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MULTI-METHOD APPLICATION IN MANAGEMENT: PERSONAL REFLECTION THROUGH STORYTELLING

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Abstract

Stories are essential realities from the past and present. Qualitative interviews play a crucial role in giving meaning to the personal stories of research participants as primary sources of data in action research. However, since it depends on a single point of view, mono-method studies are often criticized when it comes to addressing results from single qualitative research. To overcome this kind of barrier, researchers have adopted multi-method application in research. Still, in terms of the execution of multi-method studies, few were carried out, and there is a massive gap in multi-method execution in research. This paper exclusively discusses multi-method applications in management areas through my MBA thesis experience. This application and its author adopted storytelling as a method to address the findings of this paper. Through the application authors identified in terms of management discipline, multi-method is the tool that can be applied. It can support overcoming barriers in the mono method through qualitative and quantitative sequential design. The researcher can adopt a multi-source database in a multi-method study (interview, focus group, documentation) to increase the validity and reliability of findings. Based on the master's thesis of MBA, the researcher adopted a multi-method qualitative study and equipped in-depth personal interviews and documentation as the data sources to enhance findings. This uniquely multi-method approach supported the management discipline to develop the researcher's theoretical model and support the findings' re-confirmation through several data sources. This study It is hoped that this article will inspire other researchers who are doing multi-method qualitative research to think outside the box when it comes to presenting their participants' lived experiences in meaningful and collaborative ways..

Keywords

Storytelling, Qualitative, Multi-method.



1. Introduction

1.1 Story Telling: Master Thesis Experience

Doing research is my kind of excitement as a young academic. I have been engaging with people in research, mostly expertise in quantitative studies, but I want to be a good researcher in qualitative studies. Then I read some key books on qualitative research methods, including "Qualitative Inquiry & Research Design: Choosing among Five Approaches" and "Qualitative Researching" (Creswell, 2013; Mason, 2002). I started my MBA at Rajarata University in Sri Lanka, and they allocated Dr.Y.Nanthagopan as a Research supervisor, senior lecturer, at Vavuniya University. Initially, I met him with strategic management related topics and he reviewed and suggested that I come up with a fine-tuned proposal. Finally, I developed a proposal that explored the factors affecting strategic implementation in public universities in Sri Lanka. The supervisor said the proposal was OK but you needed to do more interviews because it's the study going to study each of the public universities and the supervisor said something about multi-method. Then I stopped and asked him what multi-method was with excitement He said to me to refer to Morse, J. M. (2003). Principles of mixed methods and multi-method research design. In C. Teddlie & A. Tashakkori (Eds.), *Handbook of Mixed Methods in Social and Behavioural Research* (pp. 189-208). Sage Publication, Thousand Oaks, CA. Based on in-depth reading, I developed the proposal with little amendment and the final title has been developed as "Exploring the factors that affect strategic implementation: A Multi-method study."

1.2 How I Selected Selection of Research

Paradigm and Philosophical Foundation

The research paradigm is linked to behavioral assumptions and makes assumptions about truths and what it means to know (Wills, 2012). According to Sekaran & Bougie (2016), three philosophical foundations can be identified as interpretivism, positivism, and pragmatism. Positivism studies are going to be conducted under a quantitative approach. This is based on positivism philosophy. Under the positivism paradigm, it is assumed that reality is standing out there, and the researcher's role is limited to collecting data and interpreting it. Positivism relies on quantifiable data, which leads to statistical analysis. The Pragmatism philosophy combines quantitative and qualitative methods and is used in mixed method study design. In particular, as the study is going to be conducted under qualitative study under the interpretivism philosophy (Lewis, 2006).

