related to research methodology. The researcher will analyze the existing literature to identify patterns and trends in research methodology. By using previous research and other references, researchers can develop stronger, evidence-based arguments and contribute to a broader understanding of research methods, (P. C. Susanto, Arini, et al., 2024).

Data was collected through a literature review. The literature review is an important step in this research as it allows the researcher to identify and analyze various sources relevant to the topic at hand. The researcher will collect data from journal articles, books, and other relevant documents to gain insight into the research methods. The literature review also informs the researcher about the latest developments in the field and identifies research gaps that need to be filled (Almeida et al., 2016).

This research utilizes data from a variety of leading academic journals, including Thomson Reuters Journal, Springer, Taylor & Francis, Scopus, Emerald, Sage, WoS, Sinta Journal, DOAJ, and EBSCO, as well as platforms such as Publish or Perish and Google Scholar. By using these sources, researchers can ensure that the data they collect is valid and accountable. The use of multiple sources also allows researchers to gain a more comprehensive understanding of research methods from various perspectives.

RESULTS AND DISCUSSIONS

Results

The following are the research findings considering the context and problem formulation:

Mixed Methods Research Design

A mixed methods research design is an approach that integrates quantitative and qualitative methods in a single study, thereby facilitating a more comprehensive understanding of a given phenomenon. This approach is employed when the use of a single method is inadequate for thoroughly addressing the research question. The objective of mixed methods research is to combine the advantages of both methods, such as the generalization of data from quantitative and the depth of insight from qualitative research. The collection of data can be conducted concurrently or successively, contingent on the selected design. The findings derived from both methods are integrated to yield more valid and pertinent conclusions (Angkawijaya, 2019).

Indicators or dimensions contained in the Mixed Methods Research Design variable include: 1) Data Integration: The extent to which quantitative and qualitative data are combined to comprehensively answer the research questions; 2) Data Collection Sequence: Determining whether data are collected sequentially (explanatory/exploratory) or simultaneously (parallel); 3) Validation Triangulation: The use of both methods to mutually validate findings, thereby increasing the validity of research findings; and 4) Design flexibility: The ability to adapt the approach based on research needs and relevant data types (Angkawijaya, 2019).

Mixed Method Research Design variables are relevant to previous research conducted by: (Masruroh et al., 2022), (Vebrianto et al., 2020), (Sutopo, 2021).

Quantitative

Quantitative research is a systematic methodology that entails the collection and analysis of numerical data to measure relationships or influences between variables. This approach employs statistical techniques to evaluate hypotheses and generate inferences about the

population. Quantitative research is frequently conducted through the utilization of surveys, experiments, or secondary data analysis. The principal advantages of quantitative research are its objectivity and its capacity to yield results that can be subjected to mathematical measurement and comparison (Muhammad Taufiq Azhari et al., 2023), (Sugiyono, 2022).

Indicators or dimensions contained in Quantitative variables include: 1) Numerical measurement: Data are represented in numbers, such as scores, percentages, or other statistics for analysis; 2) Generalisability: The ability to apply research findings to a larger population based on a representative sample; 3) Hypothesis testing: The use of statistical methods to test relationships or differences between variables; and 4) Replicability: The ease with which the study can be repeated under similar conditions to test its reliability (Jaya, 2020).

Quantitative variables are relevant to previous research conducted by: (Sugiyono, 2022), (Auliya et al., 2020), (Agustianti et al., 2022).

Qualitative

Qualitative research is an approach that seeks to comprehend the significance, experience, or viewpoint of individuals about a given phenomenon. This approach utilizes non-numerical data, such as interviews, observations, or documents, which are subjected to in-depth analysis to identify specific patterns or themes. Qualitative research is exploratory and is typically conducted in a natural context. The principal advantage of this approach is its capacity to facilitate the exploration of complex and nuanced insights (Hermawan, 2019), (Agustianti et al., 2022).

Indicators or dimensions contained in Qualitative variables include: 1) Deep understanding: The ability to explore the meanings, experiences, and perspectives of participants; 2) Naturalistic context: Research is conducted in a natural setting without manipulating conditions; 3) Non-numerical data: Uses interviews, observations, or documents as the primary source of data; and 4) Thematic analysis: Focuses on grouping data into themes or patterns that emerge from the researcher's interpretation (Purwono et al., 2019).

