

**MITIGATING COMMUNICATION BARRIERS IN  
WATER SUPPLY PROJECTS IN SRI LANKA:  
THE CLIENT'S PERSPECTIVE**

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Degree of Master of Science in Project Management

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## DECLARATION

“I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Date:

The above candidate has carried out research for the Master of Science (Project Management) dissertation under my supervision.

Signature of the Supervisor:

Date:

## DEDICATION

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Let this be dedicated to my beloved husband  
and my children who have stood by me and  
rendered enormous support and  
encouragement.

## **ACKNOWLEDGEMENT**

This dissertation would not have materialized if not for encouragement, guidance, constructive criticism and assistance of all those persons to whom my sincere gratitude is extended from the very bottom of my heart.

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I also take this opportunity to thank those who participated from National Water Supply projects and from remote project sites in this research. Without their invaluable input and feedback at various times, this study may not have been possible.

Finally, I wish to thank my family and friends who supported me in many ways during the study. Without their assistance and patience, it would not have been easy to meet the demands of this study.

## **ABSTRACT**

### **Mitigating Communication Barriers in Water Supply Projects in Sri Lanka: The Client's Perspective**

Future competition will be managerial competition, and the focus of competition among organizations will be effective communication among the members of the organization and with external organizations.

In this regards, this study aims to investigate how communication barriers can be mitigated in water supply projects in Sri Lanka firstly to review the important effective channels, media, directions, formal and informal, barriers and facilitators of communication together with project phases and stakeholders in the construction, secondly to identify the effectiveness of communication in water supply projects thirdly to identify barriers to effective communication in water supply projects and finally to propose measures of mitigation and facilitators/enablers to improve effective communication in water supply projects in Sri Lanka.

The study is conducted on Water Board Projects by the author in various national level project implementations. The study was conducted as a Qualitative study and with interview approach to collect the data from various levels of professionals in the project organization. This included projects which are distributed across the country and also which are constituted in one project location as well.

Based on research findings, the lack of clear objectives was revealed as the main communication barrier in water supply projects in Sri Lanka. Finally, it is identified as decentralization of project office and standardization of project documents are the leading communication facilitators for effective communication in water supply projects in Sri Lanka.

**Keywords:** *Communication, Barriers, Facilitators, Effectiveness, Water Supply Projects.*

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Description</b>
ADB	Asian Development Bank
Adl.GM	Additional General Manager
CE	Chief Engineer
CMC	Colombo Municipal Council
DGM	Deputy General Manager
FTF	Face to face
GM	General Manager
GOSL	Government of Sri Lanka
NWS&DB	National Water Supply and Drainage Board
P&D	Planning and design
PM	Project Manager
PMU	Project Management Unit
PRDA	Provincial Road Development Authority
RDA	Road Development Authority
RSC	Regional supporting center

## **CHAPTER ONE INTRODUCTION**

### **1.1. Background**

According to Notes desk (2009), communication is a process of exchanging information, ideas, thoughts, feelings and emotions through speech, signals, writing, or behaviour. Communication forms an integral component within almost all business and industry. According to Hellriegel, Jackson and Slocum (2005), communication is to an organisation what the bloodstream is to a person. Communications are essential to keep our entire organisation functioning at maximum levels. Bernard (as cited in Sarhadi, 2015) emphasized that communication is the primary task of any executive, and communication with employees regarding their concerns, problems, ideas, and suggestions about the organization is the critical skill of managing. Also he believed that in the exhaustive theory of organization, communication would occupy a central place, because the structure, extensiveness, and scope of organization are almost entirely determined by communication techniques.

Tai, Wang and Anumba, (2009) argued future competition will be managerial competition, and the focus of competition among organizations will be effective communication among the members of the organization and with external organizations. From another perspective, in the new business world in the organizations, team members are mostly from different cultural backgrounds who work together, partnering has been presented as one of the most suitable approaches to overcome the new practical shortcoming (Florichel, Bonneau, Aubry and Sergi, 2014). Thus communication can play a very important role, because without effective communication effective partnering cannot be achieved (Tai, Wang and Anumba, 2008).

Project is a temporary organization, where a range of roles and professionals work together as a team to achieve their common goal within limited time. This can be achieved by effective communication between team members of the project. According to Lewis and Dudley (2005) a project becomes live or dead by the flow of information, because many problems occur simply because various stakeholders are

not kept informed. Further authors add being kept constantly informed gave the stakeholders a sense of belonging to the entire team and a sense of ownership. Sarhadi (2015) concluded that communication is very important in different areas of project management such as: Human Resource Management (HRM), knowledge management, and virtual team coordination, trust building between team members, leadership, and stakeholders' management. Therefore good communication is very important for projects from inception to completion for mutual understanding and knowledge development among the team members.

According to Tam (1999), the construction industry is largely depending on information. In construction projects different professions in areas of expertise gather under one roof. Therefore it is crucial to transfer or move information among distinct professionals; all who may have conflicting priorities and differing objectives (Faniran et al, 2001). Due to its complexity, this emphasizes the efficiency and effectiveness of the construction process and shows how strongly it depends on the quality of communication. Good communication can improve teamwork and lead to a better collaboration. Hoezen, Reymen and Dewulf (2006) from their literature review found an improvement in the communication in project teams and between project manager and contractors could reduce failure and communication improvements in early phases of projects would positively influence the quality as perceived by all stakeholders involved. Further authors identified improved communication during the briefing might lead to better decision making and open communication at all levels could lead to innovations and better technical solutions.

One of the first steps in communicating more effectively is to identify hurdles to the process (Hellriegel et al., 2005). Further they identify these barriers as organisational and individual barriers. Organisational barriers are mostly linked with both formal and informal channels of communication. Individual communication barriers are personal communication competencies. Hence it is important to understand the various communication channels and barriers in construction projects to find out mitigating measures.

