KEY PRACTICES FOR EFFECTIVE RIGHT-OF-WAY ACQUISITION MANAGEMENT IN CONSTRUCTION PROJECTS: HIERARCHICAL IMPORTANCE AND INTERRELATIONSHIPS

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A THESIS SUBMITTED TO THE COLLEGE OF CIVIL ENGINEERING AND ARCHITECTURE, ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN CONSTRUCTION ENGINEERING AND MANAGEMENT

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Key Practices for Effective Right-of-Way (ROW) Acquisition Management in Construction Projects: Hierarchical Importance and Interrelationships

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DECLARATION

I, **Sebona Bekena**, hereby declare that this Master's thesis entitled "**Key Practices for Effective Right-of-Way (ROW) Acquisition Management in Construction Projects: Hierarchical Importance and Interrelationships**" is my own work and has not been submitted to any university for similar purpose. The references used in this thesis are duly recognized by proper citations.

Sebona Bekena

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RECOMMENDATION OF ADVISOR

I, **Fikreyesus Demeke (PhD)**, the major advisor of this thesis, hereby certify that I have closely supervised the student, **Sebona Bekena**, during the preparation of this thesis entitled "***Key Practices for Effective Right-of-Way (ROW) Acquisition Management in Construction Projects: Hierarchical Importance and Interrelationships***".

I confirm that the candidate has successfully defended the thesis and has incorporated the comments and suggestions offered by the Board of Examiners during the final defense. Therefore, I recommend the acceptance of this thesis by the department in partial fulfillment of the requirements for the Degree of Master of Science in Construction Engineering and Management.

Fikreyesus Demeke (PhD)

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Major Advisor	Signature	Date

APPROVAL BOARD OF EXAMINERS

We, the undersigned, members of the Board of Examiners, have read and evaluated the thesis entitled "**Key Practices for Effective Right-of-Way (ROW) Acquisition Management in Construction Projects: Hierarchical Importance and Interrelationships**" prepared by **Sebona Bekena.** We have examined the candidate during the open defense and assessed their understanding of the thesis.

This is, therefore, to certify that the thesis is accepted, and we recommend the granting of the Degree of Master of Science in Construction Engineering and Management. Finally, approval and acceptance of the thesis is contingent upon the submission of its final copy to the Office of Postgraduate Studies (OPGS) through the Department Graduate Council (DGC) and School Graduate Committee (SGC).

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LIST OF ACRONYMS

AHP	Analytical Hierarchical Process
CI	Consistency Index
CR	Consistency Ratio
ISM	Interpretive Structural Modelling
MICMAC	Cross-Impact Matrix Multiplication Applied to Classification
RI	Relative Index
ROW	Right of Way

ABSTRACT

Right-of-Way acquisition is a major challenge in Ethiopian road construction projects, especially in the Arsi Zone, where delays caused by compensation disputes, weak stakeholder coordination, and inadequate planning often results cost and time overruns. To identify solutions for these challenges, the study focuses on assessing and ranking key management practices for effective Right-of-Way acquisition by combining the Analytic Hierarchy Process and Interpretive Structural Modeling. Analytic Hierarchy Process was used to prioritize practices based on their perceived importance, while the Interpretive Structural Modeling method assessed their interrelationships. For this study Primary data were collected from 25 experts and practitioners directly involved in road construction, especially in Right-of-Way management, through structured questionnaires. The first Analytic Hierarchy Process results ranked Conduct pre-acquisition public involvement, provide fair, reasonable, and adequate compensation, and Encourage property valuation based on current market values as the top three critical management practices. The Interpretive Structural Modeling analysis showed that creating legally binding policies that require stakeholder coordination, providing training for all levels of Right-of-Way staff, and using modern software systems to manage Right-of-Way activities are highly influential drivers of other practices. When integrating both analyses through quadrant analysis, eight practices fell into the Keep Up the Good Work quadrant, indicating high importance and strong influence. These management practices include early public involvement, fair and timely compensation, transparent valuation, ongoing communication, legal reform, dispute resolution support, staff capacity building, and adoption of digital Right-of-Way management tools. By combining these methodologies, this study provides a comprehensive framework to guide contractors and road authorities in Ethiopia to address Right-of-Way related challenges and improve the success rate of road construction projects

Keywords: Analytic Hierarchy Process, Critical Failure Factors, Infrastructure Projects, Interpretive Structural Modeling, Quadrant Analysis, Right-of-Way.

CHAPTER ONE
INTRODUCTION

1.1. Background of the study

Despite its wide range of importance, Ethiopia's road infrastructure remains underdeveloped. According to the Africa Infrastructure Development Index (AfDB, 2016), Ethiopia is ranked among the lowest in Africa and also among sub-Saharan Africa. Recognizing this Ethiopia has made significant progress in road construction. This result can be clearly seen in the recent increase in rural accessibility index (RAI) in which increased from 13% in 1997 to 64% in 2018 (Nakamura et al., 2019). Road coverage, which was 39% in 2009/10, had also increased to 76% by 2014/15 (Ministry of Finance, 2014). This increase in coverage has also led to the growth of related utility networks in both scale and complexity. However, the overall performance of road projects over the last 21 years reached only 73% of the planned targets (Lebeza, 2021a). This highlights critical performance issues that hinder road construction projects.

One of the major challenges in Ethiopian road construction is the acquisition of Right-of-Way (ROW). Conflicts involving ROW acquisition are a critical factor delaying road construction projects, leading to project delay and failures. This was also stated in the Second Growth and Transformation Plan (GTP-II) (Ministry of Finance, 2014). ROW means the legal right to access land for public projects, especially for road projects, often requiring land acquisition and compensation for property owners (Jeong et al., 2016a). However, ROW acquisition in Ethiopia faces multiple challenges, including conflicts regarding public and private property ownership, difficult topography and environmental terrain, livelihood displacement, and a lack of clear policies and regulations for ROW implementation (Tesfaye, 2019). The acquisition is further complicated by coordination issues, fragmented state and local laws, conflicting public policies, public involvement, environmental concerns, agency staffing, appraiser qualifications, and mediation (Abdelaty et al., 2023). These factors significantly affect the cost and duration of ROW acquisition, often causing delays and cost increases for road construction projects.

Right-of-Way (ROW) acquisition, one of the first pre-construction activities in road construction projects, is critical to ensuring the timely and efficient execution of road construction projects. Delays in this initial process can lead to significant challenges, including

cost and time overruns and conflicts among stakeholders (Sohn et al., 2014). Despite utilizing different management practices aimed at solving such challenges, ROW acquisition continues to be a complex challenge, hindered by legal, social, and administrative constraints (Chung et al., 2022). In Ethiopia, the existing challenges in ROW acquisition practices present risks to the broader framework, affecting the successful delivery of road construction projects. These challenges not only delay the construction of roads but also hinder the nation's ability to develop. Furthermore, the lack of clear processes increases the impact of these challenges, highlighting the need for solution to enhance ROW acquisition efficiency and support the country's development goals (Kidane, 2021a).

In Ethiopia, there have been limited studies done on the impact of management practices on Right-of-Way (ROW) acquisition for road construction. This is due to the limited focus given to identifying key practices that contribute to effective ROW acquisition. Additionally, many studies do not focus on examining the interrelationships between these practices, which indirectly affect their overall efficiency. Most of the existing research tends to focus on the impact of ROW acquisition on construction performance, rather than on the specific practices that ensure its success. Given the significant challenges Ethiopia faces in the performance of its road construction projects, it is crucial to address these issues by studying the key practices that influence the effectiveness of ROW acquisition and their interconnections. This research aims to fill this gap by providing a comprehensive analysis of the practices that enhance ROW acquisition efficiency in Ethiopia.

1.2. Statement of the problem

A project, especially a construction project, is considered successful when it achieves its objectives of mainly time, budget, and quality. However, road construction projects, particularly in Ethiopia fail to achieve this often due to major challenges related to the Right-of-Way (ROW) acquisition. ROW conflicts often arise due to lack of transparency, insufficient public engagement, inadequate property management, financial constraints, political pressures, frequent plan revisions, and insufficient provisions for housing.

In Ethiopia, delays in road construction projects are widespread, with ROW conflicts being one of the primary causes. These conflicts lead to time and cost overruns, affecting the overall performance of the construction industry (Islam & Trigunarsyah, 2017). Unresolved ROW issues, such as delayed site clearance and inadequate compensation, exacerbate project delays

and result in adverse socioeconomic effects, including displacement and loss of livelihoods (Lebeza, 2021b). These challenges highlight the need for a comprehensive solution to enhance ROW acquisition and support Ethiopia's infrastructure development (Kidane, 2021a).

Although various best practices have been implemented to address the challenges of ROW acquisition, many of these are only effective in specific contexts and fail to accurately predict the time required for ROW acquisition in the early planning phases (Waters, 2000). Existing studies in Ethiopia, such as those by (ALEMIE, 2019; Kidane, 2021b, 2021a; Lebeza, 2021a; Tesfaye, 2019), have largely focused on identifying the causes of ROW conflicts. However, limited research has been conducted on effective management practices for ROW acquisition in the Ethiopian context. Moreover, the available studies primarily assess the relative importance of practices on project success without considering the interrelationships between these practices (Chen et al., 2012; Liu et al., 2016).

Since ROW acquisition management practices are not independent, prioritizing them solely based on relative importance is insufficient. Less critical practices may significantly influence more important practices, while highly influential practices may not directly contribute to project success. Therefore, a comprehensive approach is required to identify, analyze, and hierarchically structure ROW acquisition practices, considering both their relative importance to project success and their influence on one another.

This study aims to address these gaps by focusing on Right of Way (ROW) acquisition practices in selected road construction projects located in Arsi Zone. The study seeks to provide structural clarity by establishing a hierarchical framework that prioritizes ROW acquisition management practices based on both their relative importance and influence. By integrating these methods, the study aims to support more effective resource allocation and contribute to improved efficiency and successful delivery of road construction projects in Ethiopia.

1.3. Objective of the study

1.3.1. General objective of the study

The general objective of the study is to investigate the importance and interrelationships among key practices for managing ROW acquisition effectively in construction projects and their combined impact on enhancing acquisition outcomes.

1.3.2. Specific objective of the study

- Establish a hierarchical framework for management practices affecting ROW acquisition using the Analytic Hierarchy Process (AHP).
- Analyze the interrelationships and influences of ROW acquisition management practices using interpretive structural modeling and MICMAC analysis.
- Create a comprehensive framework that highlights the importance and interdependency of management practices for ROW acquisition

1.4. Research questions

1. What are the most critical management practices affecting Right-of-Way (ROW) acquisition as determined using the Analytic Hierarchy Process (AHP)?
2. What are the interrelationships and influences among ROW acquisition management practices based on Interpretive Structural Modeling (ISM) and MICMAC analysis?
3. How can a comprehensive framework be developed to demonstrate the relative importance and interdependency of management practices for effective ROW acquisition?

1.5. Scope of the study

This research is focused on the Arsi zone to investigate the management of Right of Way (ROW) acquisition in 5 on going road construction projects. This research aims to evaluate the efficiency of the current ROW acquisition process and the impact of the process on the time and cost of the construction projects. In this research, the critical ROW acquisition management practices are identified and used to develop a hierarchical structure. This structure considers both the significance of the ROW acquisition management practice and how the practices are interrelated. This research aims to help increase the efficiency of the ROW acquisition process and ensure the success and timely completion of road construction projects in Ethiopia.

1.6. Limitation of the study

This research has two important limitations in dealing with the objectives effectively. First, achieving the research objectives depends upon the availability and quality of data regarding the road construction projects in Arsi Zone, specifically in relation to the acquisition of the right of way, but the comprehensive list regarding all the projects in Arsi Zone was not available; therefore, in this case, the data has to be collected from various parties. Second, many of the targeted parties in this research were quite engaged in their daily work and, therefore unable to complete the questionnaires fully. Moreover, the study does not include any practices regarding the other matters associated with the road development projects.

1.7. Significance of the study

This research is expected to offer key insights and increase awareness regarding the management practices needed to ensure the efficiency enhancement of Right-of-Way (ROW) acquisition process in road construction. This research will help by concentrating on essential practice identification, analysis, and prioritization. This research can prove to be highly helpful to the government and other policymakers regarding decision-making. This research will help by contributing to the design of effective management strategies regarding ROW and will be able to support the development of infrastructure by the government of Ethiopia.

Specifically, the study provides a framework for understanding the interrelationships among the ROW acquisition practices beside just importance, whereby the study can help the stakeholders to implement a successful delivery of projects as per the required timelines as well as costs. Moreover, the study fills a gap since there are no comprehensive studies regarding the importance of hierarchical interconnections among the ROW acquisition practices, whereby this study illustrates that interconnections have paramount importance within ROW acquisition practices that can be implemented for improving efficiency of projects as well as reducing potential setbacks for projects. In addition, this study acts as a base for future studies on infrastructure development projects within Ethiopia.

1.8. Research Organization

The proposed research is structured into five main chapters, as follows: Introduction, Literature Review, Methodology, Results and Discussion, & Conclusion and Recommendations.

Chapter One: This chapter presents an overview of the study, including the research background and the statement of the problem. It also outlines the study objectives, significance, research questions, scope, and potential limitations.

Chapter Two: Literature Review: This chapter presents a comprehensive review of existing literature on Right-of-Way conflict management.

Chapter Three: Methodology: The methodology chapter describes research design, target population, sampling methods, and data collection instruments such as surveys, interviews, and document analysis.

Chapter Four: Results and Discussion: This chapter presents the findings from the research, including an analysis of the key causes of ROW conflicts, their effects on project performance, and the effectiveness of current management practices.

Chapter Five: Conclusion and Recommendations: This chapter summarizes the main findings of the study and presents recommendations for improving Right of Way (ROW) acquisition and conflict management

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This literature review focuses on road construction project success, with an emphasis on factors influencing delays and cost overruns. It begins with an introduction to the construction industry, the general concept of road projects, project success, and the critical success factors. The review also explores key definitions and concepts related to road construction.

2.2. General Overview of the Construction Industry

2.2.1. The Construction industry

The construction industry dates back to ancient times when people began to create their shelters, such as huts, from the natural resources available to them (Shewangzaw, 2022). The sector has changed dramatically since those days, particularly in modernized economies, but the fundamentals remain the same. Construction is still humans employing natural resources to construct items that are useful to them, such as private shelter, roadways, or public buildings. Construction is as old as history as humankind has been constructing structures for centuries. Construction is a broad term that refers to the art and science of creating items, systems, and organizations. It can be expressed by two levels of definition which vary from one extreme to the other extreme (Dang & Sui Pheng, 2015)

The first extreme as it was given by (Gruneberg, 1997) defined Construction as an economic activity that encompasses the entire construction process, from the production of raw and manufactured building materials and components to the provision of professional services such as design and project management to the physical execution of the work on site. Construction, in this view, is an economic activity that spans all three economic sectors: the primary sector, which includes the extraction of natural resources; the secondary sector, which includes the manufacture of building materials and components, as well as the transformation of these materials into finished buildings; and the tertiary sector, which includes project management, design, and structural engineering.

Construction, on the other extreme, is viewed as an economic activity that focuses solely on the final stage of the construction process, which is the physical work performed on the production site. All services such as project management, planning, and design, as well as offsite manufacturing and supply of building materials, are excluded from this perspective of construction (Pheng & Hou, 2019). This classification includes project management for construction, architectural and engineering activities, and the manufacture of building materials industries other than of the construction industries. So according to this classification, construction is regarded as an economic activity involving the creation of new work, renovation, repair, or extension of buildings, structures, and other heavy constructions such as roads, bridges, and dams.

Generally, Construction can be defined as the erecting, maintaining, and repairing of buildings and other stationary structures, as well as the construction of roadways and service facilities that form fundamental components of structures and are required for their usage. Construction, in its broadest sense, includes processes involved in constructing buildings, infrastructure, and industrial facilities, as well as related operations, from conception to completion.

When we come to Ethiopia's case, according to (MoUDC, 2012) The construction industry is a business that converts diverse resources into the physical, economic, and social infrastructure that is required for socioeconomic growth. It encompasses the process of planning, designing, procuring, constructing or producing, altering, repairing, maintaining, and deconstructing the physical infrastructure in question. It includes:

- Buildings
- Transportation systems and facilities which are airports, harbors, highways, subways, bridges, railroads, transit systems, pipelines, and transmission and power lines.
- Structures for fluid containment, control, and distribution such as water treatment and distribution, sewage collection, and treatment distribution systems, sedimentation lagoons, dams, and irrigation and canal systems. Underground structures, such as tunnels and mines.

The minister further clarifies the stakeholder and participants of the industry. According to (MoUDC, 2012) Companies, enterprises, and people acting as consultants, primary contractors and subcontractors, material and component makers, plant and equipment suppliers, builders, and merchants are among the organizations and individuals involved in the sector.

2.2.2. Role of the construction industry to the economy

The construction industry is crucial to the socio-economic success of any country. the industry's operations are critical to achieving national socio-economic development goals such as infrastructure, refuge, and employment (Oladinrin et al., 2012). In both developing and developed countries, construction plays an important role in economic progress. For developing countries Construction activities and their outputs are a crucial aspect of the national economy and industrial expansion during the development process (Anaman & Osei-Amponsah, 2007). It is frequently seen as a stimulant for economic development, particularly in underdeveloped nations. Construction has a noticeable impact on a country's production; it creates jobs and incomes for people, therefore the effects of changes in the construction sector on the economy may be seen at all levels and in almost every element of life (Rameezdeen, 2007). This indicates that construction is inextricably linked to a wide range of economic activities (Lean, 2001) and that whatever happens to the sector will have an impact on other businesses and, eventually, on a country's wealth.

Various empirical studies on the construction sector in developed countries have largely emphasized the building industry's involvement in economic growth over the years (Rameezdeen, 2007). And small number of studies in developing countries such as Sri Lanka, Ghana Singapore, Barbados and Cape Verde have looked into the direction of the causal relationship between the construction industry and economic growth (Lopes et al., 2011). The empirical evidence on the causal relationship between economic growth and construction investment in developing economies shows that economic prosperity leads to a rise in construction (Rotimi & Rameezdeen, 2013) and that the construction industry has an impact on economic growth due to its close ties to other industries.