2. Literature Review

2.1 Selected Philosophical Foundation for

Interpretivism (Confirmation for Multi-Method Study)

According to Eriksson & Kovalainen (2008), ontology explains the ideas about the existence of and relationships between people, society, and the world in general. They state that ontology covers all theories and methodological positions (Eriksson & Kovalainen, 2008). In this thesis, the ontological assumption is that the issue is subjective. On the other hand, epistemology, on the other hand, is defined as the scientific knowledge that is available

and the limitations of that knowledge. Also, it explains the scientific practise and process (Eriksson & Kovalainen, 2008). In this thesis, the epistemological approach is subjectivism, in which reality is moulded by social forces. As Eriksson and Kovalainen illustrate, it means that knowledge can be gained only through social actors. They also state that this epistemological view is often related to the position called interpretivism. (Eriksson & Kovalainen, 1998). Satyaprasad and Krishnaswami (1998) define applied research as "research that aims to find a solution to an actual problem that necessitates action, preferably an immediate practical outcome" (Satyaprasad & Krishnaswami, 1998). Applied research, according to Satyaprasad and Krishnaswami, is "directed towards discovering what is happening, why it is happening, and what can be done about it." It aims at identifying the causes of a problem and the possible solutions to it. "(Satyaprasad & Krishnaswami, 2010). Interpretivism, according to Wills (2012), is what the world means and is interpreted by the person, in this case, regarding the participant in the study. Thus, the research was conducted within the constructivism-interpretivism paradigm. This paradigm allows for reality to be constructed in the mind of the person, ensuring that the hidden meaning can be brought to the surface through deep reflection (Ponterotto, 2005). The researcher therefore conducted the study using this paradigm because, by studying the lived experiences of the practitioner, it assists in discovering how strategy evolves, as recommended by Samra-Fredericks (2003). The interpretivism paradigm was deemed appropriate as the study conducted an in-depth analysis of the

practises of strategic people or practitioners during strategy implementation in addition to exploring the working lives of the university's top people. In the next section, the researcher specifically addresses the description of the inquiry strategy.

2.2 Review on Multi Method Study and How I Selected to my MBA Application

Here is a quotation from Creswell's chapter in the 2nd edition of the Handbook of Mixed Methods Research: "Writers in mixed methods are also careful to distinguish between "multi-method studies" in which multiple types of qualitative or quantitative data are collected (Green *et al.*, 2007) and "mixed methods studies" that incorporate collecting both qualitative and quantitative data." The distinction is that mixed methods combine qualitative and quantitative methods, while multi-methods use two qualitative methods (in principle, multi-methods research could also use two quantitative methods, but no one I know uses this label for multiple quantitative methods). Multimethod design can be defined as the conduct of two or more research methods, each conducted rigorously and complete in itself, in one project, and the results are then triangulated to form a complete whole(Wills,2012). The multimethod approach has emerged in different research areas as a way of improving the research process and findings. Multiple methods are used in a research programme when a series of projects are interrelated within a broad topic and designed to solve an overall research problem (Morse 2003, p. 196). The main advantages of multimethod research are triangulation – seeking to validate data and results by combining a range of data sources, methods, or observers; creativity – discovering

fresh or paradoxical factors that stimulate further work; and expansion – widening the scope of the study to take in contextual aspects of the situation (Vivek & Nanthagopan, 2023). Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study (Vivek & Nanthagopan, 2023). The Multi method is one of the most recent research applications. Combining several advantages Triangulation is the most well-known of these five purposes. It refers to the convergence or corroboration of data gathering and interpretation about the same phenomenon. The exact approach or form of data gathering and/or interpretation can vary. For example, researchers sometimes state they are using data triangulation, investigator triangulation, theoretical triangulation, or methodological triangulation. Data triangulation refers to the convergence or corroboration of data about the same phenomenon. Investigator triangulation refers to the collaboration of two or more investigators to gather and interpret the data. Theoretical triangulation refers to the use of more than one theoretical framework to guide the conceptualization of the study and the interpretation of the data. And, methodological triangulation refers to the use of more than one method to gather the data. (Martha, 2007). Complementary reaches beyond triangulation by focusing not only on overlapping or converging data, but also on the different facets of a phenomenon, providing a greater range of insights and perspectives. Development: Development combines, or uses, the findings from one method of studying a phenomenon to develop another method. For example, focus groups are