Qualitative variables are relevant to previous research conducted by: (Pahleviannur et al., 2022), (Harahap, 2020), (Yusanto, 2020).

Explanatory Sequential

A sequential explanatory design is a mixed-methods research design that begins with the collection of quantitative data, intending to identify patterns or relationships between variables. This is followed by the collection of qualitative data, to provide an explanation or explore the quantitative results. To illustrate, a survey is conducted to ascertain the stress levels of students, after which interviews are conducted to elucidate the underlying causes of the stress (Abisibah et al., 2022).

Indicators or dimensions contained in the Sequential Explanatory variable include: 1) Initial quantitative data: The first stage begins with the collection and analysis of quantitative data to find patterns or trends; 2) Supporting Qualitative Data: Qualitative data is used to explain quantitative findings, providing a deeper insight into the relationships between variables; 3) Structured Sequence: Data collection is carried out sequentially, with the first stage influencing the second; and 4) Explanation of phenomena: Focus on answering the "why" behind quantitative results (Nurhayati & Natasukma, 2019).

Sequential Exploratory variables are relevant to previous research conducted by: (Darmawanto, 2023) and (Agustinah et al., 2020).

Sequential Exploratory

A sequential exploratory design is a research strategy that begins with the collection of qualitative data, to explore a phenomenon or develop a hypothesis. This is followed by the collection of quantitative data, which is used to test the initial findings in a more general

context. To illustrate, initial interviews are conducted to gain insight into customer needs, after which surveys are administered to gauge these needs on a larger scale (Silvia & Paramita, 2019).

Indicators or dimensions contained in the Sequential Exploratory variable include: 1) Initial exploration: Qualitative data is collected first to understand the phenomenon in depth or to develop initial hypotheses; 2) Quantitative data validation: Quantitative data is collected in the second stage to test or extend qualitative findings; 3) Instrument development: Qualitative findings can be used to develop quantitative measurement tools, such as questionnaires; and 4) Generalisation of findings: Quantitative findings aim to extend the results of qualitative exploration to a larger population (Sitepu, 2020).

Sequential Exploratory variables are relevant to previous research conducted by: (Widyaningdyah, 2019), (Siregar & Suryani, 2021), (Permana & Guci, 2024).

Embedded

An embedded design is a mixed methods design in which one method (quantitative or qualitative) is the primary method, while the other is employed as a supplement. This supplementary data is employed to enhance or provide context to the primary results. An example would be a quantitative survey on the effectiveness of a training program, supplemented by in-depth interviews to obtain the views of participants (Adolph & Hoch, 2019).

The indicators or dimensions contained in the Embedded variable include: 1) Primary method: One of the methods (quantitative or qualitative) is the main focus of the research; 2) Supporting method: A second method is used as a complement to provide context or enrich the main findings; 3) Complementary function: Supporting data helps to explain or provide additional insight into the main findings; and 4) Flexibility: The ability to adapt the supporting methods according to the research needs (Nelles, 2020).

Embedded variables are relevant to previous research conducted by: (Marwedel, 2021) and (Moons et al., 2019).

Parallel Convergent

A convergent parallel design is a mixed methods design in which quantitative and qualitative data collection is conducted in parallel, and the results are analyzed separately before being integrated to conclude. This design is used when both types of data are considered equally important. An example would be a mental health survey conducted alongside in-depth interviews to gain a broader perspective (Sabil & Karnita, 2022).

Indicators or dimensions contained in the Convergent Parallel variable include: 1) Simultaneous data collection: Quantitative and qualitative data are collected simultaneously without influencing each other; 2) Separate analysis: Data from both methods are analyzed independently before being integrated; 3) Integration of results: Results from both methods are combined to provide a more complete and valid picture; and 4) Data validation: Quantitative and qualitative data support each other to strengthen the validity of the findings (Alfahani, 2019).

Parallel Convergent variables are relevant to previous research conducted by: (Rahardhian et al., 2023) and (Ibrahim & Rahmajati, 2022).