## **1.2. Research Problem**

Several studies concluded that the construction sector could benefit from effective communication. Baiden and Price (2011) have found that, communication is central to the efficient performance of any team, especially on construction projects, because of the different skill requirements. According to Tai, Wang and Anumba (2009), effective project team communication is one of the major challenges to a construction project's success (as cited in Ruwanpura, 2012). Amantha and Premakumara (as cited in Fernando, 2002) said poor communication has always been a problem in construction industry. Although the studies highlight several aspects of communication in construction, there seem to be a lack of literature mitigating communication barriers in the construction projects, particularly of water supply projects. The Sri Lankan Government targets to provide a safe drinking water supply for all by 2025 (Sarath Gamini, 2014), and there are 312 major, minor and small water supply schemes in operation under the NWS&DBs' purview (NWS&DB, 2011). Further The NWSDB was provided with Rs. 18,862.20 million as foreign funds for capital works on water supply and sewerage projects. The GOSL (Government Of Sri Lanka) contribution was Rs. 10,355.70 million as counterpart funds (NWS&DB, 2013). This indicate water supply projects are major infrastructure development projects in Sri Lanka, hence there is a dire need for improving communication to increase the project success. Therefore, it is necessary to understand that essential communication barriers that could affect mutual understanding and knowledge development among the team members. Thus it can be expected that communication barriers could arise when people who are in the team do not interact effectively in these water supply projects. This study aims to find out communication issues in water supply projects and thereby propose mitigation measures to overcome the communication barriers.

## **1.3. Aims and Objectives**

This research aims to investigate the communication barriers in water supply projects in Sri Lanka.

The aim was deliver through the following objectives:

1. To review communication channels, the measures of effectiveness, and barriers of communication in construction projects.
2. To investigate the communication channels and effectiveness of communication (in terms of factors identified in objective 1) in water supply projects.
3. To identify barriers to effective communication in water supply projects.
4. To provide recommendations to mitigate communication barriers in water supply projects in Sri Lanka.

#### **1.4. Methodology**

Research methodology which was used in this study is as follows.

##### **Literature review**

A comprehensive literature review was carried out by referring journals, conference papers, books, other publications and web-based sources in order to understand important, effectiveness, channels, media, directions, formal and informal, barriers and facilitators of communication in the construction industry.

Semi structured interviews were carried out with construction professionals who have been involved in water supply projects, to identify effects of communication, issues and barriers to effective communication in water supply projects and find mitigation measures and facilitators/enablers to improve effective communication in water supply projects in Sri Lanka. 10 participants were selected and data analysis was done through thematic analysis to drive the outcomes.

#### **1.5. Scope and Limitations**

Effective communication among all project stakeholders ranks high among the factors leading to the success of a project. Therefore, this study was focused to identify communication barriers in design and construction phases of water supply projects in the client's perspective and ways to mitigate those barriers. NWS&DB is the one and only client organization for water supply projects in Sri Lanka. Almost every water

supply project is handled by NWS&DB, thus effective performance of NWS&DB's project team will cause a better outcome in water supply projects in Sri Lanka. Further the scope of the study was limited to human aspects of communication.

## **1.6. Chapter Breakdown**

Chapter breakdown is organized as follows.

### **Chapter One – Introduction**

This chapter presents an overview of the research background, problem statement, aim and objectives, research methodology, scope and limitation and the chapter breakdown.

### **Chapter Two – Literature Review**

This chapter provides a comprehensive theoretical foundation to identify factors responsible for ineffective communication within construction project team.

### **Chapter Three – Research Methodology**

This chapter consists of the method that is used to find the relevant data in order to conduct the research and also describes the data analyzing techniques.

### **Chapter Four – Data Collection and Analysis**

This section provides a summary of the collected data together with its interpretation and discussion of findings.

### **Chapter Five – Conclusions and Recommendations**

The final chapter concludes the research with conclusions, recommendations and suggestions for further research.



## **CHAPTER TWO**

### **LITERATURE SYNTHESIS**

#### **2.1. Introduction**

A comprehensive introduction to the research was given in Chapter one. This chapter discusses the existing knowledge level regarding communication in construction projects and the barriers of communication in construction project.

It initially provides a brief explanation on construction project and the priority of communication, the stakeholders in construction projects and phases of a construction project. Then it goes on to discuss the communication process, channels, media, directions and types of communication in construction project are discussed respectively. Afterwards, communication barriers and facilitators are explained by using key literature findings. Finally, the problem of this research is declared at the latter part of this chapter.

#### **2.2. Construction Projects**

Several authors define the construction industry as complex and different from other industries. Baiden, Forgues and Koskela (as cited in Che Ibrahim, Costello, and Wilkinson, 2015) explain the construction industry is predominately known as a project-based industry, where the industry is represented by several types of organizations and group of individuals with different characteristics, different cultures and organizational practices of work but complementary skills and expertise needed for the delivery of a project

Further it is unlike other project-based sectors, where prototypes can be tested before production gets underway, construction projects tend to be one-off, unique undertakings that are designed and constructed to meet a particular client's product and service needs. Even where a standard design is being used, individual sites will present their own individual challenges with regards to ground conditions, logistical constraints and the prevailing weather, further different parties and their behaviors will provide a completely different set of relationships and interrelationships for every venture undertaken (Dainty, Moore and Murray, 2006).

Barlow (2000) described construction industry as due to its project based nature and the complexity of its supply chain relationship it makes less in control of its environment. Further he added conflicting interests arise because project participants have differing goals and priorities, and risk is transferred down the supply chain to those who are generally less stable to bear it. Further, Dainty (2006) also mentioned that construction is a fragmented and dynamic sector with a project based nature in implementation. The author added more that in construction projects multiple stakeholders operate in frequently changing sets of relationships which are contractually driven. Cheng, Li, Love and Irani (2006) also mentioned that the construction industry is considered to be a divisive and fragmented industry, where construction parties pay attention to conforming to contractual requirements defined by purchasers. Therefore construction projects show a reality of conflicts and lack of mutual respect and trust due to its culture that construction parties pay attention to conforming to their own interests.

Zhong and Low (2009) pointed out that the construction project process can be interrupted by enumerable incidents and crisis because in construction typically complex, crisis-prone activities are carried out in an environment which is uncontrollable, compared to many manufacturing industries.

