

The Complex Nature of Integrating Sustainable Development for Mixed Used Buildings in Nepal

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ABSTRACT- One of the most critical concerns of our generation is sustainability. This study aims to determine the extent to which the construction sector in Nepal considers and applies sustainability concepts in its project management activities to develop a change strategy to improve sustainability practices. To better understand the existing situation, this research was conducted through semi-structured interviews. First, the existing literature on sustainability practices was critically studied to understand the current situation and the participating company's objective to improve sustainability performance in developing countries. The literature review results formed the basis for a series of semi-structured interviews with eight members of middle and senior management representing three different stakeholder groups: clients, contractors, and regulatory agencies. The interviews were conducted to gain a deeper understanding of the reasons behind current practices and barriers to implementing sustainability in Nepalese mixed-use buildings. The interview data were coded and analyzed using the thematic analysis method. The findings of this research show how difficult it is to implement sustainability in buildings of Nepal, and the statistics show that the practices of many organizations are poor in terms of socio-environmental sustainability.

KEYWORDS- Sustainability, Construction, Environment, Project Management, Implementation, Interpretivism, Inductive, Qualitative, Organization, Mixed-Use Building.

I. INTRODUCTION

The call for sustainable development and sustainable construction became louder than ever in the second half of the twentieth century [1] [2]. This theme of sustainable development refers to social, economic and environmental sustainability and has become one of the most critical issues in government policies worldwide. Sustainable development has been crucial since the last decades of the twentieth century as the negative impacts of construction practices on society and the environment have become increasingly evident [3] [4]. Most developing countries, such as Nepal, suffer from unsustainable construction techniques that lead to environmental damage [5]. Struggle for change, lack of initiatives to promote sustainable construction techniques, public awareness and government support, among other

factors, are the major factors are affecting sustainable construction in developing countries like Nepal [6] [7].

A. Statement of problem

The construction sector and the built environment are the world's largest consumers of resources, energy and materials, according to [8] [9] states that buildings, in general, consume more than 35 percent of the world's total energy and an enormous amount of raw materials, 70 percent of global timber [10]. The construction sector is heavily dependent on fossil fuels for energy. Building-related CO₂ emissions reached an all-time high of 10 GtCO₂ in 2019 due to the continued use of fossil fuels for energy production [11]. According to the 2020 Global Status for Building and Construction report, carbon emissions from the building and construction sector have increased to 38% of global carbon emissions.

B. Aims and Objectives

Aim: The aim of this research is to examine the challenges for the implementation of sustainable development in mixed used buildings of Nepal.

Objectives: Based on the following set of objectives, it is presumed that the research aim will be successfully achieved:

- To review and understand the complications of implementing sustainable development for mixed used buildings in developing countries.
- To identify the major challenges of integrating sustainable development in all three aspects (environment, economy and social) for mixed used buildings of Nepal.
- Investigate the barriers associated with sustainable development for mixed used buildings of Nepal.
- To draw conclusions about the challenges/barriers for implementing sustainable development for mixed used buildings in Nepal and develop recommendations to remove those barriers.

II. LITERATURE REVIEW

The available literature relevant to the research is critically reviewed and presented in this chapter. First, the core ideas of the research are defined, such as the definition of sustainability and its three aspects: the need for sustainable construction, the benefits of sustainable buildings and the barriers to sustainable construction. Then there is a discussion of what has been done and what hasn't been done in this field and what other

researchers agree and differ on, and finally, the knowledge gap is examined in depth. According to various authors [12] [13] [14]. Developments that are continuous, reproducible and reusable fulfil the needs of present living beings and do not endanger the fulfilment of needs and requirements of future generations are sustainable developments. Moreover, [15] mention that sustainable development implies the handover of life-sustaining resources to people of future generations in equal amount as we are getting now. This means, living conditions of human beings should keep on enhancing. However, the environmental impact should remain within the ecological limit of the biosphere so that it will not lead to environmental degradation [15] [16]. On the other hand, state that achieving sustainable development is not an easy task, as the three aspects of sustainable development, i.e. Environmental Sustainability, Economic Sustainability and Social sustainability, have to be equally assessed, and deficiency of one aspect means that it will be a threat for whole sustainability.