Construction accounts for 50% of all industries in Ethiopia, according to the National Bank of Ethiopia (NBE). Furthermore, the business is quickly increasing. The construction industry rose by 37% in 2013/14 alone. Ethiopia's entire production was made up of 15% industrial activity and Construction contributed to 7.5 percent of Ethiopia's overall GDP during this time period eto guide. According to these statistics, this amounts to 9.4 percent of total output at current prices, according to African Economic Outlook. The construction business would be worth roughly $6 billion as a result of this. And with its constant growth in the 2015/16 fiscal year, it contributed approximately 15.9% of the country’s gross domestic product (GDP) value

according to (African Development Bank Group et al., 2017). So, the construction sector has significantly contributed to the national economy of Ethiopia.

The construction industry by its nature has many special problems and requirements for a discussion of the key features of the industry. And According to (MoUDC, 2012), the construction industry has witnessed significant changes in recent years as a result of better technology, greater competition, rising consumer expectations and demands, and limited economic resources. As a result, the sector needs better, knowledgeable, and effective managing abilities to handle challenges arising from these dynamic developments. The importance of taking measures to improve the performance of the construction industry has now been recognized in several countries at various levels of socio-economic development (Ofori, 2002). Considering the significance of the construction sector, it is necessary to identify the major issues affecting the efficiency of the sector and take corrective action for an increase in economic growth and development.

2.3. Construction project success

The definition of project success varies depending on the unique conditions of the project, making it difficult to set a single universally accepted standard definition. The definition of project success has evolved throughout the year, and its early definitions include definitions from scholars like Tuman (1986) and De Wit (1988), who defined project success as the ability to finish a project within the given set of objectives, such as time, quality, and resource. De Wit further states that, besides the three major criteria, stakeholder satisfaction is a key component for project success. In the 1990s, Sanvido et al. (1992) expanded the scope by adding criteria like quality, cost, safety, and participant satisfaction, stating that each project participant may have distinct expectations that define success.

(Nguyen & Ogunlana, 2004) later expanded list of criteria to consider a project successful by including indicators relevant to construction projects, including functionality, contractor profitability, and the absence of disputes. More recent definitions, one by (Kumaraswamy et al., 2017) state that success is context-dependent that varies with stakeholder and by project type and phase. So, achieving a consistent definition of success requires the establishment of widely accepted performance benchmarks that reflect the perspectives of all stakeholders.

Another way of simplifying its definition is to break down the definition into two core components. According to Baccarini (1999), project success comprises two components, product success and project management success. Product success refers to the effectiveness of the result in meeting goals, satisfying user needs, and fulfilling stakeholder expectations, particularly in terms of functionality and benefits to end users. This focuses on the outcome and long-term impact of the project. On the other hand, project management success (or process success) deals with the success of the project execution, specifically whether it was achieved under time, cost, and quality constraints. It also includes the overall quality process and the satisfaction of stakeholders. While both components are interrelated, differences between them allow for a clearer analysis of what accounts for successful project and provides a more comprehensive understanding of performance in the construction industry.

2.4. Road Construction Project

Road construction has a significant impact on population dynamics, urban form, economic conditions, and the environment (Güneralp & Seto, 2008). These projects have served as catalysts for economic development by increasing the transportation of goods between regions, thus attracting substantial investment (Masuku, 2023). Besides economic benefits, roads are also believed to improve the quality of life for communities located near such infrastructure by enhancing access to social services, creating economic opportunities, and enhancing overall welfare. Furthermore, roads stimulate increased personal and business communication among residents (Doan & Oduro, 2012). However, road infrastructure can also lead to change in land use pattern, especially in urban areas which often subdivide urban areas into unconnected zones with limited interconnectivity, undermining social cohesion (Khanani et al., 2021).

In Sub-Saharan Africa, where road transport remains the dominant mode of transportation for nearly 75% of freight and passenger (Beuran et al., 2015), the need for accessibility and reach for road infrastructure is particularly critical. Approximately half of the region's location remains unconnected, and the major road network remains under construction, indicating that road development will continue to be a top priority for the government in these areas, especially in urban and peri-urban settings, with implications for both socio-economic advancement (Gachassin et al., 2010; Cobbinah et al., 2015). Improved road access has been positively correlated with higher agricultural incomes due to enhanced market access, better price realization, and reduced travel time. Research by (Gibson & Rozelle, 2002) shows that for each additional hour to the nearest transport facility, farmers face a 7% price decline for their crops.

Similarly, (Khandker et al., 2009) found that road construction contributes to higher agricultural productivity, wage increases, and improved prices. According to (Minten & Barrett, 2008) decreasing the transportation cost can nearly double household incomes in remote areas, by increasing non-farm earnings.

Even though road construction has many impacts, it can has positive and negative impacts depending on the context. Rural areas in developing nations often lack basic infrastructure, which hinders economic and social aspects of the societies (Mihai & Iatu, 2020). Most rural roads in these regions are unpaved, limiting mobility and network connectivity (Burrow et al., 2016). In Colombia, for example, rural roads account for 69% of the total network, but only 6% are paved, restricting tangible regional development (Paz, 2017). Besides just construction, proper planning and design of rural roads are thus essential to achieving technical, budgetary, and scheduling success.

According to (Markos, 2022), The significance of road development is clearly stated by the Ethiopian Roads Authority's 2021 report, which highlights the finalization of 159,218.4 km of major road works over the past 23 years. This includes 45,794 km of Federal Roads, 33,618 km of Regional Roads, and 79,806.9 km of URRAP Roads. Overall the performance reached 65.2% of the plan, with total spending amounting to ETB 414.7 billion about 80% of the budget. Specifically, the Federal Roads component saw 4,105.2 km of trunk road restoration, 12,171 km of trunk and link road upgrades, 11,091 km of new link road construction, and 185.4 km of expressway construction, in addition to 18,241 km of other heavy works.

Despite the target for the projects are partially achieved, the construction projects, particularly in urban areas were present with a unique challenge. Maintaining vehicle flow has become a critical issue for road construction in such areas due to high population densities and complex infrastructural interlinkage. Road construction in urban areas is more complex than in rural areas due to issues of land ownership, unplanned urban expansion, and dense utility lines involving electric poles, water pipelines, and other services. These complexities are further exacerbated by the need to relocate existing infrastructure, which leads to additional time and costs (International Road Federation, 2010).

Road construction in urban areas requires careful coordination with vehicle movement to maintain flow during construction. According to Karani (2007), road projects are linear and recurrent efforts and the growing number of complex projects in urban areas, often characterized by aging infrastructure, limited right-of-way (ROW), and increasing populations,

increased the need for integrated project management approaches. According to Council (2011) the successful execution of such projects requires thorough consideration of urban movement particularly in space-constrained areas where land acquisition is costly, and resettlement is difficult. Effective project scope and cost management are essential to ensure that only the necessary work is included and that projects are delivered within budget and on time.

In summary, while road infrastructure development plays a larger role in economic growth, social inclusion, and reginal connectivity, it also introduces considerable challenges especially in urban areas. The successful implementation of such projects demands planning, technical design, and management of scope, cost, and stakeholder coordination to mitigate negative effects and maximize societal benefits.

2.5. Right-of-Ways Acquisition and Its Impact on Road Project Success

Acquiring a right-of-way (ROW) is the initial step in any country's road construction project. The term ROW acquisition describes the lawful purchase of land required for road construction projects which may include both private and public (owned by the government) properties (Kidane, 2021). As an initial step it is critical because construction cannot begin until the land required for the project is secured. Most of the time this requires negotiations with landowners or, if necessary, legal process to acquire the land when agreements cannot be reached. ROW acquisition has an effect that is not bounded by economic consideration as it also involves social and environmental issues, as it frequently leads to the displacement of residents, businesses, and institutions which make it even more complex for developing countries like Ethiopia. The successful execution of ROW acquisition impacts the overall success of road construction projects, and any delays in acquiring the land can result in delays and increased costs during the construction phase (ALEMIE, 2019).

According to Alemie, 2019; Kidane, 2021 the ROW acquisition process generally follows a structured steps in order to ensure all legal, technical, and social processes are addressed. First is planning, which includes conducting environmental assessments, studies, and public introduction and announcement. Environmental assessments are conducted to assess the impacts of the project, such as the displacement of people or businesses, the potential harm to community services, and any effects on wildlife. While conducting this the involvement of the Public crucial as it provides affected communities with an opportunity to learn about the project, voice their concerns, and participate in discussions that may shape the outcome of the project. After completing the planning phase, the process moves into the negotiation phase,

where the agency or project authorities make offers to property owners for the land acquisition. With the agreement being reached through a process of negotiation, during which compensation offers are made based on the value of the property appraised. If the negotiations fail, the process can progress to condemnation, where legal proceedings are initiated to acquire the land through the government's power of eminent domain, which is often necessary to ensure that public road projects can move forward (Berger et al., 2023).

Following negotiations, Relocation is the next stage after negotiations and is especially crucial when public infrastructure projects necessitate the relocation of people, companies or communities. The relocation process involves several stages, including planning, notification and the physical relocation of affected individuals. Under various international frameworks, displaced residents are entitled to receive written notification of their eligibility for relocation and to be provided with assistance in finding new homes. Additionally, the body responsible for ROW acquisition must ensure that the relocation is done with minimal disruption of the affected individuals. In some cases, compensation might include the provision of alternative land or property, in addition to financial payment. A key component of the ROW acquisition process is property valuation, which determines the fair market value of the land or property being acquired. Appraisals are usually conducted by qualified evaluators, and the compensation amount offered to the landowner is based on the appraised value. While monetary compensation is the most common form of payment, in some cases, landowners can choose alternative forms of compensation, such as land or property, as part of the exchange process (Kidane, 2021b).

For road construction project ROW acquisition is critical as delays in such processes are major causes for time and cost overrun which are common challenges faced by such projects. Delays in ROW acquisition are caused by disputes with landowners, delays in valuation, elongated relocation processes, and long negotiation time. These delays can affect the construction project by preventing contractors from gaining access to land where the road is going to be constructed. Additionally, these delays often lead to increased project costs due to additional compensation claims, legal proceedings, and overhead. These delays have a significant impact as they can lead to a negative public perception of the project, damage the reputation of the contractors involved, and result in financial losses for the stakeholders. This impact shows that ROW acquisition processes must be managed properly to address potential to avoid failure of such projects (Essop, 2021).

Generally, ROW acquisition is an everyday challenge in Ethiopia's road construction projects, especially in rapidly developing urban areas. While processes for ROW acquisition exists, there are repeated delays due to limited resources and poor coordination between government agencies. Since land in urban areas is limited and highly contested, the fast urbanization and expanding infrastructure requirements are complicating the ROW acquisition process. Moreover, it is difficult for local governments to oversee planning and road construction projects to guarantee landowners receive just compensation while also making sure that the project moves forward without delays. As Ethiopia continues to grow improving the ROW acquisition process will be crucial to ensuring that transportation projects are delivered on time and within budget. Addressing these challenges is required to make sure the road construction projects are completed successfully, which requires governmental agencies to perform highly in a transparent way while also fostering better communications (David, 2016).

2.6. Challenges in Right-of-Way Acquisition

The challenges associated with Right-of-Way (ROW) acquisition have become increasingly recognized in recent times. According to (Jeong et al., 2016b), Costs in ROW acquisition process are affected by the market value of the land, the damage caused to properties, legal fees, and the delay costs. These costs usually occur in urban areas since demand for land is high. In such environments where demands are high, it is obvious that the acquisition process tends to be more complex. ROW acquisition in urban counties often involves more legal cases and high development of the land. Such cases will cause delays in road projects; such disputes can delay the transfer of property, subsequently delaying the start of the project.

Kamanga and Steyn (2013) conducted a study to identify factors contributing to delays in road construction projects in Malawi initially listed 72 factors causing delays. The top 4 factors included fuel shortages, insufficient contractor cash flow, delays in payment, and a lack of adequate technical personnel. From this study, one of the critical factors contributing to delays in road construction projects was the delay in paying compensation to landowners for ROW acquisition. Similarly, other studies conducted in different contexts delayed compensation is the major cause for delay. One of such cases is (Tibebu, 2020), who conducted a study within the Addis Ababa Roads Authority projects and identified ROW-related challenges as a significant cause of road construction delays. Besides the obvious factors, the study also identified design-related issues, integration with utility providers, and delays in payment as among the top 5 causes of time delays in road construction projects.

Shambel G. and D. Patel (2018) also explored the factors influencing time and cost overruns in road construction projects in Addis Ababa. His finding shows that delays in land acquisition, along with construction delays and incomplete designs, were the top 3 factors affecting both time and cost overruns. Similarly, Semira (2021) identified that delays in compensating landowners were primarily client-related factors affecting road construction projects, while also stating that delays in relocating utilities were also critical from external-related factors. Based on the above studies, these factors were identified as factors with high impact on the timely completion of projects and often also affecting costs, as cost overruns can also result in higher material costs and labor costs. Another research conducted on the impact of ROW acquisition on road construction projects is Getachew Taye (2019). The study assessed the influence of land acquisition on cost overruns. The study identified land acquisition-related issues as one of the top ten causes of cost overruns in road construction projects. These studies show that ROW acquisition is a critical factor affecting the success of road construction projects, and its impact on road construction projects is high, especially in Ethiopia. The effects of delays in ROW acquisition, whether due to legal issues, compensation delays, or utility relocation, cause major risks to the overall success of road construction projects. Addressing these challenges through better planning, compensation paying mechanisms, and increased coordination could reduce delays and cost overruns, leading to the success of the road construction projects.

(Kidane, 2021b) also conducted a study focused on projects under Addis Ababa Roads Authority and identified major causes of delays in road construction projects. The finding shows that with ROW related issue being one of the most significant contributor for delays in Addis Ababa road projects. The study also showed beside the ROW-related factors other factors included improper design, lack of coordination with utility providers, delayed payments for completed work, shortages of materials and equipment, and delays in site delivery. (Zewdie, 2020) Further studied the contributors to time and cost overruns in Addis Ababa's Road construction projects, identifying land acquisition delays, design changes, insufficient material and equipment supply by contractors, and incomplete designs as the top 10 factors affecting time and cost overruns in these projects. Furthermore, (Shemekt, 2021) identified land acquisition as one of the top ten causes of cost overruns in construction projects, highlighting its significant role in project delays and budget increases. Wonderwesen (2019) pointed out that ROW conflicts in the Addis Ababa City Road Authority were often caused by property owners' reluctance to vacate their land, coupled with their high expectations.

Overall, these studies shows the role of ROW acquisition in road construction project delays,. Delays in provision compensating and the slow pace of utility relocation all lead to project delay and overrun costs. Moreover, the legal and financial issues in acquiring land, especially in urban areas, can increase the delay. Solving these issues through better planning, improved communication, and enhanced legal processes could help minimize the delay caused by ROW acquisition and improve the overall efficiency and success of road construction projects.

2.7. Key Practice for Effective Row Acquisition in Different Country Contexts

Right-of-Way (ROW) acquisition remains critical for the successful completion of road construction projects. But the challenges faced during ROW acquisition vary considerably between developed and developing countries. Furthermore, such challenges also vary between different regions within the same country.

First, considering the developed countries context, considering road construction project in the United States, ROW acquisition challenges are typically associated with procedural, legal, and financial issues. According to the study conducted by (Abdelaty et al., 2023) which was conducted on the impact of eminent domain law amendments in Minnesota, revealed that legislative changes led to a significant increase in land acquisition costs and legal disputes. The study also identified barriers linked to the appraisal process, legal frameworks, and stakeholder disagreements. Furthermore, he provides recommendations for improvements such as the use of mediators in dispute resolution, transparency through public information sharing, and legislative adjustments to cap attorney and appraisal fees. Similarly, (Sohn et al., 2014) Conducted a study on ROW acquisition but majorly focusing on road construction projects in Texas, identifying factors influencing ROW acquisition include dedicated funding, political influence, residential relocation needs, and availability of housing. These studies shows that in contexts of developed countries with established legal and institutional frameworks, the focus lies on transparency, legal efficiency, and financial accountability.

In contras considering the developing country context, the issues are more different than this. The challenges identified were more focused systemic and institutional limitations of the ROW process. According to (Alemie, 2019), which was a research conducted in Ethiopia, especially focused on the capital Addis Ababa, identified ROW acquisition is affected by public involvement, the presence of qualified staff and appraisers, and project schedules. Similarly (Kidane, 2021b), focusing on rural Ethiopia, conducted his research and identified 4 practices

essential for effective ROW acquisition across Ethiopian road construction projects. These factors include enough budget allocation, effective communication, not selecting areas with high public utility, and effective supervision and control. These findings suggest that ROW acquisition in developed countries focus on working on existing practices, whereas in developing countries, particularly in rural areas, the challenges are more foundational, requiring systemic reforms. Even within the Ethiopian context, ROW acquisition practices and barriers differ between urban and rural areas. In Addis Ababa, better access to skilled personnel and more formalized landholding are critical, while in rural areas, informal land tenure, institutional fragmentation, and limited technical capacity pose significant challenges.

Generally, management practices affecting ROW acquisition are not uniform and vary between different countries with different economic conditions While developed countries may focus on improving procedural and financial-related issues, developing countries must prioritize foundational capacity building and institutional-related issues.

2.8. Key Practice for Effective Row Acquisition in Ethiopia

Studies conducted in Ethiopia have identified key management practices that contribute to the successful completion of Right-of-Way (ROW) acquisition. (Alemie, 2019) Conducted a study on road construction projects in Addis Ababa using a Likert scale. Based on the study, the result shows that urban road construction projects are highly affected by early-stage public involvement, the presence of qualified and experienced staff, particularly for property appraisal, and a well-defined project schedule. According to the study, these 3 management practices were highly linked with the success of securing the ROW and completing projects on time.

(Abajebal et al., 2022) also conducted a study on road construction projects in Jimma Zone of Ethiopia, focused on factors affecting the successful acquisition of Right-of-Way (ROW). The findings of the study show that basing property valuation on current market values, ensuring compensation payments are reasonable, fair, and adequate, avoiding delays in compensation disbursement, providing training to all ROW staff, and maintaining good communication and relationships with all stakeholders during the planning, design, and scheduling phases were the top 5 most important management practices. These practices were found to increase the successful acquisition of ROW. Similarly (Dagne, 2022) conducted a study on road projects in Addis Ababa. According to his result Right-of-Way (ROW) acquisition is highly influenced by several practices including active participation of the public, enhancing the institutional capacity, and minimizing challenges related to relocation or resettlement.