A construction project usually requires a variety of skills and technology, and the involved parties belong to different professional backgrounds such as architecture, structural engineering, quantity surveying, civil engineering, project management, building surveying, etc. In addition, it is common that a project consists of several phases, including planning, design, construction, and commissioning which are generally completed by different professionals. The work done in one phase or by one party normally becomes the input for another phase or party. Therefore sharing and exchange of resources, information and knowledge and promote better understanding amongst project team members is important for successful completion of construction projects (Cheng, Li, Love, and Irani, 2001).

Further on-site problems deriving from the construction project process are identified by Kelsey, Laufer, and Tucker as lack of information sharing, Dainty, Emmit, Gorse, and Gustavsson also mention that poor communication between project actors and between project phases and Bankvall, Dubosi and Gadde mention uncertainties (as cited in Thunberg, Rudberg, and Gustavsson, 2017).

Due to the complex nature as described above of construction projects, it is necessary to identify the importance of communication. Therefore the next section discusses the importance of communication in a construction project.

### **2.3. Importance of communication in construction Project**

In construction projects, a large number of professionals and parties are involved dynamically thus greater interaction between all these parties is necessary. According to Cheng, Li, Love and Irani (2001), since these parties represent different professions with their multidisciplinary skills limit the scope of co-operation between them because a variety of their expertise is always a source of conflict if communicated improperly. Further they mention significant reason for this lies with the inherent problems in communication. Some common examples are not having open lines of communication (protocols), inappropriate communication channels (inefficient and/or ineffective), and unexpected communication breakdown.

In a construction project, its complexity is in its decentralized nature that is caused by geographical distribution of project participants, the different responsibilities of various parties, parties joining in different times to the construction teams, and the information generated by one party (i.e. the source of information) which delivers to another party have highlighted the importance of proper communication.

Barlow (2000) argued that the concern about the poor performance of the construction industry and its lack of innovation is coming at a time when its customers are demanding more and projects are becoming increasingly complex. The presence of short-term, discrete supply networks complicates the flow of knowledge and innovation between organizations. Similarly, standardization, innovation and organizational learning in the construction industry are all hindered by its discontinuous, project-based nature. Under these circumstances, coordination and integration of knowledge across organizations is critical for successful project delivery. In addition, the author pointed out that one of the key factors for this is the development of non-hierarchical internal and external communications structures. Further the author explained the degree to which cross-organizational knowledge transfer can influence several factors, which partly relate to the objectives of each

partner and partly to the type of knowledge, which may be transferred. Both these factors are, in turn, affected by the nature of intra and inter-organizational communications and organizational culture.

Internal communication problems concern a lack of coordination, mainly between the phases in the construction project process and on-site activities also create a lack of information and knowledge sharing. External communication problems cause a lack of coordination of work and information between contractors, sub-contractors and suppliers (Thunberg, Rudberg, and Gustavsson, 2017). Further this author argued trust can be improved as suppliers and subcontractors are engaged early in the planning process and are able to share their knowledge on planning and get a broader understanding about the construction project. In addition Phua and Rowlinson (2004) identified in their study, in contracting firms good communication and intra organizational cooperation are predictive of project success.

Kärnä and Junnonen (2016) found from their research that an effective communication network may prevent miscommunication between the designer and the contractor. Further they identify the importance of frequent and formal meetings as communication channels which help design team members and the contractor to understand the design process, improve buildability and solve problems. Further improving information flow throughout the procurement process, especially during the design process can minimize variation and rework (Love, Irani, and Edwards, 2004).

Tai, Wangan and Anumba (2008) have found that the performance of construction closely correlates with the effectiveness of communications. Further they found that the performance of the construction projects will enhance by 10.0 % if the communications could improve by 19.1%. Several other authors found that good communication between parties

- will improve mutual trust between parties
- is a crucial factor for project success
- during design process will reduce variation and rework
- is a significant factor for 'no-dispute' performance

On the other hand, ineffective communication between stakeholders will cause several negative impacts on construction projects as well. According to Dolage and Pathmarajah, (2015), poor communication with other parties is one of the potential causes of delay to the contractor in the construction industry of Sri Lanka. Sambasivan and Soon (2006) found lack of communication between parties is one of the factors for delays in the Malaysian construction industry as well. Further Rahman, Abdullah and Azis (2010) identified that the lack of communication between parties was found as a major factor affecting construction cost performance. Table 2.1 provides an overview of literature sources discussing the effects of communication in construction projects.

**Table 2.1: Influence of communication in construction projects**

<b>Source</b>	<b>Date</b>	<b>Country</b>	<b>Factor</b>	<b>Impact</b>
Kärnä and Junnonen	2017	Finland	Effective communication network	Improve buildability and solve problems
Dolage and Pathmarajah	2015	Sri Lanka	Poor Communication	Construction delay to contractor.
Rahman, Abdullah and Azis	2014	Malaysia	Lack of communication	Poor cost performance.
Garbharran, Govender and Msani	2012	South Africa	Effective communication	Project success.
Tabish and Jha	2011	India	Adequate communication	‘No-dispute’ performance in public construction projects
Tai, Wangan and Anumba	2008	China	Effective communication	Increase construction performance.
Wong ,Cheung, Yiu, Pang.	2007	Hong Kong	Good communication	Develops cognition-based trust among working members.
Sambasivan and Soon	2006	Malaysia	Lack of communication	Construction delay.
Love, Irani and Edwards	2004	Australia	Improving information flow	Minimize variation and rework.

#### **2.4. Construction Project Stakeholders**

Stakeholders are individuals or groups that benefit from an organization (Moloney, 2006). The author further stated that fundamentally, stakeholders affect and are affected by an organization and its activities. Stakeholders could affect functioning,

goals, development and even survival of an organization.