A. Sustainable building aspects and elements

There are several aspects of sustainable building construction, each with its own set of definitions for its constituent components. These components or elements are mentioned as dimensions in the literature. Sustainability has been defined primarily from an environmental standpoint by authors [17]. This has led to the concept that sustainable building is synonymous with strong environmental practices in construction management in the work of numerous other authors. However, as time has passed, our knowledge of the notion has grown tremendously.

B. Demand of Sustainable Buildings

One of the most obvious characteristics of human evolution and history has been the exponential growth of the global population. In the present scenario, where global energy demand has been increasing at an unprecedented pace there is a need for sustainable buildings that will utilize renewable and recyclable materials, which will ultimately help to reduce energy consumption and waste production. In addition, sustainable buildings will also have proper insulation to prevent heat loss, solar panels to reduce energy consumption, and building materials with a long lifespan. Reducing energy use in buildings is one of the most effective ways to reduce the overall environmental impact by a human. Furthermore, [18] states that buildings are significant contributors to environmental issues, consuming massive quantities of energy and responsible for about 35% of greenhouse gas emissions. [19] states that sustainable building has low operating prices, lower energy costs, low waste and water costs, low maintenance costs, which is the exact need of every nation now.

C. Benefits of Sustainable Buildings

Building practitioners worldwide begin to recognize and appreciate the benefits of implementing sustainable principles in construction projects [20]. As per the statement of [21], we can see that sustainable building overall costs are less than conventional buildings, save energy, use material efficiently, and reduce waste production. Sustainable buildings will positively

contribute to improved quality of life, work efficiency and a healthy work environment.

D. Barriers of Sustainable Buildings

Despite having so many benefits of the sustainable development of buildings, there are many barriers to sustainability. This section illustrates the obstacles associated with the sustainable construction of buildings in developing countries. Implementing sustainable policies in construction industries requires expertise with more knowledge, regulations, incentives and leadership engagement, guidance, instruments, demonstrations and best practices lacking in developing countries [22]. In addition to that [23] also agreed that Sustainable building is generally considered more expensive than a conventional building. Moreover, [24] added that implementing sustainable policies would add various standards and constraints in the design, construction, maintenance, rehabilitation, and demolition of projects. People are giving less priority to sustainable construction.

III. SUSTAINABLE BUILDING CONCEPTS

The concept of sustainability lies at the core of the challenge of environment and development and how governments, businesses, and environmental groups respond. [25] pointed out the inaccuracy of the SDC concept in developed and developing countries. In developed countries, SDC means high-tech office buildings, hospitals, universities, and large commercial buildings that are greened and incorporated with high-tech innovations to reduce energy consumption and carbon emissions. However, for developing countries like Nepal, SDC means using biodegradable materials for environmentally friendly, cost-effective, and durable buildings. According to [26], smart buildings are essential for achieving sustainability. The installation and use of advanced and integrated automation systems such as air conditioning management, lighting control, power control, and metering define smart buildings, which is also known as "intelligent buildings" or "digital buildings" [27] and [28]. According to [29], the driving forces for smart buildings are economics, energy, and technology, including building automation systems in smart buildings, which play a crucial role in determining operational energy efficiency, resulting in energy savings in the structures. Energy savings are done automatically using detecting devices by turning off unused equipment and plug-load devices [30]. The motivation for smart cities in developing countries is political status, commercial profit, international real estate developers and a financial sector in search of new markets. Finally, the human and social dimensions of smartness are overlooked in the context of Nepal, including poverty and the fact that a large proportion of the population lives in residential areas with minimal amenities.