2.9. Literature Summary and Gap

Right of Way (ROW) acquisition ranks among the most important aspects in the early stages of road construction projects and greatly influences their success. This refers to the legal procedure by which the government acquires land with the intention of constructing roads and other infrastructure. The success or failure of a road construction project usually depends on the success of the ROW acquisition process in respect to timeliness and cost-effectiveness. Challenges in Ethiopia associated with the ROW acquisition process include lack of clarity in the ownership of the land, the time it takes to pay compensation to the owners, and coordination among the relevant government agencies (Yimam, 2020; ERA, 2022).

Several studies have highlighted best practices in ROW acquisition that help minimize delays and conflicts. In Ethiopia, recommended practices include early identification and registration of affected people, timely and fair compensation, public consultations, and the establishment of clear legal frameworks (Wondimu & Jibat, 2021). Comparative studies from Kenya, Ghana, and other African countries also show that the adoption of integrated land information systems, decentralized decision-making, and stakeholder participation are key to success (Onyango et al., 2018; Asiedu & Danso, 2019). Similarly, international experiences from countries like Malaysia, India, and the Philippines indicate that the use of digital land records, transparent land valuation, and community engagement lead to smoother acquisition processes and project efficiency (Abidin & Razak, 2017; Patel & Shah, 2020; Alvarado, 2019). These studies demonstrate that legal clarity, early engagement, and transparency are the most consistent practices in successful ROW acquisition.

Despite the abundance of studies on ROW acquisition practices in different countries, there is still limited literature that focuses on how these practices can be adapted and applied in the Ethiopian context. The country has its own unique administrative, legal, and cultural settings, which influence the effectiveness of ROW acquisition strategies. Most of the existing studies have focused on general project delays without giving enough attention to ROW-specific issues. In addition, the interaction between key ROW practices and critical project success criteria like time and cost has not been adequately explored. Therefore, this study aims to fill this gap by focusing on identifying and analyzing the key ROW acquisition practices that influence the success of road construction projects in Ethiopia, while also comparing them with international best practices to draw relevant lessons. Three key gaps are identified in literature:

- Current studies focus on the importance of individual practices but do not sufficiently examine their interrelationships, which is essential for effective project management.
- There is a lack of focused research on ROW acquisition management in Ethiopia, particularly for road projects located in Arsi zone, limiting understanding of context specific challenges.
- There is a gap in using application of multi criteria analysis methods in evaluating ROW acquisition management practices, restricting comprehensive and structured assessment in the Ethiopian context.

Table 2. 1 Collected factors from literature review

Group	Factor	(Abdelaty et al., 2023)	(Sohn et al., 2014)	Dagne (2022)	Kidane (2021b)	Alemie (2019)
Public Involvement and Stakeholder Communication	Conduct pre-acquisition public involvement	✓	✓		✓	✓
	Communicate with all parties during planning, design, and scheduling	✓	✓	✓		
	Provide a thorough understanding of the projects for society	✓	✓	✓		
	Disclose public information to promote transparency and trust		✓		✓	✓
Dispute Resolution and Legal Support	Use mediators to help settle disputes efficiently	✓		✓	✓	
	Solve disputes promptly with the assistance of team members		✓			✓
	Create legally binding policies requiring stakeholder coordination			✓	✓	✓
	Propose new legislation to support ROW processes		✓	✓		✓

Compensation and Relocation	Provide reasonable, fair, and adequate compensation	✓	✓	✓		
	Avoid unnecessary delays in compensation payments		✓		✓	✓
	Encourage property valuation based on current market values			✓	✓	✓
	Provide for all basic needs of displaced families in their new location	✓	✓		✓	
	Establish incentive programs for early settlement	✓	✓	✓		
Staffing and Resources	Provide training for all levels of ROW staff		✓	✓		✓
	Ensure responsiveness of local title companies		✓	✓		
	Confirm availability of appraisal and acquisition personnel	✓	✓	✓	✓	
	Ensure adequate funding for outsourcing staff assistance	✓		✓	✓	
	Schedule road projects in alignment with ROW activities		✓	✓	✓	

Project Scheduling and Management	Implement realistic acquisition schedules to avoid delays		✓		✓	✓
	Relocate utilities along the ROW promptly	✓		✓		✓
	Identify and address problem areas, deficiencies, and deviations	✓				✓
Technology and Tools	Use modern software systems to manage ROW activities	✓	✓	✓		
	Improve and monitor the current appraiser system		✓	✓		

CHAPTER THREE

METHODOLOGY

3.1. Introduction

The role of methodology is to carry out research work scientifically and validly. This chapter includes the method used in this thesis work and provides information about the research approach, target population, sample size, research method, questionnaire design, questionnaire content, and tests the consistency of the questionnaire during data analysis.

3.2. Study Area

The study was conducted on road construction projects in Arsi Zone. Arsi zone is one of the largest zones located in the Oromia regional state in Ethiopia. Arsi Zone is an important area due to its location along major national transportation corridors and as a major agricultural producing area. In recent years, the zone has experienced significant growth in road construction projects, which are connecting the woredas and cities within the zone, and also roads that connect the zones to other zones and regions. This phenomenon has increased the demand for effective project management practices, particularly those related to Right of Way (ROW) acquisition. This study focuses on selected road construction projects within the zone to examine key ROW acquisition management practices, analyze their interrelationships, and assess their influence on project efficiency and performance.

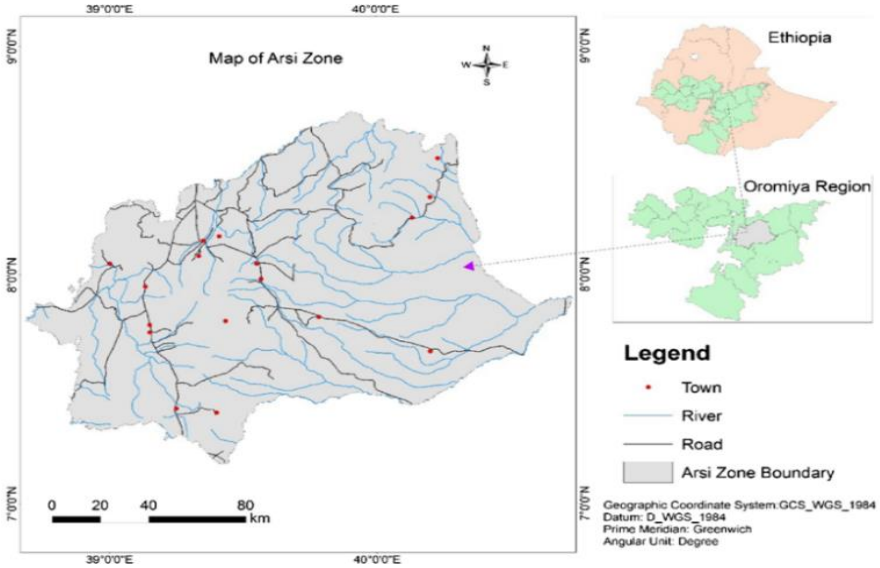

Figure 3. 1 Map of Arsi Zone

3.3. Study Design

This study adopted a mixed approach that includes both qualitative and quantitative research approaches under the descriptive study framework. The main focus on the research is the utilization of expert judgment for a better understanding of the management of Right of Way (ROW) acquisition in road construction projects. The primary objective of the study is to create a hierarchical framework for the effective prioritization and management of ROW acquisition practices. The study combines the Analytic Hierarchy Process (AHP) and the Interpretive Structural Modeling (ISM) analysis method into a single framework format to achieve this objective. The AHP analysis method is applied for determining the relative importance of the various ROW acquisition management practices by assigning quantitative weight in terms of expert judgments. Simultaneously, the ISM analysis method is also applied for evaluating the relationship of the various ROW acquisition management practices and determining how they impact each other within the ROW acquisition system. The findings of these methods will then need to be combined by using the Quadrant Analysis method, which enables these acquisition practices to be assessed in terms of their relative significance and their influencing values.

For the current study both primary and secondary data were utilized. The Primary data were collected through structured AHP and ISM-focused questionnaires designed for AHP and ISM analyses, in which experts pare wise comparon value identify directional relationships between management practices. Secondary data were gathered from relevant literature, Books, and project reports mostly found on the web to support the identification of the management practices. The analyses were conducted using Expert Choice, the latest version of software for AHP, and Exmpro ISM software for interpretive structural modeling. The overall research process is illustrated in Figure 3.2. The figure includes the steps for the research, starting from the literature review and pilot study to AHP and ISM analyses, and finally the Quadrant Analysis. This integrated approach provides a comprehensive understanding of ROW acquisition practices and their interactions, supporting improved management of road construction projects.

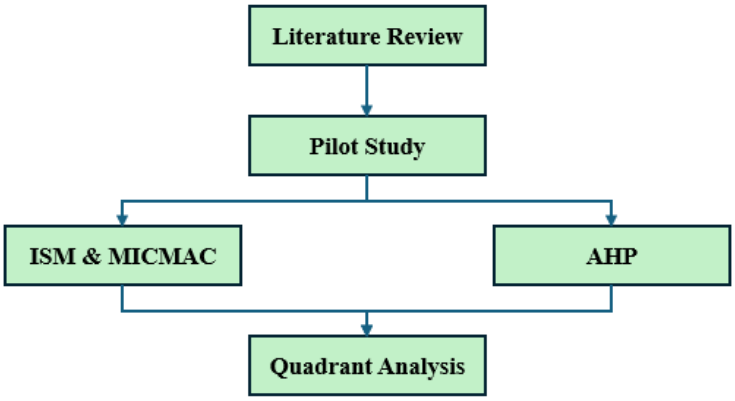

Figure 3. 2 Research design

3.4. Population and Sampling Technique

3.4.1. Target Population

The population of this study is selected road construction projects in Arsi Zone of Ethiopia, including two projects under the Ethiopian Road Authority (ERA) and three projects under the Oromia Roads and Logistics Office (ORLO). Under these projects, key stakeholders linked with road construction projects and especially ROW acquisition participants included project managers, site and office engineers, local government officials, environmental specialists, and other stakeholders directly involved in Right of Way (ROW) acquisition and management. These participants were selected as targets because of their practical experience, which would help provide valuable insights and challenges regarding ROW acquisition across the selected projects.

3.4.2. Sampling Technique

This study utilized purposive sampling, which is a non-probability sampling technique, to select participants who were most relevant to the objectives of the research. Purposive sampling is recommended for studies that rely on expert judgment and specialized knowledge. Particularly such methods are recommended when an in-depth understanding of complex concepts is required (Creswell & Plano Clark, 2023). The sampling focused on individuals directly involved in Right of Way (ROW) acquisition and road construction projects in Arsi Zone of Ethiopia.

To increase the reliability of the study, only professionals with more than five years of experience in ROW acquisition or road project implementation were included in the study. This is supported by Saaty (2008), who emphasizes that participants with substantial professional experience are better positioned to provide consistent and credible judgments in expert-based

decision-making methods, such as AHP. This criterion helped enhance the quality and validity of the data used in the analysis.

3.5. Source of Data

As stated in the project design section this study use of both primary and secondary data sources. Primary data were collected from key stakeholders involved in road construction projects in Arsi Zone, including project managers, engineers, local government officials, and other stakeholders directly engaged in Right of Way (ROW) acquisition. These participants provided first-hand insights into the key practices that influenced the success of ROW acquisition. Secondary data were obtained from relevant literature, including books, journal articles, government reports, and other credible sources. These sources provided a broader understanding of key practices and contexts affecting the success of ROW acquisition in road construction projects and will help to contextualize and support the analysis of the primary data. The combined use of primary and secondary data strengthened the study's findings and improved the robustness of the conclusions.

3.6. Method of Data Collection

3.6.1. Pilot Study

Before conducting full scale survey, small scale pilot study was conducted on selected 3 construction professionals with more than 15 years of experience roads construction project. Before conducting the pilot study detailed literature review was conducted to identify the key Right of Way (ROW) acquisition management practices in road construction projects. The findings from this review were used to develop a draft questionnaire intended to capture critical ROW acquisition management practices. To ensure the relevance and applicability of the questionnaire to road construction projects in Arsi Zone of Ethiopia, the draft questionnaire was reviewed by three experts. These experts have broad experience in the practical acquisition and implementation of ROW projects. Their comments are utilized to refine and upgrade the questionnaire to ensure it captures the appropriate management practices of ROW acquisition in the context.

3.6.2. Questionnaires

Questionnaires were used as the primary data collection instrument for this study due to their ease in gathering information from a diverse group of respondents and capturing expert

judgments in a structured manner. The questionnaires for all respondent were administered in person to professionals involved in the selected five road construction projects in Arsi Zone. The respondents included project managers, site engineers, construction supervisors, and other relevant professionals directly engaged in Right of Way (ROW) acquisition activities. The use of in-person distribution helped ensure a high response rate and allowed clarification of any questions when necessary. It helped ensure the data collected reflected the perspectives of individuals with direct experience, enhancing the relevance and reliability of the study findings.

3.7. Method of Data Analysis

For this study, four types of data analysis techniques were used. The first one is AHP, which is a multi-criteria decision-making method that was used to rank the success factors based on their importance. The second one was ISM, which is also a multi-criteria decision-making method that ranks and structures the critical success factors based on their influence. The third one was spearman's correlation, which was done to know the level of relation between the prioritization based on importance and influence. At last, by combining the two, the data collected was processed and gives a structure that ranks these factors based on their importance and influence which was conducted using quadrant analysis.

3.7.1. Analytic Hierarchy Process

The construction complexity is rapidly growing, and making the best decisions becomes an increasingly demanding task for the stakeholders involved. AHP replaces intuition with a transparent, quantitative procedure that integrates expert judgment with formal synthesis. It models the problem as a hierarchy with the goal at the top, criteria and any sub-criteria in the middle, and alternatives at the bottom, then elicits pairwise comparisons to capture relative preferences on a ratio scale, which is appropriate when qualitative and quantitative evidence must be combined (Saaty and Vargas, 2012).

Priority weights are derived from each reciprocal comparison matrix using the principal right eigenvector, yielding local priorities for criteria and alternatives that are then aggregated through the hierarchy to obtain global rankings. Logical coherence is checked using the consistency index and consistency ratio. If the ratio exceeds accepted thresholds for matrices of similar size, judgments are revisited to reduce contradictions and improve reliability. This combination of hierarchical structuring, ratio-scale priorities, and consistency diagnostics

provides an auditable basis for selecting alternatives in terms of cost, time, quality, safety, sustainability, and risk (Brunelli, 2015).

In this study AHP is implemented through a disciplined workflow: define the decision goal and scope, construct the hierarchy of criteria, sub-criteria, and alternatives, design the pairwise instrument and scale, elicit judgments, build and verify matrices, compute priorities and consistency measures, synthesize global priorities, and conduct sensitivity analysis to test ranking stability under plausible changes in inputs. The outcome is a defensible, reproducible ranking that documents trade-offs and supports a well-founded recommendation for stakeholders (Saaty and Vargas, 2012; Brunelli, 2015).

3.7.1.1. Steps in AHP

The AHP allows for the problem to be decomposed into a hierarchy of subproblems that may be more easily understood and subjectively evaluated. The subjective evaluations are transformed into numerical values, then used to rate each alternative on a numerical scale. The step for this method is given as follows (Bhushan & Rai, 2014).

Step 1: Break down the problem into a hierarchy that links the goal to criteria, sub-criteria, and alternatives. Structure the decision as a hierarchy where each element at one level is related to elements on the level below it. This parent child relationship propagates to the lowest level so every element is indirectly connected to the goal as shown in figure 3.2.

Step 2: Obtain expert or decision maker judgments through pairwise comparisons on a qualitative 1 to 9 scale recorded in a prepared form. Classify each comparison as equal, moderately stronger, strongly stronger, very strongly stronger, or extremely stronger with respect to the parent criterion. Use a layout like your Table 3.1.

Table 3. 1 Scale of preference in AHP

Intensity of Importance	Definition	Explanation
1	Equally	Two factors contribute equally to the objective
3	Moderately	Experience and judgment slightly favor one factor over the other
5	Strictly	Experience and judgment strongly favor one activity over the other
7	Very strictly	Experience and judgment very strongly favor one over the other
9	Extremely	The evidence favoring one over another is of the highest possible order of affirmation

Step 3: Construct square reciprocal pairwise comparison matrices for each set of peer elements under a parent node. Set all diagonal entries to 1. If entry (i, j) is greater than 1 then element i is preferred to element j. Enforce reciprocity so entry (j, i) equals 1 divided by entry (i, j).

Step 4: Derive local priority weights from each matrix. Compute the principal eigenvalue and the associated normalized right eigenvector, whose elements are the weights for criteria or sub-criteria and the ratings for alternatives. An equivalent computational route is the average of normalized columns method.

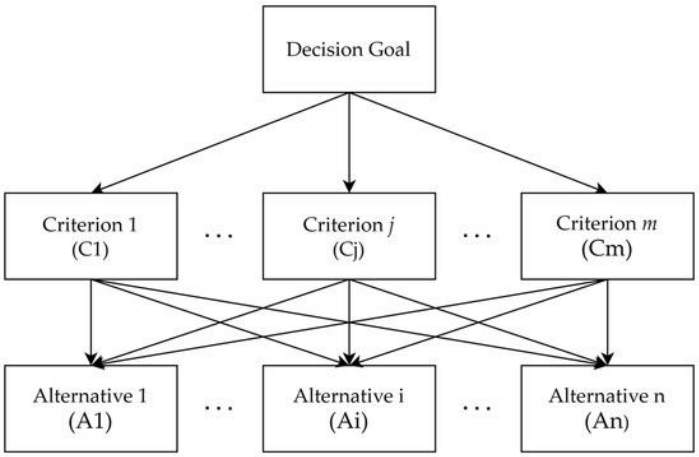

Figure 3. 3 Typical hierarchy structure of AHP

Step 5: Assess logical consistency of judgments. Compute the consistency index and the consistency ratio

$$CI = \frac{\lambda_{max} - n}{n-1} \quad \text{and} \quad CR = CI/RI, \ldots\ldots\ldots\ldots\ldots\ldots \text{Equation 3.1}$$

where λ_{max} is the maximum eigenvalue of the n by n matrix and RI is the random index for order n. If CR is greater than an accepted threshold, typically 0.10, revisit and refine the pairwise inputs.