There are numerous stakeholders involved in construction undertakings, just as in any other endeavor. The list of stakeholders in a construction project is often large and would include (and is not limited to) (Pampliega, 2013):

1. Owners and facility users
2. Project management team members
3. Facilities managers
4. Designers
5. Shareholders
6. Public administration workers
7. Subcontractors
8. Services suppliers competitors
9. Banks and insurance companies
10. Media
11. Community representative
12. Neighbors
13. General public
14. Clients
15. Regional development agencies

In a different note Calvert (1995) and Winch and Bonke (2002) indicate the stakeholders in a project can be divided into

- ✓ Internal stakeholders - that is those who are members of the project coalition or who provides finance.
- ✓ External stakeholders - those who are affected by the project in a significant way.

Each of them would influence the course of a project at some stage. Some bring their influence to the projects more often than others. If diverse stakeholders are present in construction undertakings, then the industry should be able to manage its stakeholders.

Stakeholders could also be contrasted between those that are contracted to provide services (e.g. contractors, subcontractors, consultants) in a primary or direct relationship with an organization and those who has no contracted responsibility or formal redress, but are in an indirect or secondary relationship with an organisation (Smith and Love, 2004; Carroll and Buchholtz, 2006). The un-contracted stakeholders (e.g. members of the community and potential end users who are committed to occupy/use the facilities) can have power to disrupt projects through their actions, which can be political, but they are not easily held liable for their actions. Once the stakeholders are identified and a project team is assembled, it is essential to identify the possible resistance level for the project from each stakeholder. Attention should be focused to better leverage stakeholder's power and influence and to identify possible risks (Al-Khafaji, Oberhelman, Baum and Koch, 2010) from these stakeholders.

Communication is essential for maintaining the support and commitment of all stakeholders (Briner et al. 1996). Effective, regular, and planned communication with all stakeholders of the project community is necessary for project success (Briner et al. 1996; Cleland 1995). In addition, Weaver (2007) believes that project managers should be highly skilled negotiators and communicators, capable of managing an individual stakeholder's expectations and creating a positive culture of change within the overall organization. An organization cannot engage its stakeholders effectively without communication.

## **2.5. Phases of Construction Projects**

Construction projects consist of several phases as described in the section below (Cheng, Li, Love, and Irani, 2001),(Zou, Zhang, and Wang, 2007):

### ➤ Feasibility phase

Clients shall know what kind of product they want and need, conduct the project feasibility study as practically as possible, and develop the project brief which can be informative enough to guide the project development. Government agencies may avoid bureaucracy and minimize the procedures for approvals while clients always maintain a close relationship with government officers to shorten the time for approvals. The potential influence of price fluctuation of construction materials can be



contemplated in the project feasibility study

➤ Design phase

Designers play the most important role in this phase. They will make every effort to fully understand the client's wants and needs. They will carry out comprehensive investigation of site conditions, articulate the clients' needs in a technically competent way and within the limitation of the clients' resources, work collaboratively to develop a sound program schedule and cost planning and minimize defective designs. Clients have to minimize changes at their instigation and if variations are unavoidable, they have informed designers of any changes on time. Likewise, government agencies have to eliminate bureaucracy and create a swift environment to support project development. Whenever possible, the designers can involve contractors and client in reviewing the design drawings in order to minimize design defects and improve the constructability of the design as well as to ensure the value for money.

➤ Construction phase:

Most risks in the construction phase are likely to rest with contractors and subcontractors. In this phase, the design is fixed, the project progress no longer depends on creating a realistic schedule but on sticking to it, and budgetary risk is no longer a matter of pricing but that of cost control. First of all, contract terms need to be formulated to pinpoint the roles of all project participants, in which the responsibility of variations, project delay and the method of owners' payment will be defined clearly. To keep the construction work on track, contractors with competent management skills need to be appointed and a highly cooperative construction team need to be established in which experienced specialist contractors and skilled laborers are staffed, and communication, trust, commitment and integration is expected to bridge the physical and knowledge gap between different project participants. Constructors and subcontractors have to develop safe work method statement for every major construction activity. Contractors have to at least purchase safety insurance for all employees, if not for major equipment. Last but not least, viable strategies and techniques can be adopted to monitor and minimize the pollution associated with construction activities throughout the development processes.

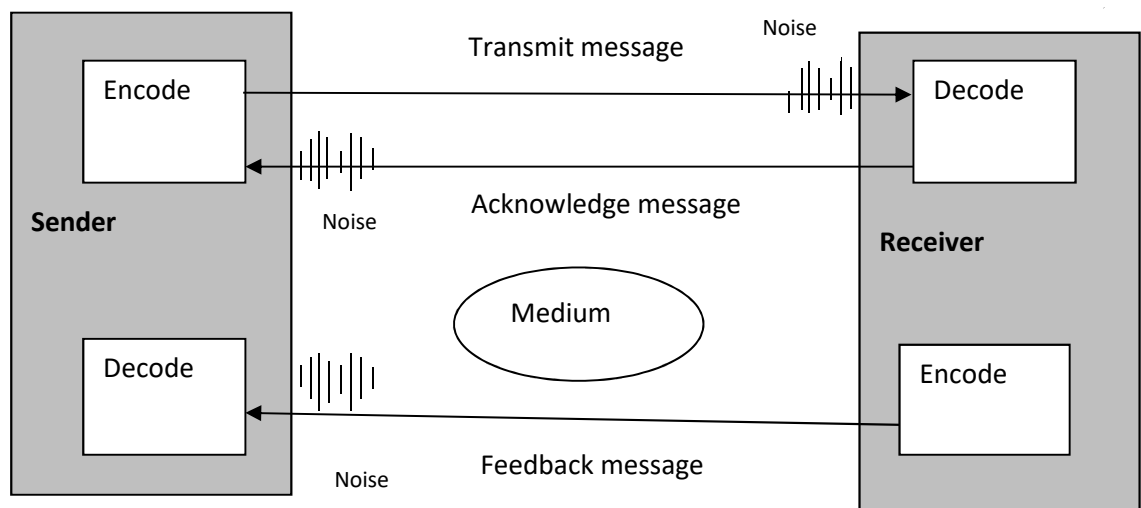
➤ Closing Phase

During the final closure, or completion phase, the emphasis is on releasing the final deliverables to the customer, handing over project documentation to the business, terminating contracts, releasing project resources, and communicating the closure of the project to all stakeholders. The last remaining step is to conduct lessons-learned studies to examine what went well and what did not. Through this type of analysis, the wisdom of experience is transferred back to the project organization, which will help future project teams.