sometimes used to gain feedback on a questionnaire beyond the initial piloting. **Initiation:** Initiation involves the intentional analysis of new perspectives on a phenomenon of interest. **Expansion:** Expansion is the overall broadening of the scope, breadth, or range of a study (Martha, 2007). For the secondary component of the multimethod study system, this would include the description of the situation or phenomenon to be discussed, the actual development and design of the research, and the creation of simple evidence utilising techniques such as evaluation reports, news sources, documents, or qualitative approaches. Analysis of the data generated in such a way as to explain the past that has given rise to it and the necessary context of the partnership and restrictions that it holds. This would include the methods of research relevant to the approach of the study and the data generated at the first level. The evaluation of the proposed explanation(s) in terms of other expected consequences, alternative potential interpretations, and, in the context of intervention analysis, the examination of forms in which the case could be different from that which is presented. The evaluation process also includes the analysis of the findings and the succession of other conditions. Action to communicate and disseminate the findings of the study and, if required or needed, to bring about an improvement in the situation. Mingers (2001) points out that these processes are not treated as separate steps, one by one, with varying relative significance as the project advances. He also notes that various experiments would concentrate on one level rather than the other. This study focuses on comprehending the

world from individuals' subjective experiences. They employ meaning-oriented approaches (versus measurement), such as interviews, which rely on reciprocal interaction between researchers and subjects (Dawood & Gallini, 2010). Interpretivism is "aligned with the philosophical space of idealism and is used to bring together different approaches, including social constructivism, phenomenology, and hermeneutics, approaches that reject the objectivistic view that meaning is independent of consciousness within the universe." Furthermore, this study tends to focus on context and may use different approaches to reprehend (Dawood & Gallini, 2010). Interpretivism refers to approaches that emphasise the meaningful nature of people's character and participation in both social and cultural life (Elster, 2007; Walsham, 1995). It denotes the methods of research that adopt the position that people's knowledge of reality is a social construction by human actors, and so it distinctively rules out the methods of natural science (Eliaeson, 2002; McIntosh, 1997). It has its roots in the philosophical traditions of hermeneutics and phenomenology, and the German sociologist Max Weber is generally credited with being the primary influence. Interpretivism looks for meanings and motives behind people's actions, like behaviour and interactions with others in society and culture (Whitley, 1984). Similarly, cultures can be comprehended by studying people's ideas, thinking, and the meanings that are important to them (Vivek & Nanthagopan, 2023). Qualitative data collection is usually dependent on interpretation. This means that the data requires several explanations. This is because vast amounts

of qualitative evidence are often collected in this study by using multiple sources of data to identify themes. Initially, the researcher selected this approach to find out the effects of the dust explosion on those of their industries. Once the approach is defined, the research strategy should be determined. This research aims to develop a strategic model for public-sector universities in Sri Lanka. To undertake an in-depth study regarding the research problem, thematic analysis is selected for the study. Due to the above concern, this study is willing to select the qualitative multi-method research approach to identify the factors that affect strategy implementation in public sector universities in Sri Lanka. A multi-study design was chosen for the current study. Method study under qualitative research adopting the constructivism-interpretivism paradigm was deemed appropriate as the study conducted an in-depth analysis of the practises of strategic people or practitioners during strategy implementation (Vivek & Nanthagopan, 2021).

2.3 How I Choose Research Approach towards Multi-Method Application

There are two types of research approaches: the inductive approach and the deductive approach. Qualitative research is based on inductively derived theories (Saunders *et al.*, 2004). Research approaches are used to organise research, including the collection of data in ways that are most likely to achieve the research aim, whereas they support organising the research activities to achieve research objectives (Tan, 2002; Easter by Smith *et al.*, 2002). Research approaches can be categorised as qualitative approaches or quantitative approaches. According to Morse (2003), the type

of research approach depends on the purpose of study, type, and availability of the information for the research. In the event of analysing this research problem, a qualitative research approach was used. This study seeks to tell the participant's experiences in their own words, so it is therefore based on narrative. The logic of this research can be challenging if researchers are more familiar with the traditional deductive approach (as most of us are) (Rantala & Hellstrm, 2001). In contrast to quantitative research in which researchers state explicit theories and then collect data to test them empirically, inductive research employs an inductive approach by first collecting data and then trying to extract conclusions from those data (Vivek & Nanthagopan, 2021). Thus, research tends to be exploratory and to see how the university views aspects of their environment. Morse (2003) defines three core principles:

Principle 1: Define the fundamental direction of the research study.