Step 6: Repeat Steps 2 through 5 for all levels of the hierarchy. Apply the same elicitation, weighting, and consistency checks to criteria, sub-criteria, and the alternative comparisons under each sub-criterion.

Step 7: Synthesize priorities from lower to higher levels to obtain global scores. Multiply alternative ratings by sub-criterion weights to form local scores per criterion, then weight and sum these by the criterion weights to produce one global priority per alternative. Rank alternatives by their global priorities.

Step 8: Conduct sensitivity analysis and report. Test how plausible changes in key judgments or weights affect the ranking. Document matrices, weights, consistency diagnostics, global scores, rank order, and any breakpoints where the preferred alternative could change.

3.7.2. Interpretive Structural Modeling

Interpretive Structural Modeling is an interactive learning methodology that structures a set of directly and indirectly related elements into a comprehensive, systematic model that combines words with graphics to portray the structure of a complex issue. Originating with Warfield's work, ISM was conceived as a communication and reasoning aid that can display many relations, allow continuous questioning and modification, remain congruent with expert perception, and be learnable by multidisciplinary audiences. In practice it uses concepts from graph theory, typically directed graphs, to represent elements as nodes and contextual relations as directed links, which turns an unorganized list of factors into an explicit representation of system structure that is accessible to both technical and non-technical stakeholders. These features make ISM suitable when the pattern of relations, not the isolated factors, determines the behavior of the system under study. (Warfield, 1973)

Operationally, ISM begins by identifying variables relevant to the problem and selecting a contextual subordinate relation, for example "influences," "leads to," or "is prerequisite for." Experts then perform pairwise assessments to populate a Structural Self Interaction Matrix, SSIM. The SSIM is converted to a binary reachability matrix, transitivity is enforced so that

indirect reach is respected, and iterative level partitioning yields a hierarchical digraph in which upstream drivers appear at higher levels and dependent outcomes appear at lower levels. The process is interpretive, because relationships reflect expert judgment, structural, because a global ordering is extracted from many local relations, and modeling oriented, because the final product is a digraph that encodes both the specific links and the overall hierarchy (Gao and Yang, 2013; Liu et al., 2015). This systematic procedure supports collective understanding of how factors interact, which is usually more informative than considering factors in isolation.

Following ISM, MICMAC analysis is commonly applied to classify the factors by their driving power and dependence power. By mapping each critical success factor into driver dependent space, MICMAC groups them into clusters such as autonomous, dependent, linkage, and independent drivers (Mandal and Deshmukh, 1994). This post processing clarifies which factors are leverage points, which are sensitive linkages, and which are outcomes, thereby guiding prioritization, sequencing, and management attention. Used together, ISM supplies the hierarchical structure of interrelations, while MICMAC supplies the influence dependence taxonomy, which together provide a robust basis for understanding, communicating, and managing complex systems (Gao and Yang, 2013; Liu et al., 2015).

3.7.2.1. Steps in ISM

Based on the pairwise relationships among the factors, ISM offers a systematic approach for deriving an objective hierarchical structure through mathematical deduction. The overall ISM development process follows the steps outlined by (Liu et al., 2015; Song et al., 2017).

Step 1: Structural Self Interaction Matrix, SSIM

Use expert judgment, for example through brainstorming or nominal group technique, to define a contextual relation among the variables, typically “leads to” or “influences.” For each pair of factors i and j, record the direction using four symbols: V means i influences j, A means j influences i, X means mutual influence, O means no relation. Discuss the draft SSIM with the expert group and finalize it by consensus.

Step 2: Reachability Matrix

Convert the SSIM to an initial binary matrix using these rules. If SSIM has V at position i, j then set reachability i, j to 1 and j, i to 0. If SSIM has A at i, j then set i, j to 0 and j, i to 1. If SSIM has X at i, j then set both i, j and j, i to 1. If SSIM has O at i, j then set both i, j and j, i to

0. Embed transitivity by inserting 1* where an indirect path implies reach, then remove the star notation to obtain the final reachability matrix.

Step 3: Level Partitioning

From the final reachability matrix, compute for each factor its reachability set, elements it can impact plus itself, and its antecedent set, elements that can impact it plus itself. The intersection of these sets identifies factors whose reachability equals their intersection. Those factors form the top level. Remove top level factors and repeat to find the next levels until all factors are assigned. These levels provide the basis for the hierarchical ordering.

Step 4: Conical Matrix and Driving or Dependence Power

Reorder the final reachability matrix by clustering factors level by level to form the conical matrix. For each factor, sum the ones in its row to obtain driving power and sum the ones in its column to obtain dependence power. Rank factors by these sums to highlight dominant drivers and highly dependent elements.

Step 5: Digraph Construction

Using the conical matrix, draw a preliminary directed graph with nodes as factors and edges as validated relations, including transitive links. Remove indirect links to produce the final digraph. Place top level factors at the top, then subsequent levels in order down to the bottom level. The digraph is the visual representation of elements and their interdependence.

Step 6: ISM Model Formation

Convert the digraph into the ISM model by replacing nodes with full factor statements and retaining the directed relations. The resulting hierarchical model expresses the collective understanding of how factors influence one another and provides an explicit structure for analysis and communication.

3.7.3. Quadrant Analysis

Quadrant analysis defines four quadrants of management actions resulting from a 2×2 combination of influence and importance mean ratings obtained from respondents. These quadrants are a priority for improvement (low influence, high importance), keep up the good work (high influence, high importance), possible overkill (high influence, low importance), and low priority (low influence, low importance) (Wibowo & Alfen, 2014). Since quadrant analysis is data-centered, the positioning of the vertical and horizontal axis is based on the grand mean of importance and influence (Bacon, 2003; Taplin, 2012). This method was applied

for the current study to combine prioritizations based on influence and importance and identify factors that are both important and influential.

3.8. Data Validity and Reliability

The accuracy and consistency of the survey are essential components of the research methodology, commonly referred to as data validity and reliability**.** In this study, validity was ensured through expert review: specialists familiar with the subject matter examined the questionnaire to assess its content quality, and their feedback was used to refine and improve the instrument. Reliability was ensured by evaluating the consistency of responses. For the AHP component, reliability was assessed using the Consistency Ratio (CR), a standard measure within the AHP framework. The CR was computed using the established AHP procedure, where λmax represents the maximum eigenvalue and n is the size of the comparison matrix. The Random Index (RI) values required for the CR calculation were taken from Saaty's standard table (Table 3.2).

Similarly, for the ISM analysis, data consistency was examined using the Consistency Index (CI) integrated into the ISM software. These measures ensured that the collected data were both valid and reliable before proceeding with further analysis.

Table 3. 2 Random consistency index value

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.4	1.45	1.49	1.52	1.54	1.56	1.58	1.59

After the computation of the Consistency ratio, it is compared with the standard ratio, which is 0.1 and if is less or equal to it, the study will continue and if not, rechecking is required (Rajesh, 2020; Yin et al., 2011) and the overall result for the current study was 0.06 which was satisfactory. On the other hand, for ISM analysis, the data collected must be at least 70% consistent (Alawamleh & Popplewell, 2011).

3.9. Ethical Considerations

Maintaining ethical integrity is crucial during scientific research, and this study fully complied with established ethical principles to ensure validity. All previous documents used during research were properly referenced to give credits to previous contributors. Before carrying out any data gathering, the study subjects were clearly informed of the reasons why there is a study,

their participation, and that it is voluntary. They were free to withdraw any time without any penalty before giving their consent to carry out the research.

Confidentiality and anonymity were completely guaranteed throughout the research. This is because the questionnaire did not require the respondents to write their names, signs their name, or any other form of identifiers. This enabled the respondents to appear anonymous. Handling the data is completely secured and utilized only and only for research purposes. The cover page of the questionnaire stated the objective of the research and the way the data will be completely protected. This indicates that the research guaranteed the accuracy of the results.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. Introduction

This chapter discusses the result and interpretation of the analysis. This chapter mainly has four components. The first part includes the demographic distribution of the respondent based on education level, place in the organization, and experiences. The second part covers the result and interpretation of the AHP analysis, and the third part discusses the output of the ISM analysis. The last one of all covers the interpretation based on the combination or integration of AHP and ISM analysis.

4.2. Respondent Profile

The questionnaire survey was conducted in a single stage to collect data from professionals involved in the selected road construction projects. The questionnaire was distributed accordingly to the identified respondents. A total of 32 questionnaires were distributed to the target population. Of these, 2 questionnaires were not returned, resulting in 30 completed responses. Among the returned questionnaires, 4 responses were excluded because the respondents had less than five years of professional experience, and 1 questionnaire was incomplete. Consequently, 25 questionnaires were considered valid and used for the final analysis with 78.1% successful response rate. The distribution of questionnaires by respondent category is presented in Table 4.1.

Table 4. 1 Respondent Distribution

Respondent Category	Total Questionnaires	Successfully Returned	Not Responded	< 5-year experience	Incomplete
Construction Engineer	7	5	1	1	0
Project Manager	3	3	0	0	0
Office Engineer	6	4	1	1	0
Site Engineer	6	4	0	1	1
ROW/Land Acquisition Specialist	6	5	0	1	0
Regional and Zonal Land Administration Expert	4	4	0	0	0
Total	**32**	**25**	**2**	**4**	**1**
Percentage (%)	**100%**	**78.1%**	**6.3%**	**12.5**	**3.1%**

Most of the respondents who participated in the survey hold a bachelor's degree, while a smaller proportion possess a master's degree. Out of the 25 respondents who returned the questionnaires, 4 respondents, representing 17 percent, are master's degree holders, whereas the remaining 83 percent hold bachelor's degrees. The distribution of respondents by educational background is illustrated in Figure 4.1.

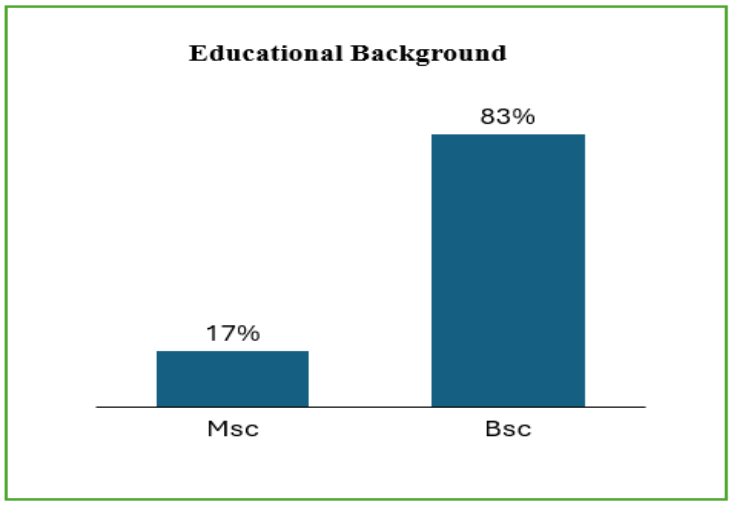

Figure 4. 1 Educational Background of the Respondent

The professional experience of the respondents included in the analysis ranges from 6 years to more than 20 years. Of the respondents, 40% have professional experience between 6 and 10 years, 20% have between 11 and 15 years of experience, and 24% have between 16 and 20 years of professional experience. The remaining 16% have more than 20 years of experience. The distribution of respondents by years of professional experience is presented in Figure 4.2.

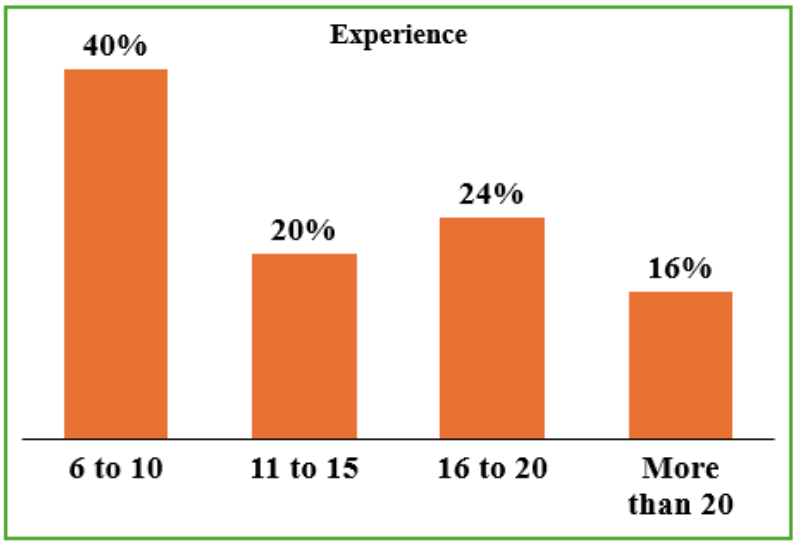

Figure 4. 2 Experience of the respondents

4.3. Prioritization of Critical ROW Acquisition Practices Using AHP

4.3.1. Prioritization of Practice Categories

Based on the aggregated judgments of the respondents, the relative importance weights of the major ROW acquisition practice categories were determined using the Analytic Hierarchy Process. The results indicate that Compensation and Relocation is the most important category, with a weight of 0.305. This is followed by Public Involvement and Stakeholder Communication (0.243), Dispute Resolution and Legal Support (0.194), Staffing and Resources (0.111), Project Scheduling and Management (0.088), and Technology and Tools (0.058), respectively. These results are presented in Table 4.2 (Column 3). The consistency of the pairwise comparisons was evaluated using Expert Choice software. The calculated inconsistency ratio was 0.03, which is below the maximum acceptable threshold of 0.10, indicating that the judgments provided by respondents were consistent and reliable.

4.3.2. Prioritization of Compensation and Relocation Practices

Within the Compensation and Relocation category, five practices were evaluated based on their contribution to successful ROW acquisition. The practice Provide reasonable, fair, and adequate compensation was ranked first, with a local weight of 0.318. This was followed by Encourage property valuation based on current market values (0.216) and avoid unnecessary delays in compensation payments (0.207). The remaining practices, provide for all basic needs of displaced families in their new location and Establish incentive programs for early settlement, were jointly ranked with local weights of 0.130 each. The inconsistency ratio for this comparison was below 0.10, confirming the internal consistency of the respondents' judgments.

Within this category, five practices were evaluated based on their contribution to successful ROW acquisition. The practice Provide reasonable, fair, and adequate compensation was ranked first with a local weight of 0.318. This was followed by Encourage property valuation based on current market values (0.216), Avoid unnecessary delays in compensation payments (0.207), Provide for all basic needs of displaced families in their new location (0.130), and Establish incentive programs for early settlement (0.130). The inconsistency rate for this comparison was below 0.1, confirming the consistency of the judgments.

4.3.3. Prioritization of Public Involvement & Stakeholder Communication Practices

Four practices were analyzed under the Public Involvement and Stakeholder Communication category. The most important practice was Conduct pre acquisition public involvement, with a local weight of 0.296. This was followed by Communicate with all parties during planning, design, and scheduling (0.236) and provide a thorough understanding of the project for society (0.236). The practice Disclose public information to promote transparency and trust ranked fourth, with a local weight of 0. 231. The pairwise comparison results demonstrated acceptable consistency, with an inconsistency ratio below the recommended threshold with an inconsistency rate under 0.1.

4.3.4. Prioritization of Dispute Resolution and Legal Support Practices

Three practices were prioritized within the Dispute Resolution and Legal Support category. The practices Use mediators to help settle disputes efficiently and propose new legislation to support ROW processes were jointly ranked first, each receiving a local weight of 0.400. The practice Create legally binding policies requiring stakeholder coordination followed with a local weight of 0.200. The computed inconsistency ratio for this category was within acceptable limits, indicating reliable judgments with an inconsistency rate under 0.1

4.3.5. Prioritization of Staffing and Resources Practices

This category also consisted of three practices. Provide training for all levels of ROW staff was found to be the most critical with a weight of 0.528. Next were Confirm availability of appraisal and acquisition personnel (0.333), and Ensure adequate funding for outsourcing staff assistance (0.140). The consistency index was well below the threshold.

4.3.6. Prioritization of Project Scheduling and Management Practices

Within the Project Scheduling and Management category, relocate utilities along the ROW promptly ranked first, with a local weight of 0.528. The second ranked practice was Implement realistic acquisition schedules to avoid delays (0.333), followed by Schedule Road projects in alignment with ROW activities (0.140). The judgments for this category were consistent, with an acceptable inconsistency level.

4.3.7. Prioritization of Technology and Tools Practices

Only one key practice was identified under the Technology and Tools category, namely Use modern software systems to manage ROW activities. As the sole practice in this category, it was assigned a local weight of 1.000. The consistency index was well below the threshold.

4.3.8. Overall Prioritization of Success Factors

In AHP, two types of comparisons are made: local and global. As discussed in the preceding sections, local comparisons are conducted within individual categories where factors are ranked based on their importance relative to others in the same group. The second level of comparison is global, where each factor's weight is adjusted by multiplying its local weight with the weight of its corresponding category to reflect its overall importance in achieving the project goal.

Accordingly, this global weight computation was performed using Expert Choice software, and the results were used to identify and rank the most influential practices for successful Right-of-Way (ROW) acquisition. The analysis revealed that Provide reasonable, fair, and adequate compensation (0.097) was the most critical factor overall. It was followed by Conduct pre-acquisition public involvement (0.072), Use mediators to help settle disputes efficiently (0.078), Encourage property valuation based on current market values (0.066), and Avoid unnecessary delays in compensation payments (0.063). These top five factors are considered crucial due to their combined significance across both importance and strategic category weight.

The complete list of global priorities is presented in Table 4.2 (column 6) and Table 4.4. These tables summarize the structure as follows: Column 2 shows the category name, Column 4 lists each factor under its category, Column 3 presents the category's overall weight, Column 5 provides local weights and ranks within each category, and Column 6 contains the global weights and final rankings of each factor across all categories. The overall inconsistency rate for the AHP comparisons was 0.05, which is well within the acceptable maximum of 0.1, indicating the consistency and reliability of the prioritization results.