A. Current Debate on SDC in developing Countries

SDC has not been effectively defined and developed in the form of green rating systems in developing countries (particularly in Nepal), according to [31]. The Ministry of Urban Development in Nepal encourages sustainable and green design and construction. The Council for Scientific and Industrial Research (CSIR) produced the Sustainable

Building Assessment Tool (SBAT) with the purpose of incorporating sustainable development into building designs and construction processes, as well as boosting awareness and support for sustainability among stakeholders [32]. SBAT examines and measures the level of a building's sustainability utilizing the three pillars of sustainability: environmental, social, and economic sustainability to promote sustainable development.

IV. RESEARCH METHODOLOGY

Philosophical assumptions, theoretical approach, method and methodologies are the four basic factors in designing a research [33]. Research methodology is a blueprint or plan of action and procedure that guides the course of research to connect the chosen methods to the desired outcomes that adequately answer the research questions [34].

A. Research Philosophy

The success of research depends on the choice of the appropriate philosophy that aligns with the nature of the research subject. Therefore, interpretivism is the chosen philosophy for this research. Interpretivism emphasizes the distinction between human behavior and physical phenomena, and in this context, where the environment of Nepal affects the successful implementation of sustainable construction, this philosophy is the best choice. Therefore, it is important to consider the environment and human engagement in this study. This method examines a variety of people from various backgrounds and environments in order to gain a new and deeper understanding [35]. Interpretivism promotes researcher engagement by enabling the researcher to empathize with the social environment of the study participants, understand their perspective, and then interpret the research material and data in light of the circumstances; this philosophy, among others, is the most appropriate

B. Research Approach

In this research an inductive approach is adopted to understand the barriers and complications in implementing sustainable building development for mixed-use buildings in Nepal. This is because the inductive approach starts with a detailed global observation that leads to more abstract generalizations and ideas [36]. Moreover, in the inductive approach, the researcher starts with a theme and tends to develop empirical generalizations and identify tentative relationships as research progresses. In the initial stages, no hypothesis can be made and the researcher cannot be certain about the nature and character of the findings until the research is complete.

C. Research Method

After learning some fundamental ideas about the necessity of choosing the right research philosophy and approach, it is crucial to match the research objective with the most appropriate research method. A qualitative method is used as this research is about subjective understanding, experiences and opinions. Moreover, this method allows for a detailed exploration of a complex topic [37]. In order to collect qualitative data, a series of interviews will be conducted with professionals in the sustainable construction industry. This is because interview participants are usually more comfortable and willing to

share their experiences and opinions than alternative techniques such as questionnaires. In addition, questionnaires usually have a poor response rate [38]. One of the disadvantages of interviews is that they are time consuming. This needs to be considered by the author throughout the research.

D. Research Strategy: Survey Based Studies Strategy

A survey study is a type of social science research approach in which data is gathered from a sample of elements drawn from a defined population [39]. This method is used to determine the occurrence of certain characteristics of the population. Longitudinal surveys, on the other hand, attempt to construct fresh data from several samples drawn from the same population at various times. The major benefit of surveys is that they produce a vast amount of data. On the other hand, have the drawback of being relatively expensive and time consuming. However, there are other cost reduction strategies that can be used [40]. While surveys may be used to assess events, their capacity to study the background remains still debatable.

Since semi structured interview falls under this strategy, the research strategy adopted for this research is the survey-based strategy.

V. DATA ANALYSIS AND DISCUSSION

The questions for the semi-structured interview were determined based on the literature and the knowledge gaps presented in chapter two. In addition to that, the well-established rating systems such as BREEAM, LEED, EIA and IEE were also studied before the questions were designed. Detailed information on the design and implementation of the semi-structured interview as well as the data analysis and discussion of the findings from interviews are covered and presented in this chapter.

A. Data Collection Method: Semi-Structured Interview

The semi-structured interview was used in this research for as it allowed the researcher to obtain further information from the respondents, such as clarifications or extensions of their answers. In addition, semi-structured interviews often lead to discussions on topics that the researcher had not considered before, but which are important to their knowledge and aid in addressing the questions and objectives of the study. Some of the semi-structured interviews were conducted over the virtual conversation (via Messenger and telephone), and some were conducted face-to-face.