Principle 2: establish a transparent understanding of the supremacy of each initiative.

Principle 3: regard for scientific honesty.

The first theory analyses the significance of the concept of theoretical motion. The theoretical move may be inductive (for discovery) or deductive (for testing). The second theory refers to knowledge of operating inductively or deductively at any given moment and means that the premise of either process is not broken. Morse (2003) describes two styles of multimethod designs that can be used: simultaneous and sequential designs. For this study, I used sequential qualitative and qualitative research methods. Because in this study, qualitative to qualitative indicates a qualitative-driven project followed by a second qualitative project, Hunter and Brewer (2003, p. 578) state that the multimethod approach "is a tool to overcome the limitations and disadvantages of each procedure by deliberately combining different approaches within the same investigations." Mingers (2001) offers a framework for a multimethod modelling methodology to map the processes of research. This multimethod research approach reflects on two main features: its multidimensionality and the different types of actions that need to be conducted throughout the phases of the review.

2.4 Research Design Application

Table 1: Research Design

Multi Method Study		
Design	First Phase	Second Phase
Source	Newspapers And Report Qualitative Phase	In Depth Interview Qualitative Phase 02
Method	Documentation Method	Personal Unsteadied Interview

Source :(Author Compilation)

The research design refers to the overall approach where we want to combine the different components of the analysis consistently and

rationally, ensuring that we effectively answer the research question of what are the factors influencing the strategic execution of Sri Lankan

public universities? "; is a blueprint for data gathering, calculation, and analysis. A research design is the collection of methods and procedures used to capture and interpret the variable variables defined in the problem analysis. To achieve the research goals of this report, I suggested a multimethod analysis methodology (see table) incorporating various study approaches, both quantitative and qualitative, with a predominance of qualitative ones. The present study adopts a sequential design which consist of two qualitative studies (Morse, 2003). The use of several methods increases the robustness of the study as the results can be enhanced through triangulation-cross-validation, achieved when different types of data points converge and are found to be compatible (Ramakrishnan Vivek & Nanthagopan, 2021). Taking the research concerns and context into account, we asked ourselves which methods of analysis would be useful in addressing these questions. These are the methods for the topic that we find appropriate for this study. We decided at the beginning that some of the experimental procedures should be modified according to the results we may have collected from each phase of the analysis. This study intends to explore the factors influencing strategy implementation in public sector universities and identify why these factors are more critical in the Sri Lankan context. Eventually, identified factors for strategic implementation in public sector universities are

confirmed through semi-structured interviews and a review of the literature and existing documents at large via a survey collection among university people. In this stance, this research tends to use multi-methods under the constructionism and interpretivism approaches.

3. Methodology

This study is comparative qualitative research focused on Constructivism and Interpretivism philosophy. The approach used by the author was inductive approach with a methodical choice focus on Multi method Qualitative study, both the multi-method research design includes sequential qualitative studies. This enabled the author to validate the information gathered from the first qualitative study and they validate both previously gathered data with the third qualitative study. The research strategy used by the researcher includes Case study in depth Interview Record keeping which was carried out with a Cross Sectional Time Horizon (Saunders *et al.*, 2006). The sampling method used for this study includes Purposive sampling method which enables the author to personally select the samples based on their credits to enhance the quality and the credibility of this study (Ramakrishnan Vivek & Nanthagopan, 2021). The sample consisted of 7 in-depth Interview and 35 Existing Record Reports. The data gathered was analysed using Thematic Analysis (Braun & Clarke, 2012).