Table 4. 2 AHP Result

Level 1: Goal	Level 2: Groups of Practices	Weights of the Group	Key Practices	Local Weights (Rank)	Global Weights (Rank)
Successful Row Acquisitions	Compensation and Relocation	0.305	Provide reasonable, fair, and adequate compensation	0.318 (1)	0.097 (1)
			Avoid unnecessary delays in compensation payments	0.207 (2)	0.063 (2)
			Encourage property valuation based on current market values	0.216 (3)	0.066 (3)
			Provide for all basic needs of displaced families	0.130 (4)	0.040 (6)
			Establish incentive programs for early settlement	0.130 (4)	0.040 (6)
	Public Involvement and Stakeholder Communication	0.243	Conduct pre-acquisition public involvement	0.296 (1)	0.072 (4)
			Communicate with all parties during planning, design, and scheduling	0.236 (2)	0.057 (7)
			Provide a thorough understanding of the projects for society	0.236 (2)	0.057 (7)
			Disclose public information to promote transparency and trust	0.231 (4)	0.056 (9)

Dispute Resolution and Legal Support	0.194	Use mediators to help settle disputes efficiently	0.400 (1)	0.078 (5)
		Create legally binding policies requiring stakeholder coordination	0.200 (2)	0.039 (12)
		Propose new legislation to support ROW processes	0.400 (1)	0.078 (5)
Staffing and Resources	0.111	Provide training for all levels of ROW staff	0.528 (1)	0.059 (10)
		Confirm availability of appraisal and acquisition personnel	0.333 (2)	0.037 (13)
		Ensure adequate funding for outsourcing staff assistance	0.140 (3)	0.015 (21)
Project Scheduling and Management	0.088	Schedule road projects in alignment with ROW activities	0.140 (1)	0.012 (24)
		Implement realistic acquisition schedules to avoid delays	0.333 (2)	0.029 (15)
		Relocate utilities along the ROW promptly	0.528 (3)	0.047 (11)
Technology and Tools	0.058	Use modern software systems to manage ROW activities	1.000 (1)	0.058 (8)

4.4. Discussion of Prioritized Key Practices for Right-of-Way Acquisition

Identification of the important practices that are contributing to the success of right of way acquisition seems to be an important area to focus on while aiming to improve the success ratio of projects in the construction of roads, taking into consideration the above point, the AHP technique was adopted to give importance to practices. These were based on expert judgments and they were prioritized accordingly. The results revealed that among the categories, Compensation and Relocation had the highest overall weight, indicating it is the most important category in achieving successful ROW acquisition. The second category was Public Involvement & Stakeholder Communication, followed by Dispute Resolution and Legal Support, Staffing and Resources, Project Scheduling and Management, and finally, Technology and Tools. The global weights of all practices and their respective categories is provided in a detailed format in Table 4.4.

The most important category group is Compensation and Relocation with a weight of 0.305, showing its criticality in achieving effective ROW acquisition. This claim is supported by (Huang, 2016), who stated that fair and speedy compensation significantly increases compliance and cooperation from the other parties mostly stakeholders affected by the projects. From this category, the most important management practice is Provide reasonable, fair, and adequate compensation (0.097), highlighting the significance of transparency and equity in compensating displaced individuals. Delays or disputes often arise when compensation is perceived as unfair or delayed. Following this, property valuation based on current market values (0.066) and avoid unnecessary delays in compensation payments (0.063) were highly ranked.

The second most important category was Public Involvement and Stakeholder Communication with a weight of (0.243). Considering the role of transparency, participation, and trust-building in the ROW process early communication and involvement of relevant stakeholders is critical. The highest-ranking practices in this category include Conduct pre-acquisition public involvement (0.072), Communicate with all parties during planning, design, and scheduling (0.057), and Provide a thorough understanding of the projects for society (0.057).These findings are supported by studies like (Bahadorestani et al., 2020) who stated that early and inclusive stakeholder engagement helps to prevent disputes and misunderstandings during the ROW acquisition. Involving affected communities early allows for concerns to be addressed

proactively in the initial phases and increases the project's legitimacy while reducing opposition.

The third category group will be Dispute Resolution and Legal Support followed with a category weight of 0.194. From this group the top practices include Use mediators to help settle disputes efficiently (0.078) and Propose new legislation to support ROW processes (0.078). These practices aim to improve the institutional and procedural framework supporting ROW acquisition. Fast and fair dispute resolution mechanisms help prevent escalation, while updated legislation ensures the ROW process remains legally sound and socially responsive. This claim was supported by(Latilo et al., 2024), who concluded that legal clarity and recourse channels are indispensable for the smooth execution of road construction projects. At number four of the group ranking, we find the Staffing and Resources category with a weight of 0.111. Within this group, provide training for all levels of ROW staff (0.059) and Confirm availability of appraisal and acquisition personnel (0.037) emerged as top practices. These results highlight the importance of human resource capacity. As ROW activities require specialized skills in valuation, negotiation, and legal compliance, undertrained or understaffed teams often cause inefficiencies and procedural delays. This claim is supported by (ASSEFA, 2018), who emphasized the need for regular training and capacity development of acquisition professionals.

The category Project Scheduling and Management received a weight of 0.088, with practices like implementing realistic acquisition schedules to avoid delays (0.029) and Relocate utilities along the ROW promptly (0.047) being prioritized as critical form the group. Especially Poor planning and coordination of schedules which is the major contributors to delays in ROW acquisition. This is especially true when utility relocations are not synchronized with project timelines. The study by (Vilventhan & Kalidindi, 2016) supports this claim, in his study he clearly states that delayed utility relocation often triggers a domino effect in delaying entire project. Finally, the last category, which is Technology and Tools, was the least weighted with a value of 0.058. Despite its lower weight, it has only one management practice under it which is Use modern software systems to manage ROW activities with a weight of (0.058) but still plays an essential supporting role. With the increased use of Modern digital technology such as GIS mapping, digital compensation status tracking, and document automation systems, transparency and efficiency in ROW management are greatly increased. As cited by (Mondejar

et al., 2021), digitalization provides coordination among stakeholders and enables tracking of ROW milestones.

4.5. Hierarchical Structuring of ROW Acquisition Practices Using ISM

After the prioritization of the management practices using AHP was completed, the same practices were analyzed further using ISM to know their interrelationship and also to know which practices are the most influential.

Based on the judgment of the experts the existence of influence/leads to relationship between any two practices was identified. The author then transformed the result got from the questionnaire into a 21-order matrix called Adjacency Matrix (A). The adjacency matrix, which shows only the direct effects of a factor on all other factors. As a next step, the reachability matrix, which shows both the direct and indirect effects of a factor on all other factors, was generated. The basic assumption for contextual relationships made by ISM is transitivity. Based on this relation, the reachability matrix is computed and generated. After that, a directed graph (digraph), where the factors correspond to the nodes of the network, where the interrelationships between any two factors are denoted as directional arrows (links) representing the features of the relationships (leads to or has influence on), will be able to pictorially interpret the contextual relationships between each two of these practices and their hierarchies.

As shown Figure 4.6 the final ISM result classify the 19 factors into 9 levels. Level 9 consists of the practice of offering training for all levels of ROW personnel, which is also the most basic practice at this level. This practice is very essential in boosting the technical capabilities of implementing ROW practices successfully in order to perform the activities at all practices that are placed above this practice in the hierarchy. Being placed at the bottom of the hierarchy also highlights the importance of this practice as the foundation of the whole process of ROW acquisition. Level 8 comprises three practices, which are: they are disclosing public information for transparent trust-building practices, offering reasonable, fair, and adequate compensation, and resolving disputes through mediators for efficient dispute resolution practices.

Each level provides valuable information on systemic behavior and causal linkage among factors that affect the process of ROW acquisition. The results of ISM for ROW acquisition

show the multilayered hierarchy of strategies interlinked. At Level 7, four practices including confirming the availability of appraisal and acquisition personnel, using modern software systems to manage ROW activities, creating legally binding policies that require stakeholder coordination, and proposing new legislation to support ROW processes. Next level 6 contains four practices that include scheduling road projects in alignment with ROW activities, communicating with all parties during planning, design, and scheduling, providing a thorough understanding of the ROW process, and ensuring adequate funding for outsourced staff assistance.

While not influential as the bottom four levels, level 5 to2 are Mid-tier practices the link between the bottom and the top. Going in detail, Level 5 includes establishing incentive

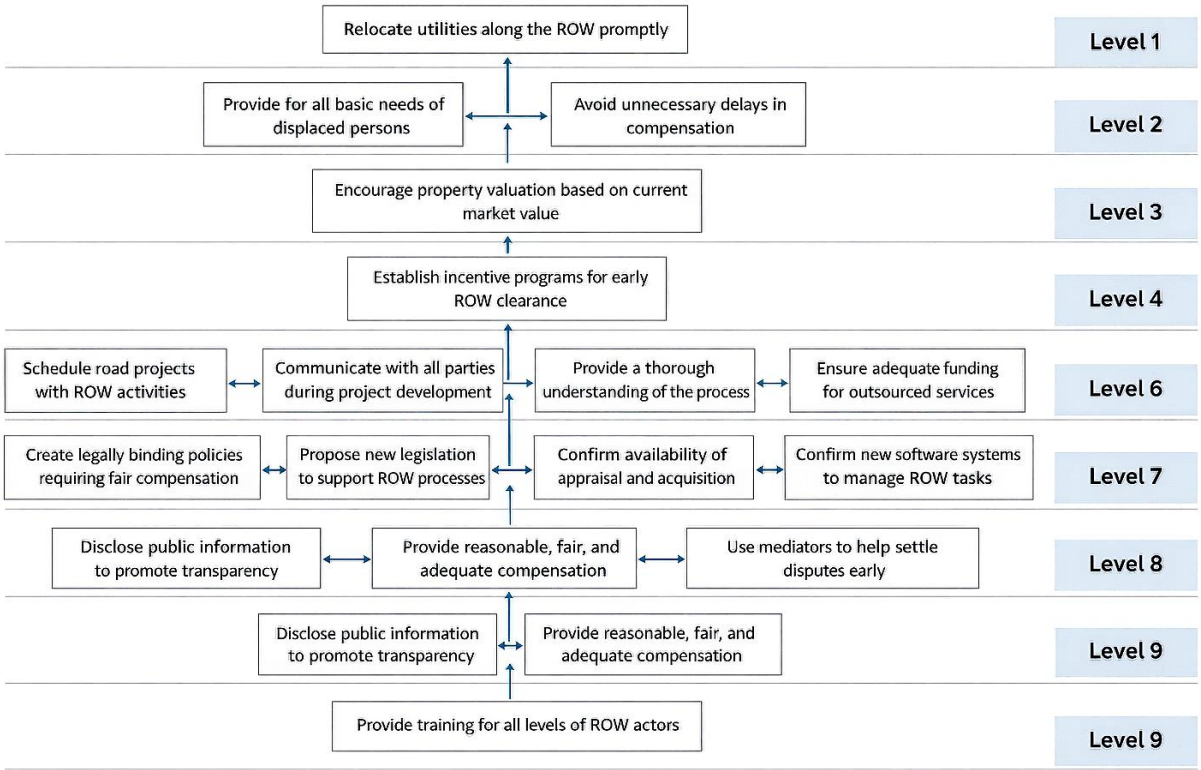

Figure 4. 3 ISM Result

programs for early settlement, which plays a strategic role in encouraging timely compliance by affected stakeholders. Level 4, includes implementing realistic acquisition schedules to avoid delays and providing a thorough understanding of the project for the societies, linking feasible timelines with community awareness. Level 3 features encouraging property valuation based on current market values, highlighting the importance of technical accuracy and fairness in compensation determination. At Level 2, practices focused on beneficiary welfare, namely

providing for all basic needs of displaced families in their new location and avoiding unnecessary delays in compensation payments, are positioned.

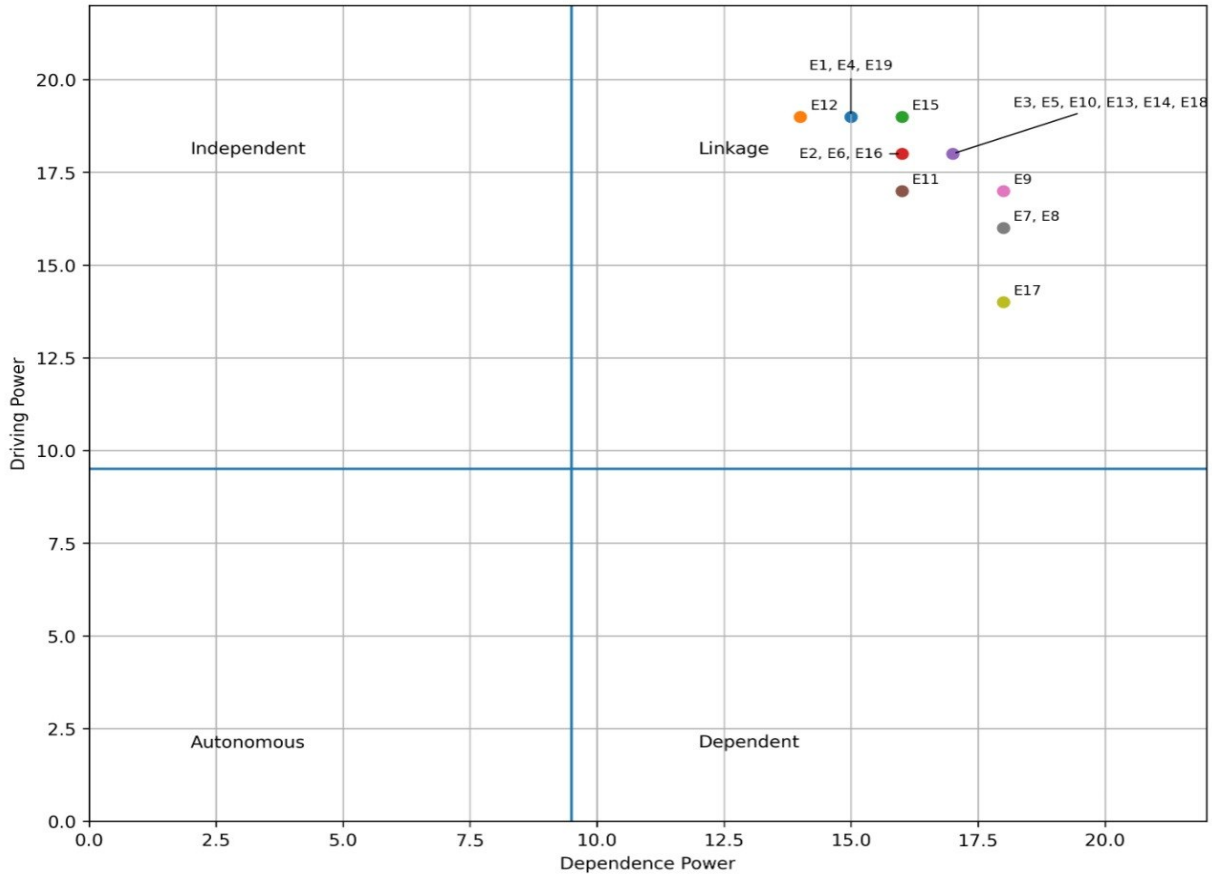

Figure 4. 4 MICMAC Result

Finally, Level 1 houses the practice of relocating utilities along the ROW promptly, indicating that it is a result-level activity that depends on the successful implementation of all supporting practices below. To complement the ISM results, a MICMAC analysis was conducted to categorize each practice based on its driving power and dependence. Importantly, as shown in figure 4.4 the MICMAC analysis revealed the absence of autonomous, dependent, or independent practices. The analysis showed that all nineteen practices fall within the linkage quadrant, showing that each practice has both high driving power and high dependence. This indicates that the practice for a ROW acquisition are highly connected and interdependent, where changes in one practice can influence many others.

4.6. Discussion of Critical Practices for ROW Acquisition Using ISM

Figure 4.6 illustrates a clear hierarchy of 19 key practices for effective Right-of-Way (ROW) acquisition and reveals a strong interrelationship between them. The practice were divided into 8 levels, and the most critical practice was located at level 8. Level 8 has one practice, which provides training for all levels of ROW implementation staff. The result shows that providing training for the staff is critical for the process. The claim was supported by (Rauscher, 2024) which argues that insufficient technical expertise among ROW personnel directly correlates with poor stakeholder engagement, errors, and schedule delays. Similarly, (Slfo, 1995) highlights that well-trained field staff are pivotal in reducing compensation disputes and implementation resistance.

The second-ranked practice included use mediators to help settle disputes early, disclose public information to promote transparency, and providing reasonable, fair, and adequate compensation. These practices, while being affected by providing training for all levels of ROW in turn they affect all other factors. One of such practices from this level is disclose public information to promote transparency, which is critical for public acceptance of the project which in turn increase their cooperation. This claim was supported by Gong et al. (2010), which notes that public disclosure of land valuation, project timelines, and legal rights reduces suspicion and enhances voluntary cooperation. However, critics such as (Ofori, 2012) argue that transparency alone is insufficient unless accompanied by accessible grievance redress systems, which are not explicitly stated in this ISM model. Similarly, providing reasonable, fair, and adequate compensation is critical. To facilitate such action aligning project schedules with available funding a must. This claim was supported by (Morrison, 2015) which demonstrated that financial shortage will cause interruptions in ROW acquisition, supporting the critical importance of funding, which affects the ability to provide adequate compensation.

Level 7 includes practices like creating legally binding policies requiring fair compensation, proposing new legislation to support ROW processes, confirming the availability of appraisal and compensation funds early, and implementing realistic acquisition schedule. The importance of legal frameworks is critical in handling such process. This was supported by d by (Mohamed-Katerere, 2022), who stated that their role in minimizing arbitrary land acquisition and creating smooth and equitable practices. This four practice being in the same level reflects the interdependence, especially legislation, policy design, funding readiness, and

planning. However, some scholars suggest that legislative reforms often lag behind practice and their results may not be seen doing impacts (Brook, 2020), suggesting that the ISM model might slightly overstate their influence during early project stages.

Level 6 includes practices such as conducting pre-acquisition public involvement programs, communicating with all stakeholders during planning and implementation, providing a thorough understanding of the ROW process to affected communities, and ensuring adequate funding for outsourcing implementation activities. These practices clearly align with participatory governance principles endorsed by organizations such as the World Bank (2014), which advocate for early and ongoing engagement to build consensus and minimize resistance. Furthermore, the participation of outsourced support aligns with Public-Private Partnership (PPP) models, particularly in Sub-Saharan Africa, where third-party consultants and land valuers are frequently employed to increase the speed (Ojebode, 2016).