Previous Research

Based on the findings above and previous studies, the following research discussion is formulated:

Table 1. Relevant Previous Research Results

No	Author (Year)	Research Results	Similarities With This Article	Differences With This Article
1	(Justan & Aziz, 2024)	-Quantitative Variables relate to Mixed Methods Research Design -Qualitative Variables relate to Mixed Methods Research Design -Triangulation Variables relate to Mixed Methods Research Design	-This article has in common examining the quantitative variables of the independent variables, and examining the mixed method research design variables on the dependent variable.	-The difference with previous research is that the Triangulation variable is another independent variable.
2	(Nasution et al., 2024)	-Qualitative variables relate to mixed methods -Triangulation variables relate to mixed methods	-This article has in common in that it examines the Qualitative variable on the independent variable, and examines the Mix Method variable on the dependent variable.	-The difference with previous research is in other Independent Triangulation variables.
3	(Puspitasari et al., 2024)	Sequential Exploratory Variables relate to the Mix Method	-This article has in common that it examines the Exploratory variable in the independent variable, and examines the Mix Method variable in the dependent variable.	Another difference is that there is an object in the previous study, which was conducted at the IAIS Lumajang Campus.

Discussion

This literature review will be discussed based on the history of the topic, research objectives, problem formulation, indicators or dimensions, and related previous research:

1. Quantitative Relationship to Mixed Methods Research Design

The relationship between the quantitative approach, which encompasses numerical measurement, generalization, hypothesis testing, and replication, and the mixed methods research design, which includes data integration, data collection sequencing, validation triangulation, and design flexibility, is complementary in addressing complex research questions. The utilization of numerical measurements in a quantitative approach enables the objective and systematic measurement of data. In a mixed methods design, quantitative data serves as a foundation for analysis that can be combined with qualitative data to provide a more holistic perspective. For example, a quantitative survey on customer satisfaction levels produces numerical data that demonstrates general patterns, while qualitative interviews are employed to investigate the underlying reasons for these patterns. This combination reflects the significance of data integration, which is a fundamental aspect of mixed methods design to facilitate comprehensive conclusions.

One of the principal advantages of the quantitative approach is its capacity for generalizability, whereby the findings of a study can be applied to a broader population based

on a representative sample. However, this approach frequently lacks sufficient depth of understanding of a specific context. In mixed methods, qualitative data compensates for such limitations by providing contextual insights. For instance, quantitative results indicating the relationship between education and job satisfaction can be generalized, but qualitative interviews enhance the comprehension of the social or cultural factors that influence this relationship. Through validation triangulation, findings from both methods can be employed to corroborate and validate each other, thus increasing the credibility and accuracy of the research results.

In mixed methods designs, hypothesis testing is frequently the initial step. Explanatory sequential designs employ quantitative hypothesis testing to identify patterns or significant relationships between variables, which are then elucidated through qualitative data. To illustrate, if statistical analysis demonstrates a positive correlation between access to finance and MSME growth, qualitative interviews can be utilized to investigate how access is utilized by businesses. The sequence of data collection in mixed methods plays a pivotal role in integrating both approaches, either through explanatory (quantitative followed by qualitative) or exploratory (qualitative followed by quantitative) designs.

The replication of studies, which is frequently employed in quantitative research to ascertain the consistency of results, is similarly pertinent in mixed methods. The combination of replicated quantitative research with qualitative data from disparate contexts can yield findings that are more flexible and applicable. In a mixed methods design, the flexibility of the design allows the researcher to adapt the approach based on the needs of the study. Researchers may elect to emphasize quantitative, qualitative, or a combination of both, depending on the complexity of the phenomenon under study.

This overall relationship demonstrates that quantitative approaches offer a measurable and structured framework, whereas mixed methods facilitate the expansion of research dimensions through the integration of quantitative and qualitative data. This integration enables a more profound understanding, valid triangulation, and flexible designs to address research questions that cannot be resolved by a single method. The combination of numerical measurement, generalization, hypothesis testing, and replication with mixed methods design principles renders this approach particularly effective for multidimensional research.