Table 2: Methodology Execution Table

Number	Description	Selection for study
01	Philosophy	Constructivism and Interpretivism
02	Approach	Inductive

03	Methodological Choice	Multi method Qualitative study
04	Type of study Design	Qualitative Plus Qualitative Sequential study
05	Strategy	Case study in depth Interview Record keeping
06	Time Horizon	Cross sectional
07	Data collection and procedure	Purposive sampling method
08	Sampling	7 in-depth Interview and 35 Existing Record Reports
09	Data source File Name	Interview-Transcript Existing Reports: Summary
10	Name of Samples in General	Strategic Directors and Registrars of University and Newspapers and Public sources
11	Data Analysis	Thematic Analysis

Source :(Author Compilation)

It is important to note that this research has followed “Storytelling” as the research presentation this is also called narrative inquiry. In qualitative research, Storytelling is a useful investigative strategy that may be used. Narrative inquiry and storytelling provide us with a new means of knowing, of researching the lived experiences of persons, and of probing the nature of our own subjectivity (Kendall & Kendall, 2012). This paper is entire writes based on actual experiences that I gained during my master's thesis and used narrative storytelling to highlight how to use multi-method qualitative study can be executed. Narrative knowledge is generated and built via the tales of lived experience and sense-making, as well as the meanings that individuals assign to their experiences, and as such, it provides significant insight into the complexity of human lives, cultures, and behaviours, among other things. When we record the rich data included inside tales, we may get insight into things like thoughts and beliefs, as well as visuals and temporal information. It also considers the interaction between an individual's experience and the larger

social and cultural circumstances in which they occur (Kendall & Kendall, 2012).

4. Result and Discussion

4.1 My research process and findings revelation through process Initial thematic model development

Thematic assessment is a tool of assessing qualitative data. It is frequently used to a group of materials, including interviews or transcripts. The researcher attentively studies the data to discover common themes and subjects, concepts and sequences of meaning that crop up again. Thematic analysis is an excellent technique to study if you’re seeking to find out anything about people’s perspectives, opinions, knowledge, experiences or values from a collection of qualitative data. Thematic analysis provides you a lot of freedom in understanding the data, and enables you to approach enormous data sets more readily by categorising them into broad themes (Vivek & Nanthagopan, 2021). However, it also carries the danger of overlooking subtleties in the data. Thematic analysis is typically extremely subjective and depends on the researcher’s perception, so you

have to think carefully on your own choices and interpretations. Thematic learning is derived from the premise that individuals absorb information best when studying in the context of cohesive whole, as they can link what they are learning to the actual world (Alhojailan, 2012). It is one form of integrated instructional approach. The integrated instructional normally contains three categories, namely the linked, thematic or webbed, and integrated type. The linked type incorporates topic areas from a certain field. The webbed or thematic type produces content from a single topic area, or from numerous subject subjects or disciplines. The integrated type incorporates content from many topic subjects or disciplines. Majid and Rochman (2013) defined thematic mode as a form of learning that departs from a focal point of interest in order to comprehend symptoms and ideas from related or peripheral areas. It is also regarded as a method that links numerous disciplines that represent the actual

environment surrounding and within the realm of the student’s abilities and growth. Thematic learning is deemed effective when a phenomenon or investigation of a certain subject becomes the key driver of knowledge. By participating in authentic experiences or studying topics, people are able to learn both the method and the substance of learning (Dixon *et al.*, 1991). Finally, based on the research title, I have selected a multi-method for study. Firstly, I have developed an initial thematic model of factors that are affecting Sri Lankan public sector universities. In this phase, research did a deep review of existing journals to explore what factors are already studied in these areas, and authors developed a model based on existing journals to ensure factors affecting public sector education are studied. The thematic approach of the study is illustrated in following tables.

Table 3: Thematic Factors

Sr. No	Initial Thematic Factors
1	Organizational Culture
2	Politicisation
3	Trade Union Activities
4	Human Resource Capacity
5	Fund and Resources
6	Communication and Language
7	Efficiency in operation

Source :(Author Compilation)

Table 03 highlights initial work that needs to focus on Multi-method research work, particular study previous Literature comprehensively studies and developed an initial thematic model that can highlight how to extend previous studies carried out on specific areas, and that can support

identifying the gap and taking the initiative to further exploration on the particular context. Based on my MBA thesis, my initial development is the thematic model on factors that affect strategy implementation in public sector universities in Sri Lanka based on a Literature review.