Level 5 includes practice such as establishing incentive schemes for early voluntary land release. Such practice has demonstrated successful execution for earlier financial, legal, and communication initiatives. This practice as stated in Gulyani et al., 2017 only work when they are supported by strong legal guarantees and fair valuation (Gulyani et al., 2017). However, empirical research conducted in Kenya and Nigeria shows conflicting outcomes. Voluntary programs frequently benefit wealthy landowners while providing poor populations with little protection (Deininger & Byerlee, 2011). Therefore, fair safeguards mechanisms are necessary for this practice to be practically effective, even though the ISM correctly portrays it as a dependent consequence.

At level 4, the framework comprises the meeting of basic requirements for displaced people and the application of latest software systems to handle ROW processes. Such applications can be categorized under downstream implementation. The need to fulfill basic requirements for displaced persons has long been debated and well-articulated in displacement and resettlement studies (Cernea, 2000). Similarly, the application of latest technologies such as GIS and automated land records is being increasingly recognized as a prerequisite for increasing the efficacy and minimizing disputes (Tse and Goh, 2014). However, some authors have argued that latest information technology is underutilized in the ISM framework and have the capability to influence at higher levels such as planning and increasing transparency.

Levels 3 and below are the least prioritized factors from the research. In level 3 are skills such as encouragement on practice of property valuation based on market rates. This outcome is based on best practice globally as denoted by FAO guidelines, 2008, which has market valuation as the level by which the purchase is made. Lastly, level 1 includes skills such as relocating utilities along the ROW as soon as possible. This level enforces its importance as the final product within the process affected by the ROW process. This enforces the fact that relocating utilities is solely reliant on a successful process within the realms of legal, financial, operational, and planning. This assertion can be proven by Mwakalonge et al. (2016) which defends this by stating that infrastructure relocation is best done once all necessary factors are met.

4.7. Prioritization Based on the Integrated Hierarchical Structure

To systematically interpret and prioritize the critical practices involved in Right-of-Way (ROW) acquisition, this study integrated Interpretive Structural Modeling (ISM) and the Analytic Hierarchy Process (AHP). ISM was employed to find the relative influence or driving power of each practice within the ROW system, while AHP captured the expert-perceived importance of each practice by assigning global weights and corresponding ranks. Given the different conceptual underpinnings of these methods structural influence versus subjective importance a quadrant analysis was carried out to reconcile both perspectives and provide a clearer prioritization framework. In this analysis, the ranking was given in table 4.3 and ISM ranks (with lower numbers showing greater influence) were plotted on the x-axis, and AHP ranks (with lower numbers denoting higher priority) were plotted on the y-axis. The mean value of each rank type served as the central threshold, dividing the scatterplot into four quadrants: “Keep Up the Good Work,” “Priority for Improvement,” “Possible Overkill,” and “Low Priority.” Each quadrant reflects a unique strategic implication.

Table 4. 3 Factor Rank and Symbols

Factor	Practice Description	ISM Rank	AHP Rank
E1	Conduct pre-acquisition public involvement programs	4	3
E2	Communicate with all parties during project development	4	9
E3	Provide a thorough understanding of the process	4	9
E4	Disclose public information to promote transparency	2	11
E5	Create legally binding policies requiring fair compensation	3	15
E6	Propose new legislation to support ROW processes	3	2
E7	Provide reasonable, fair, and adequate compensation	2	1
E8	Avoid unnecessary delays in compensation	8	5
E9	Encourage property valuation based on market rates	7	4
E10	Provide for all basic needs of displaced persons	8	13
E11	Establish incentive programs for early ROW clearance	5	13
E12	Provide training for all levels of ROW actors	1	7
E13	Confirm availability of appraisal and acquisition professionals	3	16
E14	Ensure adequate funding for outsourced services	4	18
E15	Schedule road projects with ROW activities	4	19
E16	Implement realistic acquisition schedules	6	17
E17	Relocate utilities along the ROW promptly	9	12
E18	Use modern software systems to manage ROW tasks	3	8
E19	Use mediators to help settle disputes early	2	2

The Keep Up the Good Work quadrant represents practices that are both highly influential (low ISM rank) and highly important (low AHP rank). These practices are strategic strengths that contribute substantially to both the structure and perceived value of the ROW process. A total

of eight practices fell into this quadrant, making it the most populated group. These include conducting pre-acquisition public involvement programs, communicating with all parties during project development, providing a thorough understanding of the process, proposing new legislation to support ROW processes, providing reasonable, fair, and adequate compensation, training all levels of ROW actors, using modern software systems to manage ROW tasks, and using mediators to help settle disputes early. Their dual positioning suggests that they are not only perceived as vital by experts but also hold significant leverage in shaping outcomes and should thus be maintained and possibly expanded as best practices.

The Priority for Improvement quadrant contains practices that exhibit strong systemic influence (high ISM priority) but relatively low expert-assigned importance (low AHP priority). These practices may be structurally critical but are currently undervalued, indicating a potential blind spot in strategic emphasis. Five practices were categorized under this group they are disclosing public information to promote transparency, creating legally binding policies requiring fair compensation, confirming the availability of appraisal and acquisition professionals, ensuring adequate funding for outsourced services, and scheduling road projects with ROW activities. Their presence in this quadrant suggests a need to raise awareness of their importance or reassess why they may be under prioritized despite their systemic significance.

Conversely, the Possible Overkill quadrant encompasses practices that were rated highly in importance (low AHP rank) but show relatively low structural influence (high ISM rank). These are areas where substantial attention or resources may be devoted, yet their actual capacity to affect the system holistically is limited. Two practices avoiding unnecessary delays in compensation and encouraging property valuation based on market rates fell into this category. While not unimportant, these practices may benefit from strategic reallocation of attention, especially if other high-impact practices remain under-supported.

Finally, the Low Priority quadrant identifies practices that scored low in both influence and importance, suggesting minimal strategic relevance under current conditions. These practices are relocating utilities along the ROW promptly, providing for all basic needs of displaced persons, implementing realistic acquisition schedules, and establishing incentive programs for early ROW clearance. Their combined low impact and priority mean they may be maintained with minimal investment unless future contextual shifts necessitate re-evaluation.

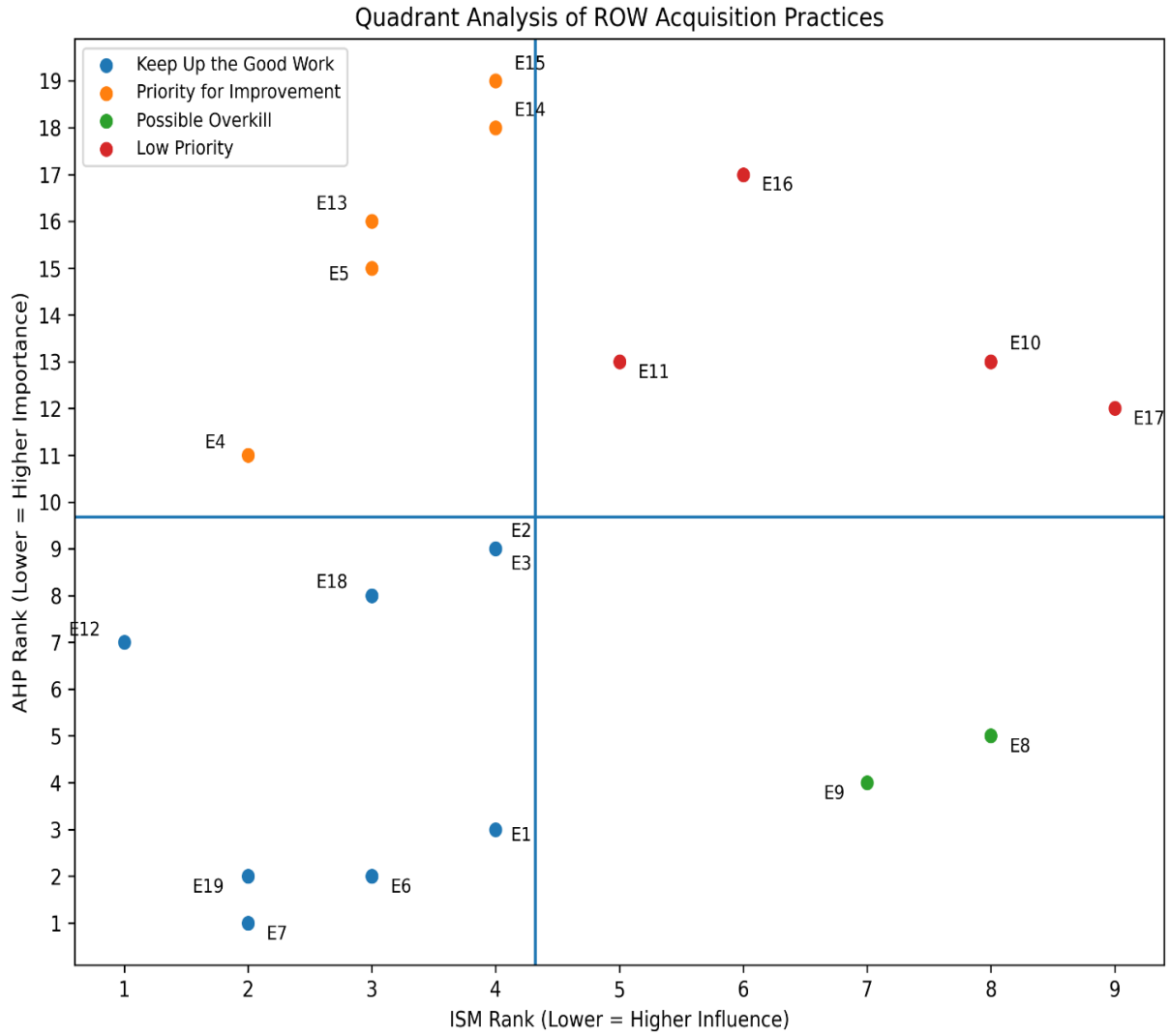

Figure 4. 5 Quadrant analysis result

4.8. Discussion

A basis for managing, implementing, and aligning not just the present but also the future right-of-way acquisition projects is established through project success. For right-of-way acquisition projects to be successfully implemented, the systematic significance of the factors must be identified. As discussed in earlier sections, for the systematic significance of the factors, Interpretive Structural Modeling techniques have been used, and the Analytic Hierarchy Process technique has been used to assess their importance. But to make strategic decisions, it is important that the factors that have both significance as well as importance should be known. For this purpose, quadrant analysis techniques have been used. This analysis helps in classifying areas of right-of-way acquisition environmental practices into four categories of

decision-making zones, namely keeping up the good work, priority for improvement, possible overkill, and low priority.

The keep up the good work quadrant practices comprise a total of eight practices that score high on structural impact as well as the perceived importance of these factors as viewed by an expert. These practices comprise conduct pre-acquisition public involvement activities, communications with all parties engaged during the process of project development, offer a complete understanding of the process, suggest new legislation facilitating ROW process activities, offer fair, adequate, as well as just compensation, train ROW actors at different hierarchy levels, Make use of modern software systems for ROW activities, and utilize mediators for resolving disputes at an earlier date.

For instance, reasonable, fair, and adequate compensation has been reported in the literature as one of the determinants of stakeholder satisfaction and conflict minimization practice (Zhang et al., 2018; Li & Xu, 2020). The current study confirms its significance by ranking the item within the top ten for both ISM and AHP tests. Also, undertaking pre-acquisition public involvement activities and Communicating with all parties were verified to improve transparency and trust levels, fundamental for obtaining a social license and conflict minimization (World Bank, 2022; Iyer et al., 2014). These observations are consistent with recommendations presented by UN-Habitat (2020), stating that active engagement of the community throughout land acquisitions is fundamental for their success.

Additionally, developing new legislation for enhanced support of ROW processes, it can be noted that there exists a significant emphasis on the importance of institutional frameworks for making up for systemic inefficiencies. The involvement of legal reforms in making it clear regarding compensation and acquisition terms has always played a crucial role (ADB, 2019), and it can be inferred that there exists great importance attached to this particular factor, as it has been ranked very high on this particular point. Additionally, it can be noted that training for all members of personnel for ROW can be considered an important activity that acts entirely as a long-term measure for improving this particular sector, and several experiments conducted by Ofori (2015) and Musa et al. (2021) have shown that there exists a significant shortage of expertise regarding ROW, which can be an important cause for delays and high litigations for projects.

The addition of digital practices like the employment of innovative software systems for the management of ROW tasks is quite relevant to the trends of the present times regarding the use of e-governance in digital transformation of infrastructure. They increase the transparency of data, make interagency coordination smooth, and minimize the chances of errors (Ahmad et al., 2025). Even despite the challenges of implementation faced by some low- and middle-income nations, the significance of digitalization continues to stand out through the degree of influence and priority positioning. Finally, the employment of mediation to resolve disputes encourages the emergence of the significance of alternative dispute resolution systems through ROW projects. The Legal systems cause project delays and inflation because of the amount of time taken for completion through formal channels; on the contrary, mediation encourages collective agreement and accelerates the process of project implementation (Li & Mo, 2023).

Despite their strong strategic value, however, some degree of caution is required in these practices too. For example, while community engagement schemes and mediation are well advised, their success may depend greatly on the specific political and social circumstances. In some areas, these may become mere tokens of commitment instead of earnest efforts if there is a lack of political will and legal support (YILMAZ, 2022). Likewise, legislation, while very effective as a strategy, may fail in their implementation stages because of administrative paralysis and other institutional factors. In other words, quadrant analysis, while pointing to these practices as strategic priorities to be maintained and developed further, their implementation requires consideration within local politics.

Overall, it is clear that it is within the keep up the good work quadrant that the most aligned practices reside. These are practices which are both valued from an operational point of view as well as having structural influence. These practices should be priority areas if there is continuity with regard to policy. Their success is a blueprint to remedy other practices.

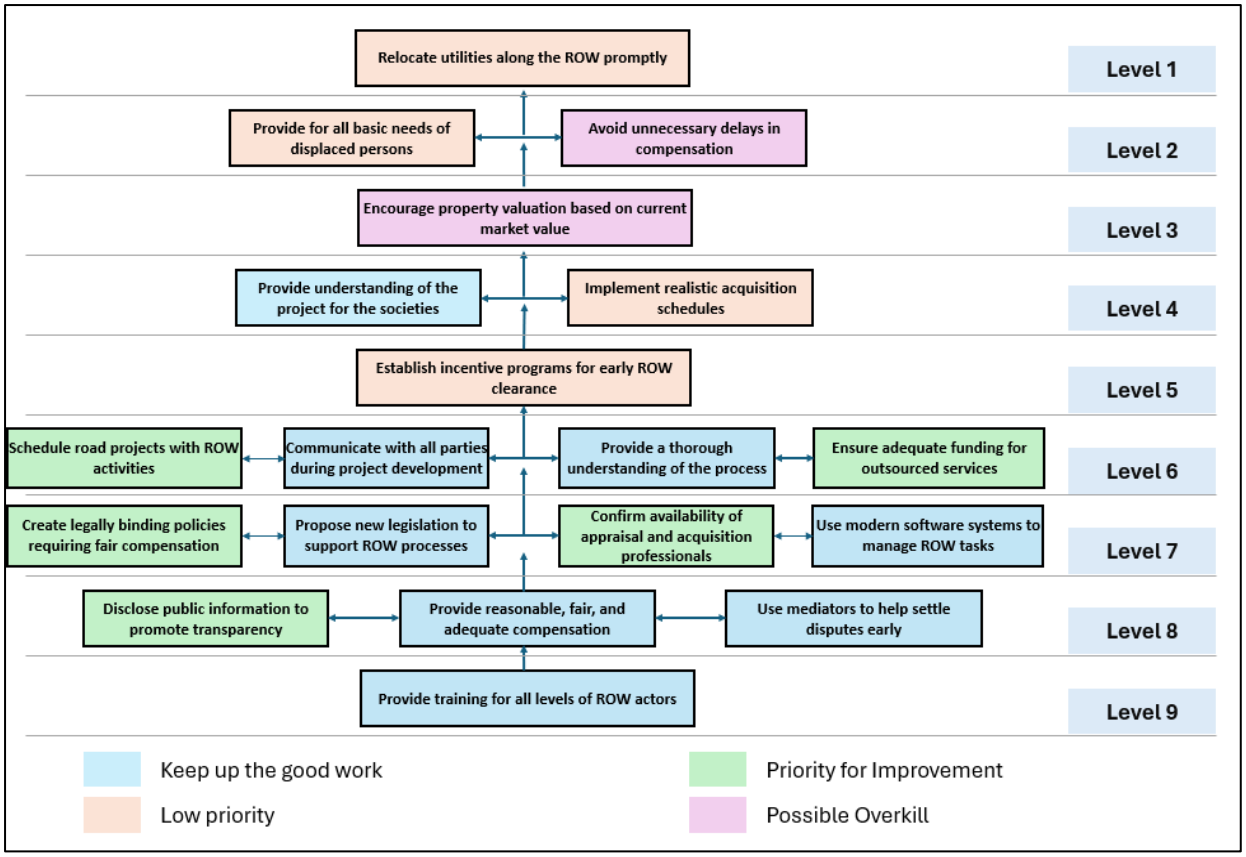

Figure 4. 6 Final Integrated Framework

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1. Conclusions

Understanding the critical management practices affecting Right-of-Way (ROW) acquisition in road construction projects is key to increasing the success rate of road projects. This study demonstrates how the application of the AHP-ISM integrated method, combined with quadrant analysis, can lead to a better understanding of how various management practices influence the success of ROW acquisition. Based on inputs from literature and expert judgment, the important weights of the factors were quantified, and their interrelationships were identified using a properly integrated method. The results revealed that:

- From the AHP analysis, practices such as providing reasonable, fair, and adequate compensation, using mediators to settle disputes early, and conducting pre-acquisition public involvement were ranked the top practices in terms of importance.
- The ISM/MICMAC approach further highlighted that providing consistent training for ROW personnel, using modern ROW management systems, ensuring legislative support, and the availability of acquisition staff are the top 3 most influential management practices. Such practices exhibit strong driver power, and they are located at the lower levels of the ISM hierarchy, meaning they significantly influence all the other factors within the system.
- The integrated results from the AHP, ISM-MICMAC, highlighted six exceptionally critical practices. They are conducting pre-acquisition public involvement programs, communicating with all parties, providing a thorough understanding of the process, legislation to support ROW processes, providing reasonable, fair, and adequate compensation, training all levels of ROW actors, using modern software systems to manage ROW tasks, and using mediators to help settle disputes early. These practices are situated in the “Keep Up the Good Work” quadrant, are not only highly important but also highly influential, requiring high focus.