2. Qualitative Relationship to Mixed Methods Research Design

The relationship between the qualitative approach, which encompasses a profound comprehension, an authentic contextualization, the utilization of non-numerical data and thematic analysis, and the mixed methods research design, which incorporates data integration, the sequencing of data collection, the triangulation of validation and the flexibility of the design, is one of close and complementary proximity. The qualitative approach is founded upon the principle of deep understanding, which provides insight into experiences, perspectives, and phenomena that are difficult to explain with quantitative data alone. In a mixed methods design, this deep understanding enriches the research results by providing a narrative or context that clarifies the numerical data. To illustrate, in-depth interviews with micro-entrepreneurs can reveal social or cultural factors that influence their business strategies, complementing survey data that shows quantitative patterns in income levels. This demonstrates how data integration in mixed methods allows for a richer combination of qualitative understanding and quantitative findings.

The naturalistic context, which is a defining feature of qualitative research, enables the understanding of phenomena in their original state, without any form of manipulation. Qualitative research conducted in the field, such as direct observation, provides data that is contextualized and pertinent to the actual circumstances under investigation. In mixed methods designs, the naturalistic context facilitates the linkage of quantitative data, which is often detached from its context, to reality. For instance, studies on job satisfaction may record

satisfaction levels through quantitative surveys, but direct interviews with employees in the workplace provide a more accurate understanding of the working conditions that influence that satisfaction. This supports the concept of validation triangulation, whereby results from both methods are used to mutually verify and strengthen findings.

The utilization of non-numerical data, such as interview transcripts, observation notes, or documents, offers researchers the flexibility to capture aspects that are not quantitatively measurable. In mixed methods designs, these data are used to complement numerical findings and provide insights that cannot be obtained through surveys or experiments alone. Non-numerical data is often pivotal in designs such as sequential explanatory, where interviews are used to elucidate survey results. Furthermore, the flexibility of mixed methods designs allows researchers to determine the role of non-numerical data based on the needs of the study.

Thematic analysis is also pertinent in mixed methods designs. The identification of key themes derived from qualitative data enables researchers to establish connections with quantitative results, thereby facilitating a more comprehensive interpretation. To illustrate, in research on organizational leadership, survey results on leadership styles can be linked to themes such as "open communication" or "consensus-based decisions" that emerge from qualitative interviews. The order of data collection is of paramount importance in designs such as sequential exploratory, where the application of thematic analysis at an early stage assists in the development of more pertinent quantitative survey instruments.

The flexibility of mixed methods research designs allows for the adaptation of qualitative approaches when necessary. Qualitative methods provide depth, context, and nuance, while mixed methods ensure that these data are integrated with quantitative results to answer research questions holistically. This relationship reflects how qualitative methods not only complement but also extend the results obtained from quantitative data, resulting in conclusions that are valid, rich, and relevant in a multidimensional context.

3. Sequential Explanatory Relationship to Mixed Methods Research Design

The relationship between the sequential explanatory design, which includes preliminary quantitative data, supporting qualitative data, structured sequencing, and explanation of phenomena, and the mixed methods research design, which includes data integration, data collection sequencing, validation triangulation, and design flexibility, reflects a complementary synergy that facilitates the generation of a deeper and more valid understanding. The initial quantitative data, constituting the inaugural step in a sequential explanatory design, is employed to discern patterns or significant relationships between variables. This data is typically obtained through surveys or experiments, which provide a numerical overview of the phenomenon under study. In a mixed methods context, these quantitative data form the basis for data integration, whereby numerical data are designed to be linked with qualitative data to be collected at a later stage. For instance, a survey indicating a positive relationship between management support and job satisfaction can be followed up with qualitative interviews to explore how that form of support is perceived by employees.

The inclusion of qualitative data is an essential element in sequential explanatory designs, providing a valuable complement to the quantitative data. The collection of qualitative data in the second stage permits researchers to investigate the reasons, context, or mechanisms underlying the relationships identified in the initial quantitative data. This facilitates the creation of validation triangulation, whereby quantitative findings are validated and enhanced through in-depth perspectives provided by participants. To illustrate, if a survey indicates that technology-based training enhances productivity, qualitative interviews can elucidate how the technology affects employees' daily work processes. This combination ensures that the research results are not only statistically accurate but also pertinent within a real context.

The structured sequence inherent to the sequential explanatory design is analogous to the principle of data collection sequence in mixed methods. This approach guarantees that the

second stage of the research, the qualitative data collection, is designed based on the results of the first stage. This provides a more precise focus on qualitative data collection, as questions or interview instruments can be adjusted to address quantitative findings. To illustrate, if the statistical analysis shows that education level influences motivation to learn, interviews with participants of different education levels can help understand the specific reasons behind the influence.