Table 4: Expanded Thematic model in phase study 01 in multi-method

Theme Number	Theme
01	Strategic Planning Process
02	Ragging
03	Stakeholders
04	Digital Infrastructure and Digital Resources
05	Quality Assurance
06	Policy Reform

Source :(Author Compilation)

Table 04 illustrates how the initial thematic model can be expanded based on the documentation method, and it reflects the first phase of the qualitative study. And it is supported by a comparison Literature review of the initial thematic model and identifies exclusive themes based on a documentation study that can be expanded. Because of its theoretical independence, thematic process is a powerful adaptable technique that can be tailored to meet the objectives of a wide range of research, resulting in a rich and thorough, but complicated, description of the data collected (Braun & Clarke, 2006; King, 2004). In contrast to other qualitative techniques, which need significant theoretical and technical expertise, theme analysis is a more accessible method of analysis, especially for individuals just starting out in their research career (Braun & Clarke, 2006). Researchers who are inexperienced with qualitative methodologies may find that theme analysis is simple to comprehend and may be learned in a short period of time since there are few instructions and steps to follow (Braun & Clarke, 2006; King, 2004). It has been suggested before by

Braun and Clarke (2006) and King (2004) that theme analysis is an effective tool for assessing the views of diverse study participants, revealing parallels and contrasts, and uncovering previously undiscovered insights. Additionally, thematic analysis is beneficial for summarising the most important aspects of a huge data set since it compels the researcher to adopt a well-structured approach to data processing, which aids in producing a clear and organised final report (King, 2004). Despite the fact that there are several benefits to employing thematic analysis, it is vital to be aware of the drawbacks of this technique as well.

2.4 Researcher Unique template development through this study

Researchers found a unique template that can support checking and reconfirming themes from a different perspective through this study. This template keeps finding exclusive themes from each stage and reconfirmation themes. This study can provide this template for future researchers to use and apply Multi-method analysis in their research.

Table 05: Reconfirmation Table with exclusive themes

Factors affecting on Strategic Implementation	Initial thematic model Based on Literature review	Expanded model development Documentation method	Expanded model development In-depth Interview
Resources and fund	✓	✓	✓
Communication	✓	✓	✓
Efficiency operation	✓	✓	✓
Organizational culture	✓	✓	✓
Strategic Planning Process	✓	✓	✓
Ragging	❖	✓	✓
Stakeholders	❖	✓	✓
Digital Infrastructure	❖	✓	✓
Quality Assurance	❖	✓	✓
Policy Reform	❖	❖	✓
Time management	❖	❖	✓
Project Application	❖	❖	✓
Media	❖	❖	✓
Risk Factors	❖	❖	✓

Availability supporting Reconfirmation and exclusive themes through documentation