The research findings provide valuable insights into the perception and understanding of critical success factors for ROW acquisition. The results presented in this paper support stakeholders and practitioners in developing appropriate strategies to improve the effectiveness and efficiency of ROW processes.

5.2. Recommendation

5.2.1. Recommendation

- It is a recommendation for professionals and policymakers to utilize the findings of this study to improve the success rate of ROW acquisition by focusing on the most critical practices.
- Based on the hierarchical structure and quadrant analysis, practitioners should use the integrated prioritization to assess the current state of their ROW practices and implement corrective measures where necessary.

5.2.2. Recommendation for Further Study

- For simplicity in this research, the factor weights were computed using the AHP approach; it is recommended that the use of the Fuzzy AHP approach be explored in future studies.
- Moreover, to simplify the complexity in the modeling, the use of ISM in this research is applicable, and future research should opt for fuzzy ISM.
- Other ROW projects may also benefit if the same methodology is replicated by researchers in different settings for validation.
- Research on the Ethiopian case regarding ROW acquisition, particularly concerning large-scale infrastructure projects, remains relatively scarce. Future studies might consider larger datasets, regional differences, and exploring more sophisticated techniques than multi-criteria decision making.

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Annex 1-Questionaries

Adama Science and Technology University

College of Civil Engineering and Architecture

Department of Construction Engineering and Management Questionnaire survey for study paper on

Key Practices for Effective Right-of-Way (ROW) Acquisition Management in Construction Projects: Hierarchical Importance and Interrelationships

This survey questionnaire is prepared as part of the academic requirements for the MSc program in Construction Engineering and Management at Adama Science and Technology University. Individuals involved in road construction projects are kindly invited to participate and contribute to this research.

The information collected through this survey will be used solely for academic purposes and will be handled with strict confidentiality. The names of participating institutions will not be disclosed. We sincerely appreciate your willingness to complete the questionnaire and return it on time. Your honest responses are highly valued.

Name- Sebona Bekena

Advisor- Fikreyesus Demeke (PhD)

General Information

Name of the organization										
Respondents position in the organization.										
Level of education of the respondent										
Relevant working	1-5 years		6- 10 years		11-15 years		16-20 years		more than 20 years	

Objective of the study

The general objective of the study is to investigate the importance and interrelationships among key practices for managing ROW acquisition effectively in construction projects and their combined impact on enhancing acquisition outcomes.

PART ONE

Carry out pair-wise comparisons to determine the relative weights of the key success factors important for effective ROW acquisition, and compute their overall scores using the Analytic Hierarchy Process (AHP).

Instruction

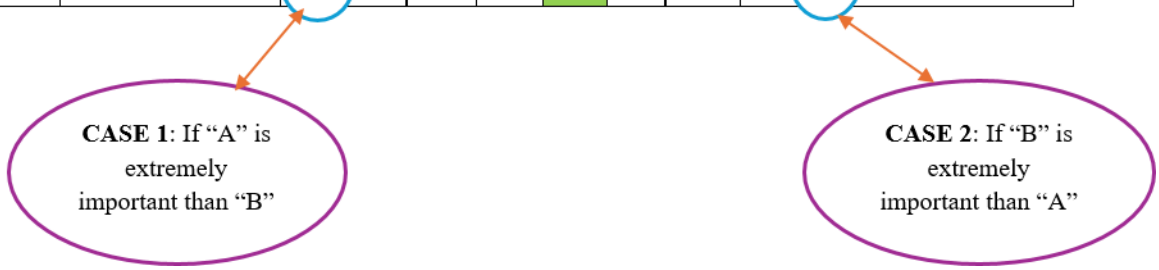
The respondent is required to compare these factors based on their importance to the success of ROW acquisition.

Example

CASE 1: If you think factor **"A"** is extremely important than factor **"B"** circle or mark the numbers **"9" to the left of the center**

CASE 2: If you think factor **"B"** is extremely important than factor **"A"** circle or mark the numbers **"9" to the right of the center**

		Extremely important	Very strictly important	Strictly imoprtant	Moderately important	Equally important	Moderately important	Strictly imoprtant	Very strictly important	Extremely important	
1	"A"	9	7	5	3	1	3	5	7	9	"B"



1. Public Involvement and Stakeholder Communication

Factor A	Extremely important	Very strongly important	strongly important	Moderately important	Equally important	Moderately important	strongly important	Very strongly important	Extremely important	Factor B
Conduct pre-acquisition public involvement										Communicate with all parties during planning, design, and scheduling
Conduct pre-acquisition public involvement										Provide a thorough understanding of the projects for society
Conduct pre-acquisition public involvement										Disclose public information to promote transparency and trust
Communicate with all parties during planning, design, and scheduling										Provide a thorough understanding of the projects for society
Communicate with all parties during planning, design, and scheduling										Disclose public information to promote transparency and trust
Provide a thorough understanding of the projects for society										Disclose public information to promote transparency and trust

2. Dispute Resolution and Legal Support

Factor A	Extremely important	Very strongly important	strongly important	Moderately important	Equally important	Moderately important	strongly important	Very strongly important	Extremely important	Factor B
Use mediators to help settle disputes efficiently										Create legally binding policies requiring stakeholder coordination
Use mediators to help settle disputes efficiently										Propose new legislation to support ROW processes
Create legally binding policies requiring stakeholder coordination										Propose new legislation to support ROW processes

3. Compensation and Relocation

Factor A	Extremely important	Very strongly important	strongly important	Moderately important	Equally important	Moderately important	strongly important	Very strongly important	Extremely important	Factor B
Provide reasonable, fair, and adequate compensation										Avoid unnecessary delays in compensation payments
Provide reasonable, fair, and adequate compensation										Encourage property valuation based on current market values
Provide reasonable, fair, and adequate compensation										Provide for all basic needs of displaced families in their new location
Provide reasonable, fair, and adequate compensation										Establish incentive programs for early settlement
Avoid unnecessary delays in compensation payments										Encourage property valuation based on current market values
Avoid unnecessary delays in compensation payments										Provide for all basic needs of displaced families in their new location
Avoid unnecessary delays in compensation payments										Establish incentive programs for early settlement
Encourage property valuation based on current market values										Provide for all basic needs of displaced families in their new location
Encourage property valuation based on current market values										Establish incentive programs for early settlement
Provide for all basic needs of displaced families in their new location										Establish incentive programs for early settlement

4. Staffing and Resources

Factor A	Extremely important	Very strongly important	strongly important	Moderately important	Equally important	Moderately important	strongly important	Very strongly important	Extremely important	Factor B
Provide training for all levels of ROW staff										Confirm availability of appraisal and acquisition personnel
Provide training for all levels of ROW staff										Ensure adequate funding for outsourcing staff assistance
Confirm availability of appraisal and acquisition personnel										Ensure adequate funding for outsourcing staff assistance

5. Project Scheduling and Management

Factor A	Extremely important	Very strongly important	strongly important	Moderately important	Equally important	Moderately important	strongly important	Very strongly important	Extremely important	Factor B
Schedule road projects in alignment with ROW activities										Implement realistic acquisition schedules to avoid delays
Schedule road projects in alignment with ROW activities										Relocate utilities along the ROW promptly
Implement realistic acquisition schedules to avoid delays										Relocate utilities along the ROW promptly

6. AHP Pairwise Comparison of Groups

Factor A	Extremely important	Very strongly important	strongly important	Moderately important	Equally important	Moderately important	strongly important	Very strongly important	Extremely important	Factor B
Public Involvement and Stakeholder Communication										Dispute Resolution and Legal Support
Public Involvement and Stakeholder Communication										Compensation and Relocation
Public Involvement and Stakeholder Communication										Staffing and Resources
Public Involvement and Stakeholder Communication										Project Scheduling and Management
Public Involvement and Stakeholder Communication										Technology and Tools
Dispute Resolution and Legal Support										Compensation and Relocation
Dispute Resolution and Legal Support										Staffing and Resources
Dispute Resolution and Legal Support										Project Scheduling and Management
Dispute Resolution and Legal Support										Technology and Tools
Compensation and Relocation										Staffing and Resources
Compensation and Relocation										Project Scheduling and Management
Compensation and Relocation										Technology and Tools
Staffing and Resources										Project Scheduling and Management
Staffing and Resources										Technology and Tools
Project Scheduling and Management										Technology and Tools

PART TWO

Method

Determine how various key success practices interact with and influence one another in affecting the success of right-of-way acquisition, and analyze the strength of these influences using
Interpretive Structural Modeling (ISM).

Instruction

The respondent is required to identify only the direct interrelationship between these factors based on which factor leads to the occurrence of the other factor. An Example is given below. Based on that please fill the rest.

Example

CASE 1: If you think factor **"A"** leads to or influence "**B"** mark the relation column by

"→" CASE 2: If you think factor **"B"** leads to or influence **"A"** mark the relation column

by **"←"**

CASE 3: If you think **both** factors lead to or influence **one another** mark the relation column by **"↔"**

CASE 4: If you think **both** factors do not lead to or influence **one another** mark the relation column by **"X"**

Case 1	**"A"**	→	**"B"**
Case 2	**"A"**	←	**"B"**
Case 3	**"A"**	↔	**"B"**
Case 4	**"A"**	X	**"B"**

A	RELATION	B
Conduct pre-acquisition public involvement		Communicate with all parties during planning, design, and scheduling
Conduct pre-acquisition public involvement		Provide a thorough understanding of the projects for society
Conduct pre-acquisition public involvement		Disclose public information to promote transparency and trust
Conduct pre-acquisition public involvement		Use mediators to help settle disputes efficiently
Conduct pre-acquisition public involvement		Create legally binding policies requiring stakeholder coordination
Conduct pre-acquisition public involvement		Propose new legislation to support ROW processes
Conduct pre-acquisition public involvement		Provide reasonable, fair, and adequate compensation

Conduct pre-acquisition public involvement		Avoid unnecessary delays in compensation payments
Conduct pre-acquisition public involvement		Encourage property valuation based on current market values
Conduct pre-acquisition public involvement		Provide for all basic needs of displaced families in their new location
Conduct pre-acquisition public involvement		Establish incentive programs for early settlement
Conduct pre-acquisition public involvement		Provide training for all levels of ROW staff
Conduct pre-acquisition public involvement		Confirm availability of appraisal and acquisition personnel
Conduct pre-acquisition public involvement		Ensure adequate funding for outsourcing staff assistance
Conduct pre-acquisition public involvement		Schedule road projects in alignment with ROW activities
Conduct pre-acquisition public involvement		Implement realistic acquisition schedules to avoid delays
Conduct pre-acquisition public involvement		Relocate utilities along the ROW promptly
Conduct pre-acquisition public involvement		Use modern software systems to manage ROW activities
Communicate with all parties during planning, design, and scheduling		Provide a thorough understanding of the projects for society
Communicate with all parties during planning, design, and scheduling		Disclose public information to promote transparency and trust
Communicate with all parties during planning, design, and scheduling		Use mediators to help settle disputes efficiently
Communicate with all parties during planning, design, and scheduling		Create legally binding policies requiring stakeholder coordination
Communicate with all parties during planning, design, and scheduling		Propose new legislation to support ROW processes
Communicate with all parties during planning, design, and scheduling		Provide reasonable, fair, and adequate compensation
Communicate with all parties during planning, design, and scheduling		Avoid unnecessary delays in compensation payments
Communicate with all parties during planning, design, and scheduling		Encourage property valuation based on current market values
Communicate with all parties during planning, design, and scheduling		Provide for all basic needs of displaced families in their new location
Communicate with all parties during planning, design, and scheduling		Establish incentive programs for early settlement
Communicate with all parties during planning, design, and scheduling		Provide training for all levels of ROW staff
Communicate with all parties during planning, design, and scheduling		Confirm availability of appraisal and acquisition personnel

Communicate with all parties during planning, design, and scheduling		Ensure adequate funding for outsourcing staff assistance
Communicate with all parties during planning, design, and scheduling		Schedule road projects in alignment with ROW activities
Communicate with all parties during planning, design, and scheduling		Implement realistic acquisition schedules to avoid delays
Communicate with all parties during planning, design, and scheduling		Relocate utilities along the ROW promptly
Communicate with all parties during planning, design, and scheduling		Use modern software systems to manage ROW activities
Provide a thorough understanding of the projects for society		Disclose public information to promote transparency and trust
Provide a thorough understanding of the projects for society		Use mediators to help settle disputes efficiently
Provide a thorough understanding of the projects for society		Create legally binding policies requiring stakeholder coordination
Provide a thorough understanding of the projects for society		Propose new legislation to support ROW processes
Provide a thorough understanding of the projects for society		Provide reasonable, fair, and adequate compensation
Provide a thorough understanding of the projects for society		Avoid unnecessary delays in compensation payments
Provide a thorough understanding of the projects for society		Encourage property valuation based on current market values
Provide a thorough understanding of the projects for society		Provide for all basic needs of displaced families in their new location
Provide a thorough understanding of the projects for society		Establish incentive programs for early settlement
Provide a thorough understanding of the projects for society		Provide training for all levels of ROW staff
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Provide a thorough understanding of the projects for society		Schedule road projects in alignment with ROW activities
Provide a thorough understanding of the projects for society		Implement realistic acquisition schedules to avoid delays
Provide a thorough understanding of the projects for society		Relocate utilities along the ROW promptly
Provide a thorough understanding of the projects for society		Use modern software systems to manage ROW activities

Disclose public information to promote transparency and trust		Use mediators to help settle disputes efficiently
Disclose public information to promote transparency and trust		Create legally binding policies requiring stakeholder coordination

Disclose public information to promote transparency and trust		Propose new legislation to support ROW processes
Disclose public information to promote transparency and trust		Provide reasonable, fair, and adequate compensation
Disclose public information to promote transparency and trust		Avoid unnecessary delays in compensation payments
Disclose public information to promote transparency and trust		Encourage property valuation based on current market values
Disclose public information to promote transparency and trust		Provide for all basic needs of displaced families in their new location
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Disclose public information to promote transparency and trust		Use modern software systems to manage ROW activities
Use mediators to help settle disputes efficiently		Create legally binding policies requiring stakeholder coordination
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Use mediators to help settle disputes efficiently		Encourage property valuation based on current market values
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Use mediators to help settle disputes efficiently		Confirm availability of appraisal and acquisition personnel
Use mediators to help settle disputes efficiently		Ensure adequate funding for outsourcing staff assistance

Use mediators to help settle disputes efficiently		Schedule road projects in alignment with ROW activities
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Create legally binding policies requiring stakeholder coordination		Confirm availability of appraisal and acquisition personnel
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Create legally binding policies requiring stakeholder coordination		Implement realistic acquisition schedules to avoid delays
Create legally binding policies requiring stakeholder coordination		Relocate utilities along the ROW promptly
Create legally binding policies requiring stakeholder coordination		Use modern software systems to manage ROW activities
Propose new legislation to support ROW processes		Provide reasonable, fair, and adequate compensation
Propose new legislation to support ROW processes		Avoid unnecessary delays in compensation payments
Propose new legislation to support ROW processes		Encourage property valuation based on current market values
Propose new legislation to support ROW processes		Provide for all basic needs of displaced families in their new location
Propose new legislation to support ROW processes		Establish incentive programs for early settlement
Propose new legislation to support ROW processes		Provide training for all levels of ROW staff

Propose new legislation to support ROW processes		Confirm availability of appraisal and acquisition personnel
Propose new legislation to support ROW processes		Ensure adequate funding for outsourcing staff assistance
Propose new legislation to support ROW processes		Schedule road projects in alignment with ROW activities
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Provide for all basic needs of displaced families in their new location		Relocate utilities along the ROW promptly

Provide for all basic needs of displaced families in their new location		Use modern software systems to manage ROW activities
Establish incentive programs for early settlement		Provide training for all levels of ROW staff
Establish incentive programs for early settlement		Confirm availability of appraisal and acquisition personnel
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Establish incentive programs for early settlement		Schedule road projects in alignment with ROW activities
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Provide training for all levels of ROW staff		Use modern software systems to manage ROW activities
Confirm availability of appraisal and acquisition personnel		Ensure adequate funding for outsourcing staff assistance
Confirm availability of appraisal and acquisition personnel		Schedule road projects in alignment with ROW activities