The final component of the sequential explanatory design is the explanation of the phenomenon, which represents the primary objective of this approach. Quantitative data provides patterns or relationships, whereas qualitative data explains the underlying reasons and mechanisms that give rise to these patterns. This relationship reflects the flexibility of mixed methods design, whereby the researcher can adapt the approach based on the necessity to address the research question. Consequently, the sequential explanatory design allows for further investigation of the quantitative findings, ensuring that the research yields insights that are not only accurate but also applicable.

In conclusion, the sequential explanatory design and the aforementioned elements of mixed methods, including data integration, data collection sequence, validation triangulation, and design flexibility, work in conjunction to yield comprehensive and nuanced research. Researchers can leverage the strengths of quantitative data to identify broad patterns and then elucidate these findings further through qualitative data, thereby producing conclusions that are pertinent, reliable, and applicable in a broader context.

4. Sequential Exploratory Relationship to Mixed Methods Research Design

The relationship between sequential exploratory design, which encompasses initial exploration, quantitative data validation, instrument development, and generalization of findings, and mixed methods research design elements such as data integration, data collection sequencing, validation triangulation, and design flexibility, represents a form of synergy that aims to produce a comprehensive and applicable understanding of a phenomenon. In a sequential exploratory design, initial exploration is conducted through the collection of qualitative data, to understand the phenomenon, formulating initial hypotheses, or identifying salient themes. This approach permits researchers to investigate information that is challenging to quantify through numerical data. In mixed methods designs, initial exploration plays a pivotal role in data integration, whereby qualitative insights are employed to structure quantitative frameworks or instruments that are more pertinent to the research context. To illustrate, interviews with MSME actors can elucidate the factors that influence business success, which are then utilized to construct a quantitative survey questionnaire.

The second stage of the sequential exploratory design is the validation of quantitative data. This stage involves the collection of quantitative data with the purpose of testing or extending the initial findings derived from the qualitative data. This process facilitates the sequence of data collection in mixed methods, which necessitates the continuous design of each stage of the research. Quantitative data not only corroborates the findings of qualitative research through numerical evidence but also expands the scope of the research by involving a larger sample. For instance, initial qualitative interviews may identify that work motivation is influenced by leadership, and subsequent quantitative survey stages verify this relationship at the population level.

One of the key strengths of sequential exploratory design is the ability to develop an instrument based on the initial exploratory results. This instrument can then be used to collect quantitative data. This element is consistent with the triangulation principle of validation, as quantitative instruments developed from qualitative data are more valid and relevant in answering the research questions. For example, interviews with students about their online learning experiences can inform the design of survey questionnaires that are more appropriate

to the online learning context. Thus, triangulation is achieved by strengthening the validity of the results from both stages of the research.

The ultimate objective of sequential exploratory design is the generalization of findings, which seeks to ensure that research findings are relevant to a wider population. The quantitative stage not only validates the qualitative results but also allows researchers to make generalizations based on larger, representative data. This reflects the flexibility of design in mixed methods, where qualitative approaches are used to explore phenomena, while quantitative approaches ensure the results can be applied more broadly. For example, initial interviews with restaurant customers to understand their satisfaction factors can lead to quantitative surveys that provide comprehensive insights into customer preferences across different locations.

In conclusion, the sequential exploratory design and mixed methods elements are mutually reinforcing in the creation of in-depth and applicable research. The initial exploration of qualitative data provided a rich basis for the construction of quantitative instruments, while the validation of quantitative data ensured that the initial findings could be tested and generalized. This combination, facilitated by data integration, structured data collection sequences, validation triangulation, and design flexibility, allows researchers to answer research questions with a richer, more relevant, and reliable approach.