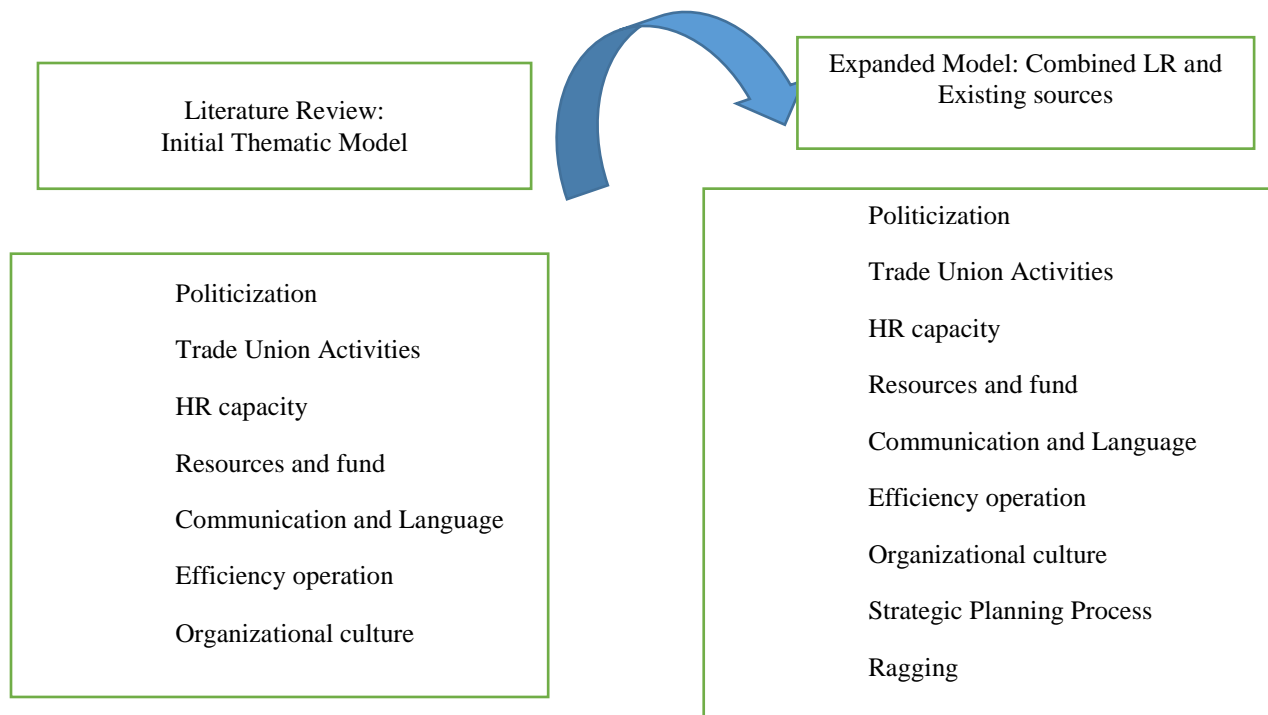


Figure 01: Expanded Thematic Model based on news sources
Source :(Researcher created)

Figure 01 illustrates how the initial thematic model expanded from the initial thematic model to the developed model with the phase 01 qualitative study. It comes under qualitative plus qualitative sequential design.