Confirm availability of appraisal and acquisition personnel		Implement realistic acquisition schedules to avoid delays
Confirm availability of appraisal and acquisition personnel		Relocate utilities along the ROW promptly
Confirm availability of appraisal and acquisition personnel		Use modern software systems to manage ROW activities
Ensure adequate funding for outsourcing staff assistance		Schedule road projects in alignment with ROW activities
Ensure adequate funding for outsourcing staff assistance		Implement realistic acquisition schedules to avoid delays
Ensure adequate funding for outsourcing staff assistance		Relocate utilities along the ROW promptly
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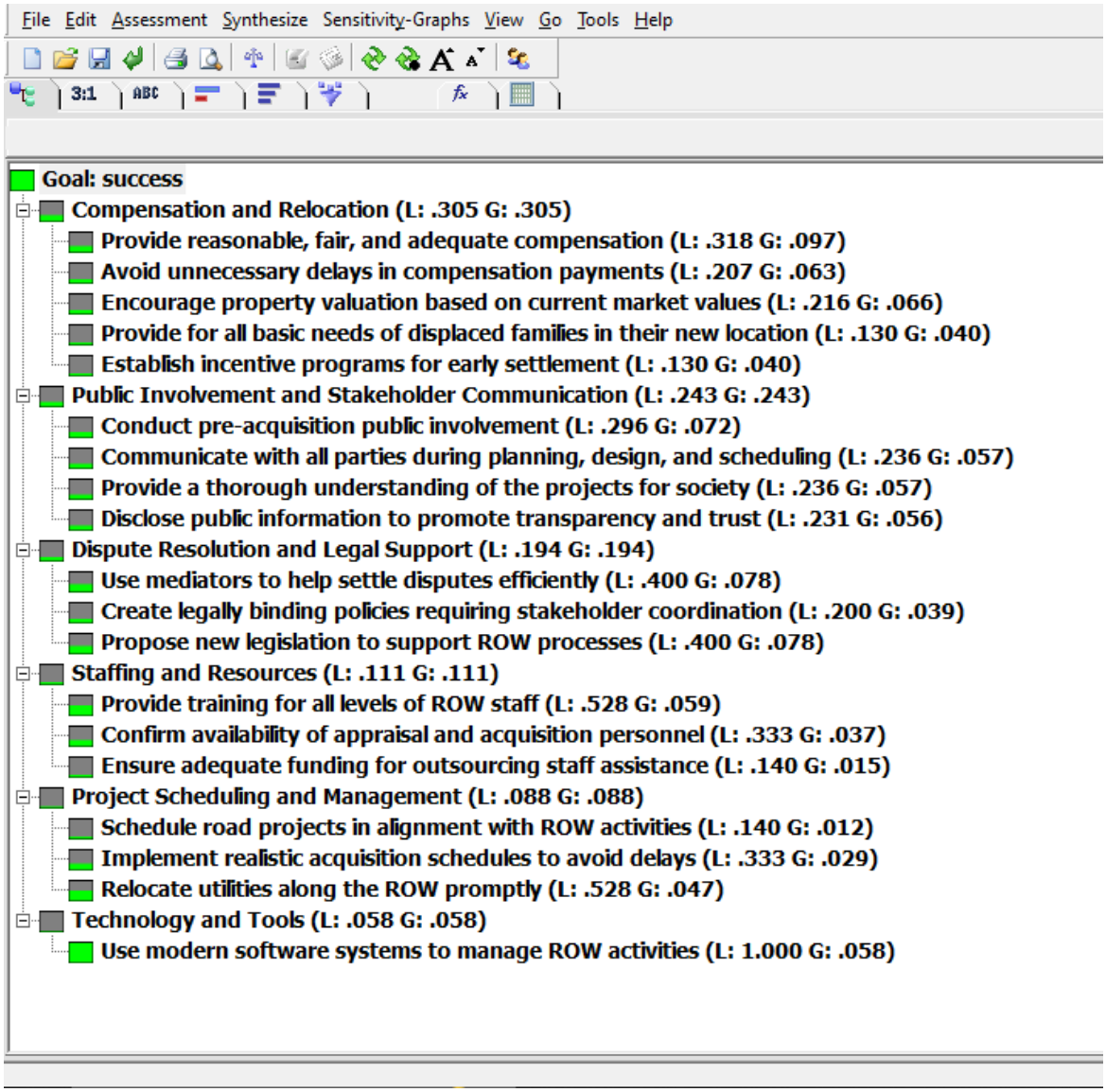
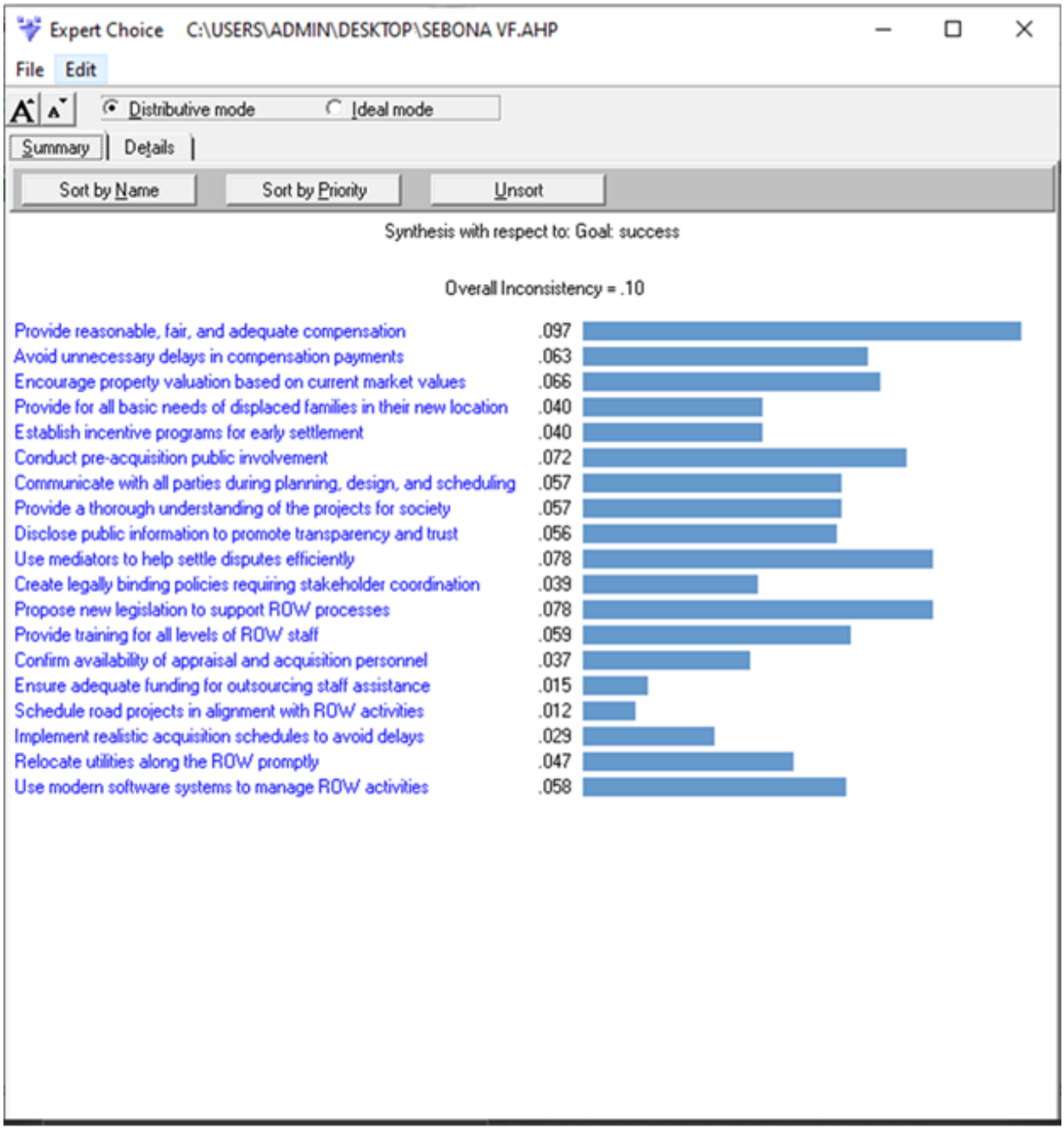
Schedule road projects in alignment with ROW activities		Implement realistic acquisition schedules to avoid delays
Schedule road projects in alignment with ROW activities		Relocate utilities along the ROW promptly
Schedule road projects in alignment with ROW activities		Use modern software systems to manage ROW activities
Implement realistic acquisition schedules to avoid delays		Relocate utilities along the ROW promptly
Implement realistic acquisition schedules to avoid delays		Use modern software systems to manage ROW activities
Relocate utilities along the ROW promptly		Use modern software systems to manage ROW activities

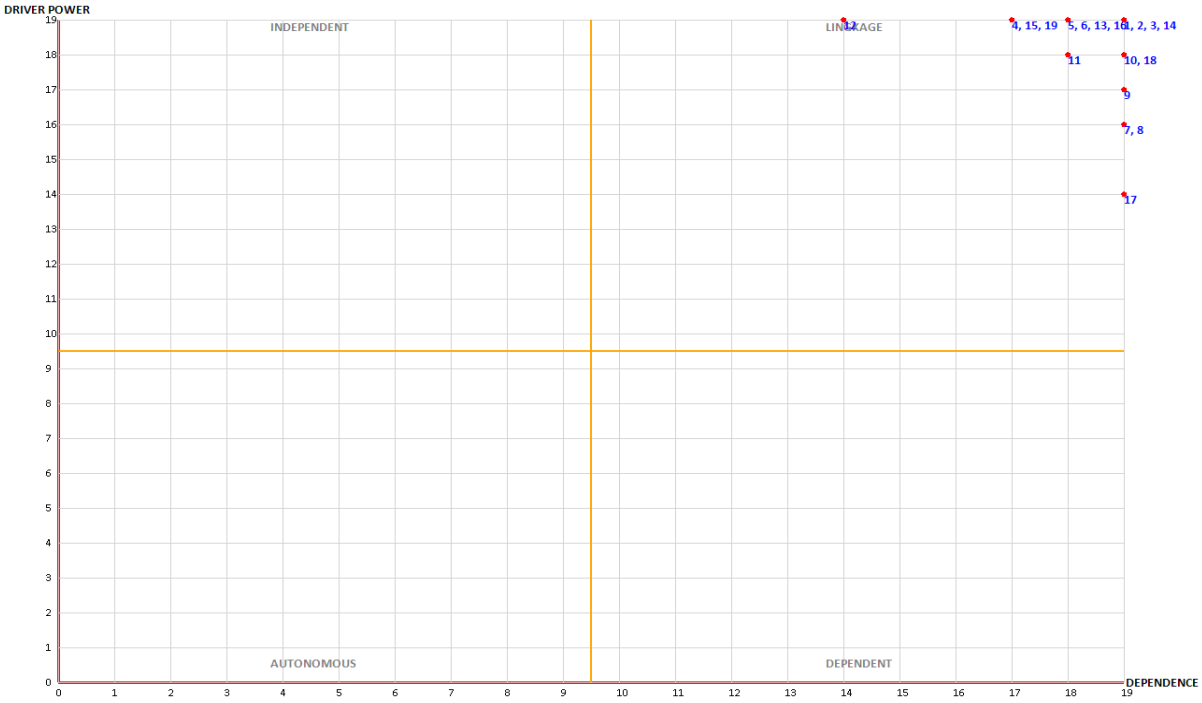
Annex 2- Software Results

AHP Output




Expert Choice C:\USERS\ADMIN\DESKTOP\SEBONA VF.AHP
File Edit
Distributive mode Ideal mode
Summary Details
Sort by Name Sort by Priority Unsort
Synthesis with respect to: Goal: success
Overall Inconsistency = .10
Provide reasonable, fair, and adequate compensation .097
Avoid unnecessary delays in compensation payments .063
Encourage property valuation based on current market values .066
Provide for all basic needs of displaced families in their new location .040
Establish incentive programs for early settlement .040
Conduct pre-acquisition public involvement .072
Communicate with all parties during planning, design, and scheduling .057
Provide a thorough understanding of the projects for society .057
Disclose public information to promote transparency and trust .056
Use mediators to help settle disputes efficiently .078
Create legally binding policies requiring stakeholder coordination .039
Propose new legislation to support ROW processes .078
Provide training for all levels of ROW staff .059
Confirm availability of appraisal and acquisition personnel .037
Ensure adequate funding for outsourcing staff assistance .015
Schedule road projects in alignment with ROW activities .012
Implement realistic acquisition schedules to avoid delays .029
Relocate utilities along the ROW promptly .047
Use modern software systems to manage ROW activities .058

ISM Output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INDEPENDENT
LINKAGE
AUTONOMOUS
DEPENDENT
DEPENDENCE
4, 15, 19
5, 6, 13, 16
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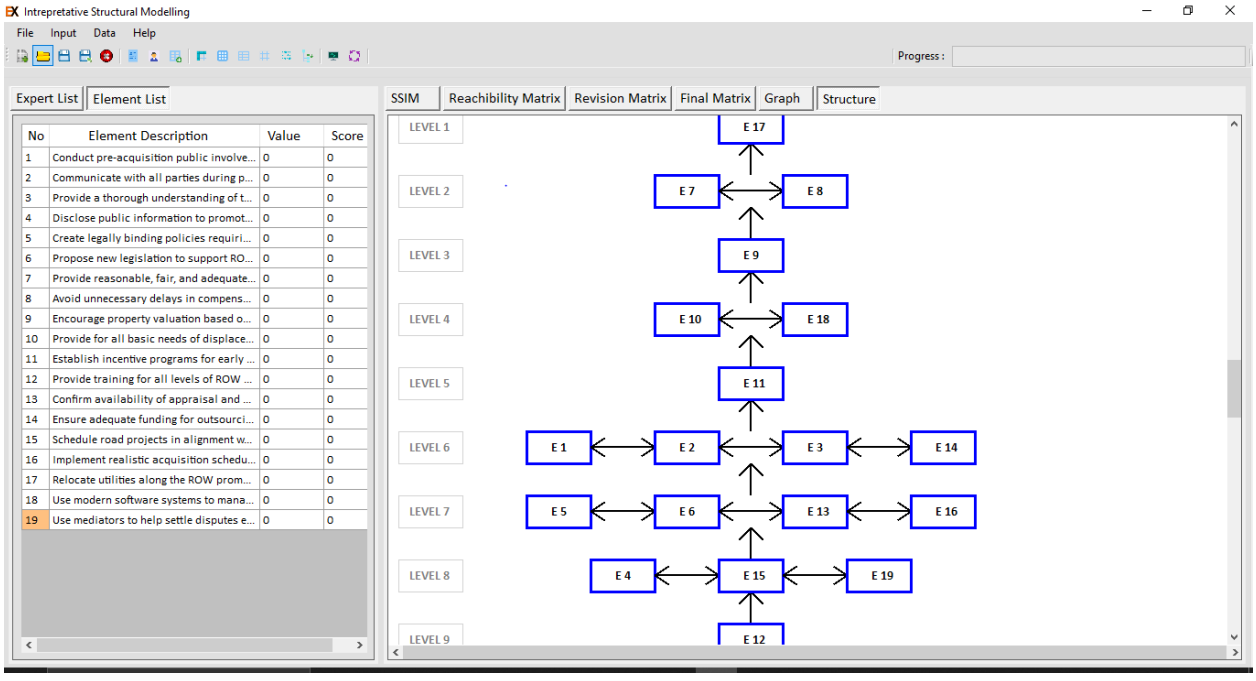
11
10, 18
9
7, 8
17


Intrepretative Structural Modelling
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Input
Data
Help
Progress :
Expert List
Element List
SSIM
Reachibility Matrix
Revision Matrix
Final Matrix
Graph
Structure
No
Element Description
Value
Score
1 Conduct pre-acquisition public involve... 0 0
2 Communicate with all parties during p... 0 0
3 Provide a thorough understanding of t... 0 0
4 Disclose public information to promot... 0 0
5 Create legally binding policies requiri... 0 0
6 Propose new legislation to support RO... 0 0
7 Provide reasonable, fair, and adequate... 0 0
8 Avoid unnecessary delays in compens... 0 0
9 Encourage property valuation based o... 0 0
10 Provide for all basic needs of displace... 0 0
11 Establish incentive programs for early ... 0 0
12 Provide training for all levels of ROW ... 0 0
13 Confirm availability of appraisal and ... 0 0
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15 Schedule road projects in alignment w... 0 0
16 Implement realistic acquisition schedu... 0 0
17 Relocate utilities along the ROW prom... 0 0
18 Use modern software systems to mana... 0 0
19 Use mediators to help settle disputes e... 0 0
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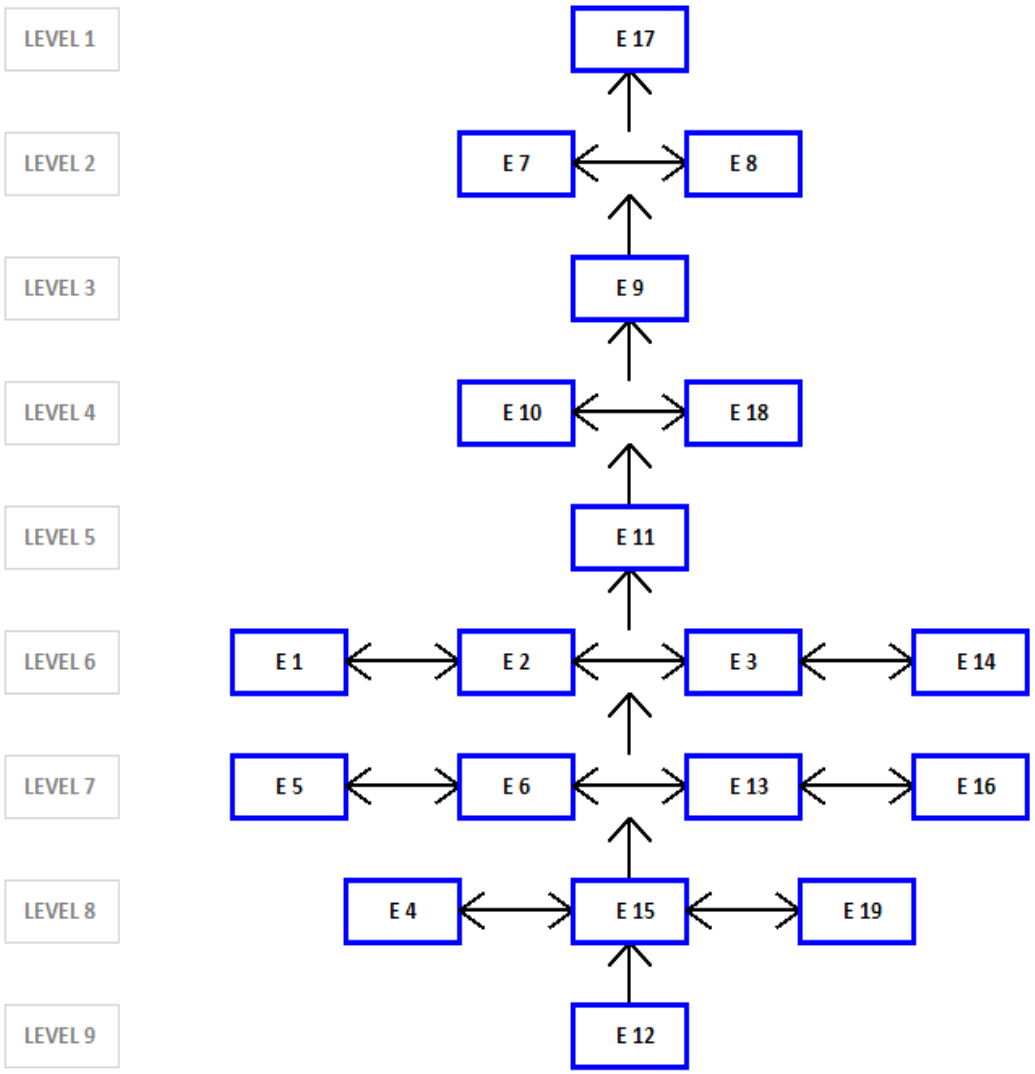
E 12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