5. Embedded Relationship to Mixed Methods Research Design

The relationship between embedded design, which encompasses primary methods, supporting methods, complementary functions, and flexibility, and mixed methods research design elements such as data integration, data collection sequence, validation triangulation, and design flexibility, reflects a strategic approach to combining the strengths of the two research approaches. In an embedded design, the primary method is the principal focus of the research, either quantitative or qualitative, depending on the research objectives. The data obtained from the primary method serves as the basis for answering the central research question, whereas the data gathered from the supporting methods are employed to enhance or elucidate the primary results. In the context of data integration, embedded designs guarantee that the data from the supporting methods are not isolated, but rather are utilized to supplement the analysis from the primary methods. To illustrate, a quantitative survey on the efficacy of a training program may be reinforced with in-depth interviews to explore the experiences of the participants.

Supporting methods serve to complement the primary methods, highlighting aspects that are not covered by the latter. In a mixed methods design, the order of data collection can be organized in a way that allows supporting methods to be conducted before, during, or after the primary methods, depending on the requirements of the study. This illustrates the significance of the sequence of data collection, whereby supporting methods are intended to provide context or address deficiencies identified in the results of primary methods. For instance, preliminary interviews may offer insights that facilitate the development of a more pertinent survey questionnaire, while quantitative surveys can precede interviews to identify respondents with specific characteristics.

The complementary functions of embedded design render it an efficacious instrument for augmenting the accuracy and depth of analysis. Validation triangulation entails the utilization of data from supporting methods to corroborate or augment insights derived from primary data. To illustrate, if a survey indicates a high level of trust in leaders, interviews can elucidate the underlying reasons for this level of trust, thereby providing a more comprehensive representation. In this manner, embedded design not only enhances the validity of the findings but also ensures that the research outcomes are more contextualized and pertinent.

One of the principal benefits of embedded design is its flexibility, which enables the researcher to adapt the role of supporting methods to the specific requirements of the research

project. This design allows for the prioritization of primary methods while simultaneously utilizing data from supporting methods to address additional questions or expand findings. In the context of mixed methods design flexibility, embedded designs permit researchers to adapt their approach, either by incorporating qualitative elements to enhance the depth of quantitative data or vice versa. To illustrate, a study on customer satisfaction may employ a quantitative survey as the primary method, but qualitative interviews may be used to gain insight into the emotional aspects of satisfaction that are not captured in the survey.

In conclusion, the combination of embedded design and mixed methods elements, including data integration, data collection sequence, validation triangulation, and design flexibility, facilitates the production of comprehensive and in-depth research. By employing primary methods to address core questions and supporting methods to enhance the analysis, this design offers a focused yet adaptable approach. The outcome is research that is not only statistically valid or descriptive but also contextually relevant and applicable to a range of research needs.

6. Convergent Parallel Relationship to Mixed Methods Research Design

The relationship between convergent parallel design, which includes simultaneous data collection, separate analysis, integration of results, and data validation, and mixed methods research design elements such as data integration, data collection sequencing, validation triangulation, and design flexibility creates an effective approach to obtaining more complete and credible research results. In a convergent parallel design, data collection is simultaneous, where quantitative and qualitative data are collected at the same time, independent of each other. This provides an opportunity to explore the same phenomenon from two different perspectives in parallel. Data integration in this design occurs when results from both types of data are analyzed and combined to produce a more comprehensive and robust understanding. For example, quantitative data showing customer satisfaction levels measured through surveys can be combined with qualitative interviews to understand the reasons behind those satisfaction levels.

Separate analysis is another hallmark of convergent parallel design, where quantitative and qualitative data are analyzed independently first before being combined to produce conclusions. This approach ensures that each method gets its full attention according to its strengths, without bias from the other. After the analysis is done separately, the results of both types of data are combined or compared to provide a broader and deeper picture of the phenomenon under study. In this case, the order of data collection is not bound to sequential steps as in a sequential design but is done simultaneously. This allows the researcher to obtain results more efficiently, without the need to wait for data from one method to start collecting data from another.

The data validation process is also very important in a convergent parallel design, as quantitative and qualitative data support each other and strengthen the research results. By collecting data from two different sources, validation triangulation is done to confirm the findings from one method using the findings from the other method. If both types of data show consistent results, then the findings will be more valid and trustworthy. For example, if a survey shows that the majority of customers are satisfied with the service, and qualitative interviews with customers also reveal deep reasons for that satisfaction, then these results corroborate each other and increase the credibility of the research.