Improved communication during the briefing might lead to better decision making, for example less haste in moving to solutions and better ways of looking at the requirements first (Barrett and Baldry 1995). According to Bowen (as cited in Olatokun and Pathirage, 2015). A lack of clarity with regard to communication networks between consultants is also perceived to be a barrier to effective briefing. Further Godfrey (as cited in Arditi and Gunaydin, 1997) explained communication and cooperation between designers are vital for sound design and cooperation lies in the improved communications and enhanced organization. Also lack of cooperation may result in inconsistent design, which then may cost extra time and money throughout the construction process. Further it was identified communication with owner in the design phase has to be handled carefully because the main purpose of communication with owner is not for the owner to only define the project requirements but also to transmit those requirements effectively to the other parties involved in this process and in construction phase improved communications and shared information may increase the effectiveness of the supervision by the contractor (Arditi and Gunaydin, 1997). Cheng, Li, Love, and Irani,(2001) mention in construction, communication is crucial to integrate the parties in the design and construction processes.

## 2.6. Communication Process

Communication can be thought of as the interactive transmission of signal between one person or group and another, and these signals can be written or oral (Warren, 1989). Perumaland Abu Bakar, (2011) state communication is pervasive in all areas of organizational life and it is a two-way process in which there is an exchange and progression of thoughts, feelings, or ideas towards a mutually accepted goal or direction. Further they added communication is the process in which information is encoded and imparted by a sender to a receiver via a channel/medium. The receiver then decodes the message and gives feedback to the sender. Figure 2.1 illustrates the elements of communication process in a leaner model which consist of two parties who are the sender and the receiver.



**Figure 2.1: Basic communication Model**

*Source: PMBOK guide, 2013*

- **Encode:** Thoughts or ideas are translated (encoded) into the language by the sender.
- **Transmit message:** This information is then sent by the sender using communication channel (medium).
- **Noise:** The transmission of this message may be compromised by various factors

(e.g. distance, unfamiliar technology, inadequate infrastructure, cultural difference, and lack of background information)

- **Decode:** The message is translated by the receiver back into meaningful thoughts or ideas.
- **Acknowledge:** Upon receipt of a message, the receiver may signal (acknowledge) receipt of the message but this does not necessarily mean agreement with or comprehension of the message.
- **Feedback/ Response:** When the received message has been decoded and understood, the receiver encodes thoughts and ideas into a message and then transmit this message to the original sender.

Robbins and Coulter (2002) mentioned that communication between manager and employees provide the necessary information to get work done effectively and efficiently in the organization. The famous American futurist, Naisbitt, said (as cited in Tai, Wang, and Anumba, 2009), “Future competition will be managerial competition, and the focus of competition among organizations will be effective communications among the members of the organization and with external organizations”. Further Barnard said (as cited in Tai, Wang, and Anumba, 2009), “Formal organization is based on three important elements, which are: members’ willingness to cooperate, common purposes, and communications” and further mention communication is the means of an organization to link its members and achieve their common objectives. Communication can be divided into hard and soft aspects. Hard aspects concern how information can be effectively shared among all involved organizations, and soft aspects concern attitudes, relationships, etc. (Dainty, Moore, and Murray, 2006). Zhou and Benton Jr claim that information sharing is crucial for establishing good forecasts and coordinating internal functions. Further Mentzer, DeWitt, Keebler, Soonhoong, Nix, Smith, and Zacharia claimed sharing information and establishing good relationships both internally and externally are important for establishing reliable plans and supply chains (as cited in Thunberg, Rudberg, and Gustavsson, 2017).

Effective communication skills can help organizations to facilitate the exchange of ideas and visions, which can reduce misunderstandings and encourage mutual trust (Cheng, Li, & Love, 2000). Further Aapaoja, Herrala, Pekuri, Haapasalo (as cited in Che Ibrahim, Costello, and Wilkinson, 2015) added that creating frequent communication will provide a foundation for trust among the project team.

Armstrong(as cited in Dainty, Moore, and Murray, 2006) briefly summarizedthe importance of communication in an organization as follow:

- Achieving coordinated results– An organization’s objectives can be achieved by collective actions of people and independent actions of people lead to contrasting outcomes with organizational objectives. Therefore coordinated outcomes demand effective communications.
- Managing change– Mostorganizationsimplement continuous changes fromtime to time. Thiswillaffect their employees. Therefore if the reasons for these changes are well communicated with the employees, then they will accept and embrace those changes.
- Motivating employees– the degree of motivation to anindividualto work effectively in their organisation is dependent upon the responsibility they have and the scope for achievement afforded by their role. Feelings regarding this will depend upon the quality of communications from senior managers within their organisation.
- Understanding the needs of the workforce– for organisations to be able to respond effectively to the needs of their employees, it is vital that they develop an efficient channel of communication.

Robbins and Coulter (2002) argued that the entire communication process is susceptible to noise that can interfere with the transmission, receipt, or feedback of a message and it creates distortion at any point of the communication process.Further communication can be viewed as a professional practice where appropriate rules and tools can be applied in order to enhance the utility of the information communicated (Dainty, Moore, and Murray, 2006).

### 2.6.1. Communication channels

According to Dainty, Moore, and Murray (2006), communication channels are referred to as the conduit through which the message passes (such as the telephone, a meeting, a letter etc.).

To enhance communication flow, parties have to create different communication channels for example, using workshops or meetings to enhance face-to-face (FTF) discussion, and using computers to facilitate remote discussion. Using Information Technology (IT), such as e-mail or teleconferencing, to gather the geographically dispersed parties together, shortens parties' distance and even eliminates national borders(Cheng, Li, Love, and Irani, 2001;Wong, Cheung, Yiu, and Pang, 2008).