B. Research sample and size

In this research, the participants were chosen based on their experience and occupation using a theoretical or purposive sampling technique for research interviews. Ten members of Nepalese construction organizations were targeted for interviewed. This was based on their knowledge and experience in the Nepalese construction industry. Majority of the respondent population were engineers, architects, site engineers and project managers who has the necessary experience and knowledge to contribute significantly to the interviews. Although the aim was to interview ten people, after eight interviews the researcher decided not to conduct any more interviews due to data saturation. Data saturation was achieved by

repeating the answers from the previous interviews. Each participant was given unique Id for data anonymization.

All eight interviewer’s job role and background are presented in below table.

Table 1: List of participants and their professional background

ID	Job Role	Background
HB1	Architect	Has a lot of experience and is heavily involved in the design and construction of various types of buildings.
MJ1	Senior Civil Engineer	Has vast experience in building design, construction and project management.
BA1	Senior Architect	Wide range of architectural and design experience in a variety of building types.
AJ1	Site Engineer	Experienced in various big hotel building constructions.
JK1	Project Manager	Has good record of completing large-scale, innovative construction projects in time.
SP1	Assistant Project Manager	Has experience in managing different construction projects.
RC1	Civil Engineer	Has a broad understanding and expertise in handling a variety of civil projects.
SK1	Site Manager	Site manager with extensive experience in large-scale civil projects.

C. Data Transcriptions

All eight interviews were recorded and transcribed from audio to text in the first stage of data analysis using Microsoft Word software. The researcher carried out the transcription, which helped him to become familiar with the data. Several proponents of qualitative research, and this is an important step in data analysis. During transcription, notes were collected on the developing themes about the barriers for implementing sustainability in buildings of Nepal, which helped to make sense of the information.

D. Interview Findings

The interviews sought to identify the reasons for current practices as well as the challenges in incorporating sustainability into building construction and design in Nepal, and any other elements that interviewees felt were important to current behavior. A total of eight people were interviewed, including engineers, architects, designers, and representatives of the regulatory authorities. The findings were categorized into 7 themes, which is further divided into sub-themes.

Figure 1 below shows a summary of the findings (themes) on the barriers to integrating sustainability into building construction and development in Nepal.