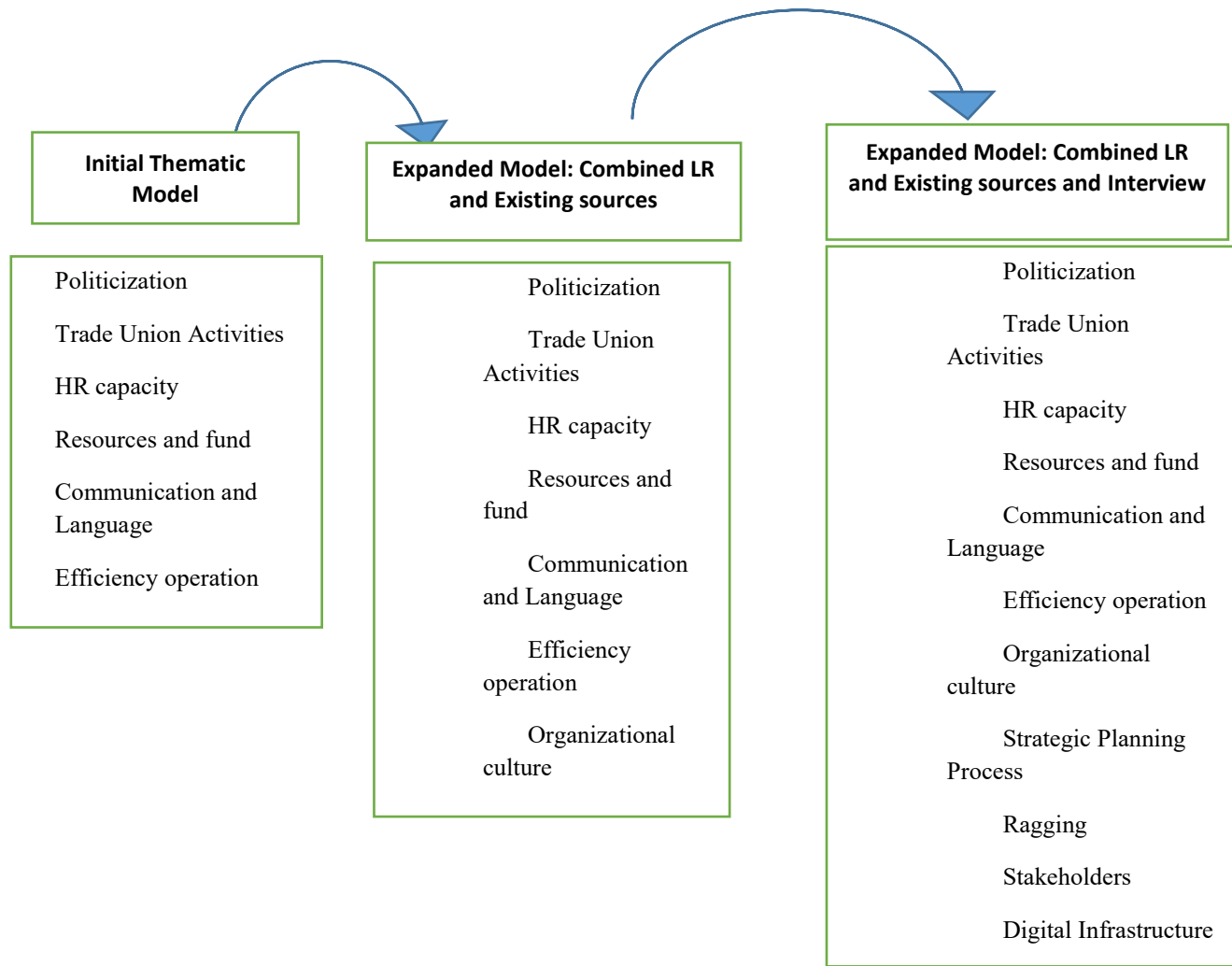


Figure 02: Expanded Thematic Model based on Interview

Source :(Researcher created)

Figure 02 illustrates how the second phase of the qualitative research applied: An in-depth interview that supports the development of the final thematic model by discussion and model, finally expanding the thematic model. The final model provides a compressive picture of the thesis study; my study focuses on factors affecting on strategic implementation of public universities in Sri Lanka. Exclusively this multi-method study can justify the elements in different data sources: Documentation and In-depth Interviews. It overcomes barriers in

the qualitative research and supports triangulation application in this thesis because of its adopted data source triangulation.

5. Conclusion

In conjunction with the advancement and validity of both qualitative and quantitative research, the mixing of the two forms of study is becoming more common. A distinct approach to research, known as the multimethod approach, has recently evolved in a variety of study fields as a means of enhancing both the research process and the research results.

When a succession of initiatives is interconnected within a large subject and meant to answer an overall research challenge, this is referred to as a research programme using many approaches. Among the most significant benefits of multimethod studies are triangulation, which aims to validate findings and analysis by using a multiple data sources and methodologies, as well as a variety of investigators; creativity, which identifies new or paradoxical elements that spur further investigation; and growth, which broadens the focus of the research to include situational aspects of a situation. Qualitative and quantitative methodologies, on the other hand, should not be considered as diametrically opposed since their combination provides both testability and context into study. Collection of various types of data using a variety of techniques from a variety of sources allows for a greater range of coverage, which may result in a more complete image of the unit under investigation than would otherwise have been possible with other approaches. The authors presented a multimethod research framework to achieve the study's research objectives, which included a mix of quantitative and qualitative approaches, with a strong emphasis on qualitative methods. Using several approaches strengthens the resilience of results since findings may be enhanced by triangulation – the cross-validation gained when diverse types and sources of data converge and are shown to be consistent – which is accomplished through the use of numerous procedures. Taking into consideration the study questions as well as the research setting, we questioned ourselves which research methodologies would be most effective in

addressing those issues and why. Research approaches that we feel are suited for this particular research project are listed below. Beginning with the understanding that certain study methodologies could need to alter in response to the findings that we would get in each research phase, we moved on. The QUAL->qual and the QUAL->quan design types, as defined by Morse (2003), are the primary guiding principles of our methodology.

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