Further, Hartmann (2006) found an open communication within construction firms will stimulate the generation of new ideas and particular attention has to be paid to communication channels allowing exchange of information about solutions of similar problems and detection of experts, especially peers from other business units. Further he added that common channel to facilitate formal communication within the business units is the meeting of construction site managers. This meeting takes place weekly and it explicitly provides the opportunity to exchange new ideas or to discuss problems among the members.

The channel must be appropriate to the content if communication is to be effective. Communication channels used in large-scale construction projects in China is shown in Figure 2.2.

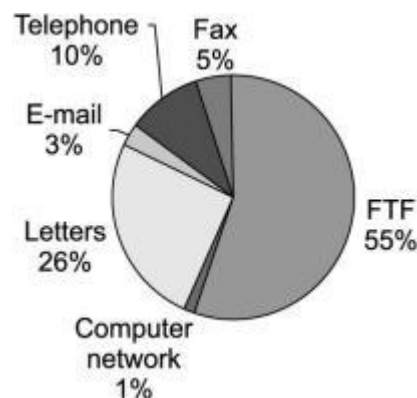


Figure 2.2: Communication channels in the surveyed projects

Source: Tai, Wangan and Anumba, (2009)

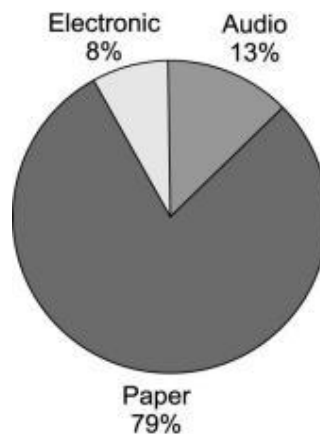
### **2.6.2. Communication media**

Dainty, Moore, and Murray (2006) mentioned the choice of which media is the most appropriate will depend upon the nature of the information and recipient, and the outcomes desired from the communication. Further these authors explained communications media comprise the following generic types

- **Speech/verbal**– Oral communication between individuals or groups where it is the most direct form of communication. It can be formal (such as in meetings and focus groups) or informal in nature. Conversations and discussions are often the most effective ways of ensuring that people feel involved or consulted in a process. They also allow immediate feedback to be collected by the transmitter and so have the potential to avoid some of the effects of noise that can militate against the effectiveness of other media. It can be either face-to-face or via the telecommunications media.
- **Non-verbal**– Direct communication is also affected through a range of non-verbal signals. Non-verbal cues convey the nuances of meaning and emotion that reinforce or contradict the verbal message in a given situation. In many ways they can be more powerful than the verbal messages they are usually combined with. Individual non-verbal cues can come in the form of expressions, gestures and eye movements. This relay more meaning to the verbal cues provided through conversation.
- **Written**– Written communication is indirect in nature, but has a big advantage in that and it provides a permanent record of the communication if desired. Many forms of written communication are governed by rules and/or protocols dictated by organizations or professional codes of conduct. Written forms of communication allow the sender to carefully consider what they want to say and to convey this in a clear and meaningful way without the need for direct interaction with the recipient. It also allows the sender to communicate with a number of different people at the same time using a medium that is readily understood and unlikely to be misinterpreted. Although this has disadvantages in the time it takes to receive feedback.

- **Audiovisual**– graphical or audio-based media designed to convey a message more effectively. Graphical media are used in combination with other media in order to convey information more clearly. These are often used to report financial information in order to effectively summarize complex data. There are also advantages in conveying complex technical issues to parties who would otherwise struggle to interpret meaning within exchanges.
- **Electronic**–The take-up of these types of technology has been particularly rapid because of the advantages that they present in speeding up the rate of transaction between parties and transferring information between parties. Innovations such as email and even video conferencing are now possible through hand-held communications devices which allow the user to communicate from remote locations and sites.

Tai, Wang, and Anumba(2009) found in their research in communication large construction projects in China, design firms only provided paper-based drawings so as to protect their intellectual property. This constitutes a big obstacle to electronic communications. Due to legal considerations, conflicts of interest, and habits, information originally generated in electronic form is often printed out in a paper media. The finding is shown in Figure 2.3.



**Figure 2.3: Communication media**

*Source: Tai, Wangan and Anumba, (2009)*



### **2.6.3. Listening**

In order to have efficient communication, one party must speak and other must listen, so they must then reverse roles. Warren (1989) argued listening is the most important in these two roles. Clements and Gido (2006) mention that the heart of communication is not words, but understanding, which makes half of effective listening. Further they added failure to listen can cause a breakdown in communication. Active listening increase understanding and reduces conflict.

### **2.6.4. Formal and informal Communication**

Communication within the organization can be divided into formal and informal communication. Formal communication refers to communication that follows the official chain of command or is part of the communication required to do one's job and informal communication is organizational communication that is not defined by the organization's structural hierarchy (Robbins and Coulter, 2002). In formal communication, information diffusion is restricted and flow insufficiently (Cheng E. W., Li, Love, & Irani, 2001). Further Perumal and Abu Bakar, (2011) mention informal communication may transmit completely imprecise information that may harm rather than help an organisation, but both informal and formal communication are required for an efficient operation in any organisation.

### **2.6.5. Direction of communication flow**

Robbins and Coulter (2002) described that there are four directions of communication. They are:

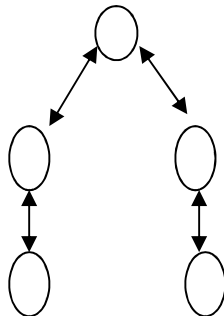
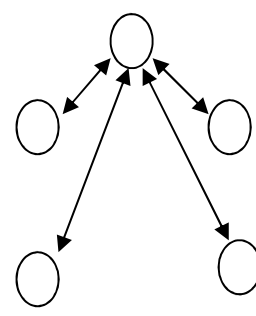
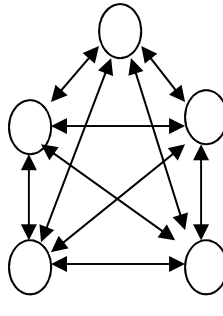
- **Downward communication:** Any communication that flows downwards from a manager to employees. It is used to inform, direct, coordinate, and evaluate employees.
- **Upward communication:** Communication that flows upward from employees to manager. Managers also rely on upward communication for ideas on how things can be improved.
- **Lateral communication:** communication that takes place among any employee on the same organizational level. It saves time and facilitates coordination.