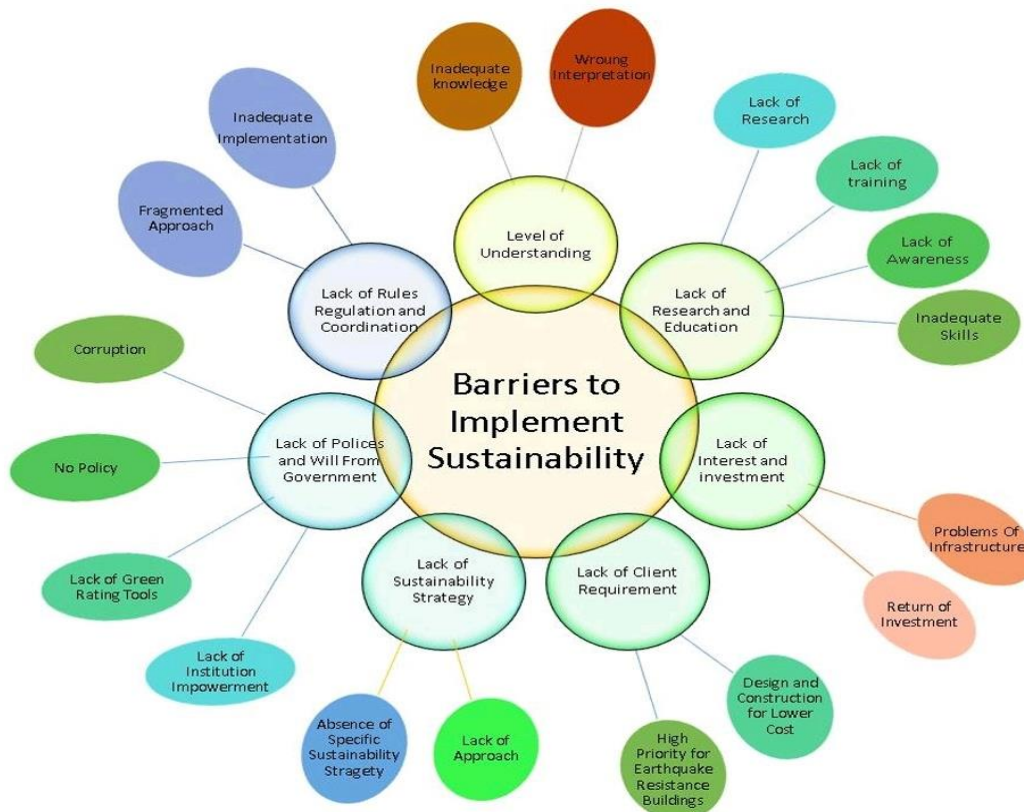


Figure 1: Research Findings

VI. CONCLUSION AND RECCOMENDATION

This research employed a qualitative technique to address the research challenge of adopting sustainability in Nepalese mixed-use buildings. A four-fold objective was defined to achieve the research's central aim.

A. Achievement of Aim and Objectives

After a long research journey, this research has fulfilled the objectives mentioned at the beginning and thus achieved the main aim of this study. Summery on how all fourfold objectives were achieved is discussed in the following section.

B. Achievement of First Objective

“To review and understand the complications of implementing sustainable development for mixed used buildings in developing countries.”

To achieve this objective, this study presents literature on the definition of the terms "sustainability" and "sustainable construction", as well as explanations of sustainable building and how it is used in practice in developing countries. It also presents the different interpretation of sustainable buildings and construction in developed and developing countries. It also identifies the different elements of sustainable building practices. In addition, it also provides the literature on Nepali construction practices to provide an insight into the current controversy and the functioning system of Nepal's construction sector. Furthermore, a variety of concepts, theories, and techniques for transitioning to sustainability in developed and developing countries were given in order to better understand how to improve Nepalese current construction practices.

C. Achievement of Second Objective

“To identify the major challenges of integrating sustainable development in all three aspects (environment, economy and social) for mixed used buildings of Nepal”.

To achieve this objective, semi-structured interviews were conducted with various companies, organizations, and regulators to gain insight into their construction practices. These interviews revealed the companies' sustainability strategy as well as the extent to which economic, social, and environmental sustainability is assessed and implemented in their practices. This supplied data from which existing practices and the sustainability performance of companies could be determined. Only eight interviews were undertaken with various experts from the Nepali construction sector, but assisted in gaining insight into the current scenario regarding the extent to which construction companies consider and incorporate sustainability into their operations.

D. Achievement of Third Objective

“Investigate the barriers associated with sustainable development for mixed used buildings of Nepal”.

To achieve this objective, a semi-structured interview with experienced individuals from construction companies, clients, and regulatory organizations was used to gain information on the reasons for present practices in Nepal. Their perspectives on sustainable construction, as well as their motivation, commitment, and strategy for

sustainable buildings and construction, were revealed in the interviews. Based on this, the aspects that influence the actions and behavior of the construction companies and actors in the industry were identified and analyzed using the Thematic Analysis method. These aspects were cross-checked with the literature and categorized into seven themes that represent the challenges in implementing sustainability in Nepal's construction sector. These themes are based on the relationships between the different elements of the research data and represent the main issues of sustainable construction in the Nepali context.

E. Achievement of Fourth Objective

“To draw conclusions about the challenges/barriers for implementing sustainable development for mixed used buildings in Nepal and develop recommendations to remove those barriers”.

To achieve this objective, a representation of primary research data is provided in order to acquire a better knowledge of the complexity of integrating and implementing sustainable construction in Nepal based solely on the findings of semi-structured interviews. It depicts Nepalese business environment and regulatory system for building operations, as well as the impact of these factors on the adoption of sustainable construction practices. It also evaluates the actions of various aspects of the system, including the government, the construction industry, companies and regulatory agencies, and discusses the complicated issues of sustainability and construction in Nepal.