Design flexibility in mixed methods, especially in convergent parallel designs, allows researchers to customize the research approach according to the purpose and context of the study. This flexibility provides the freedom to choose when and how quantitative and qualitative data will be analyzed, as well as how the results will be combined to answer the research questions more comprehensively. In this context, the convergent parallel design allows

the researcher to consider the limitations and strengths of each method, and ensure that both methods contribute maximally to the research results.

Overall, convergent parallel design provides an effective framework for combining quantitative and qualitative data in one study. Through simultaneous data collection, separate analysis and integration of results, this design produces more comprehensive and credible findings, with strong validation through data triangulation. In addition, the flexibility of the design allows the researcher to customize the research methods according to the needs, thus improving the quality and relevance of the research.

Conceptual Framework

The conceptual framework is determined based on the formulation of the problem, research objectives and previous studies that are relevant to the discussion of this literature research:

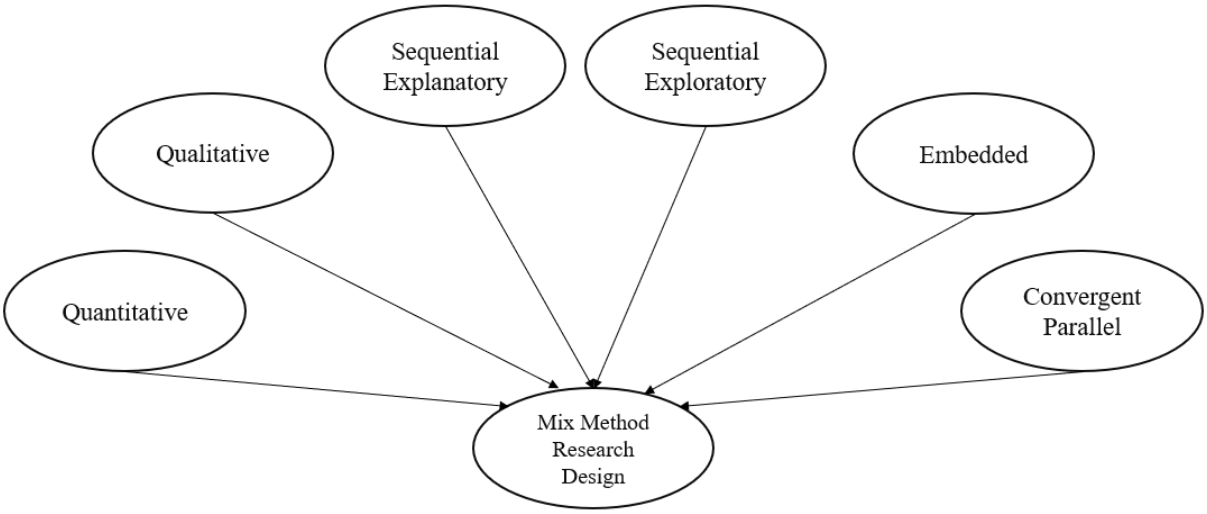

Figure 1. Conceptual Framework

Based on Figure 1 above, Quantitative, Qualitative, Sequential Explanatory, Sequential Exploratory, Embedded, and Convergent Parallel are related to Mixed Methods Research Design. However, in addition to the Quantitative, Qualitative, Sequential Explanatory, Sequential Exploratory, Embedded, and Convergent Parallel variables that relate to Mixed Methods Research Design, other variables influence, among others:

1) Triangulation: (Alfansyur & Mariyani, 2020), (D. Susanto & Jailani, 2023), (Azhari et al., 2023).
2) Community-based Participatory: (Aryani et al., 2022), (Putri, 2021), (Anwar, 2021), (Angkasa et al., 2022).
3) Transformation Design: (Arinta et al., 2024), (Rosmini et al., 2024), (Rahmat, 2021).

CONCLUSION

Based on the problem formulation, results, and discussion above, the conclusions of this study are:

1) Quantitative relates to the Concept of Mixed Methods Research Design;
2) Qualitative relates to the Concept of Mixed Methods Research Design;
3) Explanatory Sequential relates to the Concept of Mixed Methods Research Design;
4) Sequential Exploratory is related to Mixed Methods Research Design Concept;
5) Embedded is related to the concept of mixed methods research design; and 5)

6) Parallel Convergent relates to the Mixed Methods Research Design Concept.

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