- **Diagonal communication:** communication that cuts across both work areas and organizational level. It is efficient and speedy communication flow.

Vertical flow of communication has been known to be associated with information loss. Bateman and Snell (Cheng, Li, Love and Irani, 2006) reported that only 20 per cent of the information passed down the hierarchy from the top management might reach the workers on the shop floor. They added that this might be due to problems such as information overload, lack of openness, and filtering.

### 2.6.6. Communication Network

Vertical and horizontal flow of organizational communication can be combined into a variety of patterns called Network Communication (Robbins & Coulter, 2002). Different types of Network Communication are shown in Figure 2.4.

			
<b>Criteria</b>	<p><b>Chain Network</b> Communication flow formal chain of command.</p>	<p><b>Wheel Network</b> Communication flow between a clearly identifiable and strong leader and others in a work group or team.</p>	<p><b>All channel Network</b> Communication flows freely among all members of a work team.</p>
Speed	Moderate	Fast	Fast
Accuracy	High	High	Moderate
Mergence of leader	Moderate	High	None
Member satisfaction	Moderate	Low	High

**Figure 2.4: Three common Organizational communication networks and how they rate on effectiveness criteria**

*Source:* Robbins and Coulter, (2002)

Cheng, Li, Love, and Iran (2001) explain the different parties in construction project represent different professions including architecture, structural engineering, quantity surveying, civil engineering, project management, building surveying, etc., Their multidisciplinary skills limit the scope of co-operation between them due to not having open lines of communication (protocols), inappropriate communication channels (inefficient and/or ineffective), and unexpected communication breakdown. Because of these factors, there has been a surge in the formation of construction networks. Such network structures support improvements in communication and interaction between project partners. This then results in the establishment of a web (all channel) of communication, which in turn seeks to facilitate the operations of the construction parties. Free flowing communication build up trust and ensure that everyone is aware of the objectives. Further effective communication networks will reduce miscommunication between designer and the contractor (Karna and Junnonen, 2017).

## **2.7. Effectiveness of communication in Construction Project**

Effective communication extends the concept to require that transmitted content is received and understood by someone in the way it was intended. The goals of effective communication include creating a common perception, changing behaviors and acquiring information (Brown, 2015). Further Miller(2016) mention without effective civil communication, cannot define and share project goals and without efficient information exchange, cannot achieve productive project outcomes for cost certainty, timely delivery and quality products and services.

Wong, Cheung, Yiu, and Pang, (2008) explained effective communication is pivotal to the smooth running of a project. Further authors mention regular contacts like progress meetings, technical meetings, quality control work shops, site safety work shops or site visits should be frequently scheduled so that performance can be monitored and telephone and emails are more important efficient means for information sharing.

Tai, Wangan and Anumba (2009) identified that the effectiveness of communication is affected directly by the procurement method of construction projects because the

procurement method determines the interest relationships among the key participants. Further Barlow( 2000) argued that the partnering process included the dissolution of traditional hierarchical communications structures and considerable emphasis on teambuilding also result in technical and process innovation.

Dainty, Moore and Murray (2006) mention that the structural attributes of the construction industry have also been found to inhibit communication. Due to the dominant sequential view of construction activities which tend to prevail can prevent open and effective communication between parties within the construction supply chain.

According to Tai, Wang and Anumba (2008) the perception of the receivers on the information received is used to assess the effectiveness of communications. Further they divide the perception of receivers into five aspects

- Information overload
- The lack of information
- Accuracy
- Timeliness
- Completeness of information.

## **2.8. Communication Barriers**

Robbins and Coulter (2002) mentioned the following as barriers to effective interpersonal communication.

- Filtering  
The deliberate manipulation of information to make it appear more favorable to the receiver.
- Selective perception  
When people selectively interpret what they see or hear on the basis of their interests, background, experience and attitudes.
- Emotions  
How a receiver feels when a message is received influences how she or he interprets it.

- Information overload  
When the information people have to work with is exceeding their processing capacity.
- Defensiveness  
When people feel that they're being threatened, they tend to react in ways that reduce their ability to achieve mutual understanding.
- Language  
People who work for the same organization but in different departments often have different jargon.
- National culture  
Communication differences can arise from the different languages that individuals use to communicate and the national culture of which they are a part of.

Further Tai, Wang and Anumba (2009) found in their study following reasons for communication problems in large scale construction project in China.

- Lack of good communication mechanisms  
This is due to the conflicts of interest among the participants and the rights and obligations of each party. They are defined by the contract. In order to maximize its own interests, each party tends to keep information "confidential" rather than "sharing".
- Weak organizational structure of construction team  
Before reaching the intended recipients, messages communicated have to go through a long and tortuous process of transformation. This leads to information distortion.
- Lack of uniform standards for construction information.  
Large-scale construction projects often involve hundreds of professionals and numerous firms may join the construction team at different times. Firms may have a different understanding and experience of the same construction projects, and the same construction information may have different forms of expression. Lack of uniform information standards across the whole industry is another obstacle to communications.

- Lack of support for advanced communication technologies.

As a labor-intensive industry with relatively low levels of knowledge, the application of new information technologies have lagged behind compared with the manufacturing industry

According to Baguley (as cited in Dainty, Moore and Murray, 2006) the types of factors causing communication difficulties can be further refined:

Lack of clear objectives – without a clear intention, this leads to uncertainty of the message, and to confusion between the transmitter and receiver.

Faulty transmission – usually occurs because the message is sent via an inappropriate medium or channel. It can also occur when a receiver is expected to absorb too much information or when they lack an insight into the circumstances around the transmission.

Perception and attitude problems – are related to misunderstood messages where transmitter and receiver attribute different meanings so that a shared understanding is not possible.

Environmental problems – from distractions and noise, a lack of appropriate communications media and physical distance.

Chinese Whispers – the phenomenon of a message being gradually distorted as it passes along the message chain. The longer the chain, the more distorted the message would become.