F. Contribution to existing knowledge

It contributes the existing knowledge in a variety of ways. Firstly, it shows how much sustainability is considered by building companies in Nepal, as well as how it is incorporated into construction methods. Second, it provides a detailed understanding of the complexity of incorporating sustainability into the Nepalese construction industry, as well as the interactions and interconnections of the various aspects of the construction system, as well as their impact on company behavior. This is related to a lack of regulations and institutional empowerment to enforce and execute policies that promote sustainable activities. In addition, issues related to values and perceptions of construction had a significant impact on the engagement of key players. Companies and stakeholders in the sector show apathy towards social and environmental sustainability in project implementation due to lack of enforcement and/or ineffectiveness of sustainability policies and laws, and lack of explicit requirement for sustainable practices by the government which is also the main client. Corruption, insecurity, improper coordination of construction activities, cost-benefit uncertainty, and insufficient training, skills, and financing all contribute to these barriers to implementing sustainability. As a result, there is a widespread lack of enthusiasm for sustainable construction in Nepal.

G. Limitation of this Research

Due to the time constraints of this dissertation, only eight interviews were conducted during the research process. Findings based on a study of the practices of eight employees from eight different organizations may not reflect the entire population of the construction industry. In addition, this study primarily investigated the practices

of large companies, as it is expected that investigating the activities of companies that are not familiar with the concept of sustainable construction will make the study even more complex. This indicates that further studies need to be conducted to investigate other companies, especially local companies, to get a better understanding of the activities of construction companies in Nepal. The activities, commitments and behaviors of companies, as well as of construction industry actors among themselves, are used to infer values. However, as respondents tend to swing between individual and company perspectives in their answers, it was not clear whether the participants' answers to the questions represented the company perspective or were based on an individual perspective. The researcher had to infer the respondents' perspectives from the company perspective, assuming that company policies and procedures determine individual actions within a company.

H. Recommendation for further Research

Based on the findings of this study, the following recommendations can be formulated for government and other industry bodies, practitioners and academics.

I. Recommendation for Government

First, the government should develop a strong strategy and policy on sustainability and sustainable construction and sustainable buildings. Then, the regulatory authorities should pay strict attention to the implementation of these policies, rules and regulations for the development of sustainable buildings in Nepal. Secondly, the Nepalese government should try to motivate builders and stakeholders by providing subsidies for buildings that meet the required sustainability criteria. In addition, the government should also provide green jobs to motivate people to work in the field of sustainability. Finally, the government should take a strong stance on the supply chain issue.

J. Recommendation for industry practitioner

For the industry practitioners first construction companies, organization and the government authorities appointed for the construction should develop the sustainability strategy and follow that strategy strongly. Training, awareness program and workshop must be conducted for the employees' workers and staffs to make

them aware of the need and importance of sustainable buildings and its construction.

K. Recommendation for future researcher

This research is limited to a few large companies and regulatory authorities due to various limitations. Therefore, more research is needed to examine the practices of other companies, particularly local or small companies, in order to acquire a deeper knowledge of the construction industry in Nepal. In addition, this study seeks to understand how sustainability is implemented in terms of social, environmental and economic aspects. Therefore, further research is needed that includes other elements of sustainability.

L. Concluding Remark

The complexity of integrating sustainable development for mixed-use buildings in Nepal was the main focus of this research. This research concluded that the monetary approach dominates the assessment of building projects, clearly avoiding an overarching assessment that considers social factors and environmental factor. It also argued that neither sustainability assessment tools nor the most widely used Sustainability Assessment Models (SAMs) like as BREEAM and LEED have been appropriately adapted to the Nepalese context. Regional variances, resource limits, local architecture, unique environmental circumstances, and other socio-cultural and economic considerations are all taken into account. The main objective of the research was to identify the barriers to implementing sustainability in mixed-use buildings of Nepal. Therefore, the research objectives were crystallized into a four-fold objective, with a qualitative approach used to gain the best possible exploration of these objectives. A critical review of relevant literature was conducted done to provide a solid foundation for a comprehensive understanding of how sustainability practices are understood and implemented in developing countries such as Nepal, which contributed to the discovery of the research gap A semi-structured interview was then conducted to find out more about the problems in integrating sustainability in mixed-use buildings of Nepal, which contributed in finding out barriers in integrating sustainability. Finally, after the final research findings, a conclusion and recommendations were made at the end of this research journey.

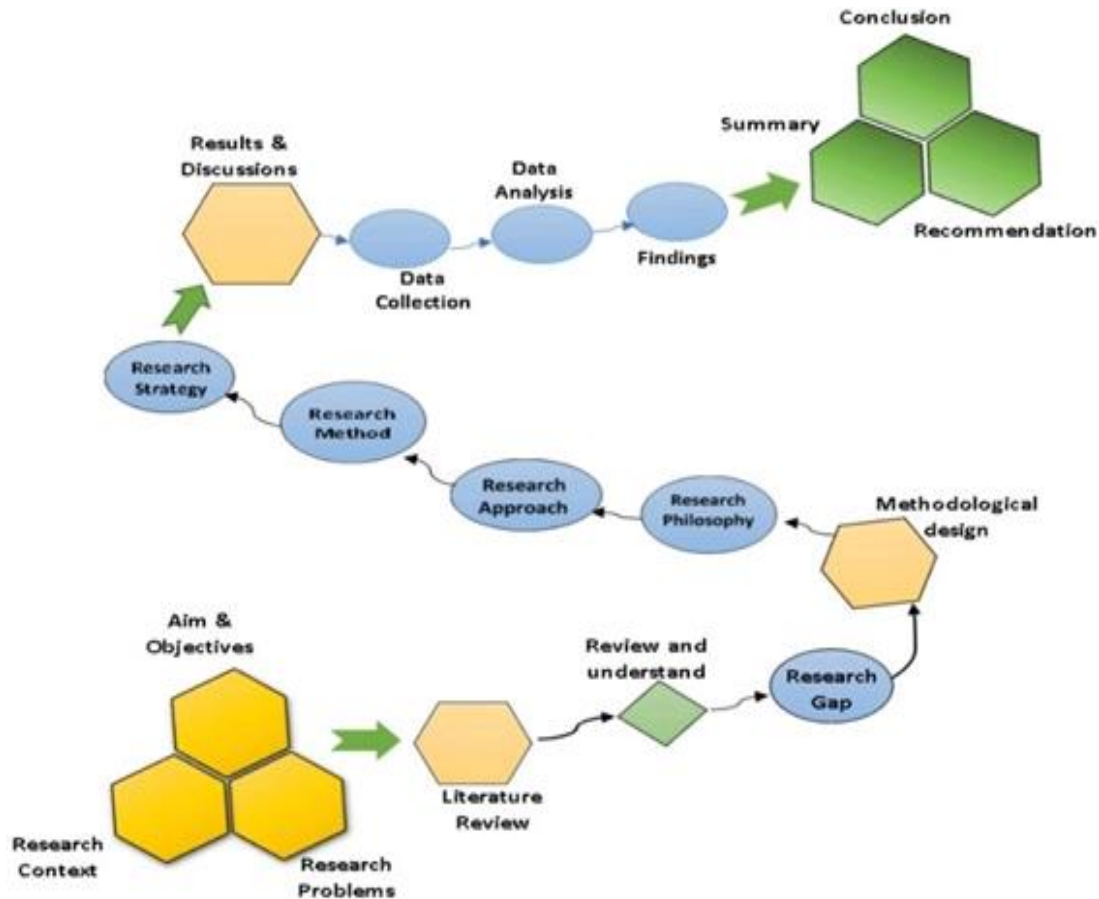


Figure 2: Research Journey

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