**Table 2.2: List of Communication Barriers**

Nos	Barriers	Sources						
		Robins and Coulter (2008)	Tai, Wang and Anumba (2008)	Sambasivan, Soon (2006)	Priyadarshani, Kumar (2015)	Perumal, Abu Hassan (2011)	Dainty, Moore and Murray (2006)	Cheng, Li, Love, Irani (2001)
01	Filtering (Deliberate manipulation of information favorable to the receiver.)							
02	Selective perception (people selectively interpret what they see or hear on the basis of their interests, background, experience and attitudes)							
03	Emotions (How a receiver feels when a message is received)							
04	Information overload							
05	Language (People who work for the same organization but in different departments often have different jargon)							
06	National culture							
07	Lack of good communication mechanisms							
09	Lack of uniform standards for construction information.							

Nos	Barriers	Sources					
		Robins and Coulter (2008)	Tai, Wang and Anumba (2008)	Sambasivan, Soon (2006)	Priyadarshani, Kumar (2015)	Perumal, Abu Hassan (2011)	Dainty, Moore and Murray (2006)
10	Lack of support for advanced communication technologies.						
11	Physical distance between the project participants.						
12	Proper various channels between the various parties.						
13	Lack of clear objectives						
14	Faulty transmission						
15	Perception and attitude problems						
17	Chinese Whispers (A message being gradually distorted as it passes along the message chain)						
18	Not having open lines of communication						



## **2.9. Communication facilitator**

According to Love, Gunasekaran and Li (as cited in Love, Irani, and Edwards, 2004) by replacing traditional project structures used for procuring projects with a horizontal organisation structure founded on multi-disciplinary team approach can improve communication and reduce the barriers to information flow in project.

Che Ibrahim, Costello, and Wilkinson (2015) had found in their study that the free flow of communication is one of the top key indicators influencing the management of team integration in construction projects. Further he adds following suggestion to encourage open communication.

- Organising some team bonding activities early in the project.
- Organising frequent meetings with a strong focus on clear communications and alignment of all team members.
- Ensure a mix of capabilities and experience, foster an open collegial working environment, co-locate and communicate clearly.
- Encourage the “culture of team” through organizing off-site and on-site events to assist with relationship building and understanding individual styles of communication.

Open and flexible communication promotes better understanding amongst members (Cheng, Li, Love and Irani, 2006). Not only between client and other professional parties, Love (1997) pinpointed that subcontractors rely heavily on the general contractor for developing open communication. Further, Moore and Danity (2001) suggested that in a multi-disciplinary project team, the flow of communication can be improved as they will encourage face to face relationships and interaction between team members.

Cheng, Li, Love and Irani, (2006) argued to enhance communication flow, parties have to create different communication channels (Using workshops or meetings to enhance face-to-face discussion, and using computers to facilitate remote discussion. Using information technology (IT), such as e-mail or teleconferencing, to gather the geographically dispersed parties together, shortens parties' distance and even eliminates national borders.)

Lloyd-Walker, Mills and Walker (as cited in Che Ibrahim, Costello, and Wilkinson, (2015) explained no blame approach encourages free flow communication and sharing of information thus helping to release organizational knowledge that exists within individuals through collaboration. The utilization of Information and Communication Technologies (ICTs) within project will enable team members to have a greater accessibility to one another and this may enable greater degree of interaction between team members. This will contribute to an effective communication process in the project (Love, Irani, & Edwards, 2004).

Perumal and Abu Bakar (2011) revealed in their research, better understanding among stakeholders in construction industry can be reached by good document standardization and the usage of communication instruments. Further the authors mention a good standardization process ensures timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information.

Tai, Wang, and Anumba (2009) explore the following to improve communication in Chinese large scale construction projects.

- Establish mechanisms for sharing the savings resulting from improved communications.
- Make full use of existing IT tools to explore the possibility of new organizational forms for the construction project teams.
- Establish a uniform communication standard for construction information across the whole construction industry.
- Resolve the legal issues in electronic communications early in the project lifecycle.

The summary of communication facilitators in construction projects are identified from the literature survey are given in Table 2.3

**Table 2.3: List of Communication facilitators**

Nos	Facilitators	Sources					
		Love, Irani, and Edwards (2004)	Che Ibrahim, Costello, and Wilkinson (2015)	Moore and Danity (2001)	Cheng, Li, Love and Irani, (2006)	Perumal and Abu Bakar (2011)	Tai, Wang, and Anumba (2009)
01	Replacing traditional hierarchical organization structure with horizontal organizational structure.						
02	Organizing team bonding activities early in the project.						
03	Organizing frequent meetings with a strong focus on clear communications and alignment of all team members						
04	Ensure a mix of capabilities and experience, foster an open collegial working environment, co-locate and communicate clearly.						
05	Encourage the “culture of team” through organizing off-site and on- site events to assist with relationship building and understanding individual styles of communication.						

Nos	Facilitators	Sources					
		Love, Irani, and Edwards (2004)	Che Ibrahim, Costello, and Wilkinson (2015)	Moore and Danity (2001)	Cheng, Li, Love and Irani, (2006)	Perumal and Abu Bakar (2011)	Tai, Wang, and Anumba (2009)
06	Create different communication channels.						
07	No blame culture						
09	The utilization of ICTs within project						
10	Good document standardization and the usage of communication instruments.						
11	Establish a uniform communication standard for construction information across the whole construction industry.						
12	Resolve the legal issues in electronic communications early in the project lifecycle.						

## **2.10. Water supply Project in Sri Lanka**

Water is an essential element for the survival of mankind and 30% of world's population has no proper access to drinking water. According to the data given by the Department of Censuses and Statistics [40% of the Sri Lankan population have organized water supply facilities and 59.4% is dependent on other sources such as wells, tube wells, streams and rivers etc., including 10% on unprotected sources. The Sri Lankan Government targets to provide a safe drinking water supply for all by 2025 with 60% piped born water supply coverage by 2020 through the national authority to provide drinking water, NWS&DB (Sarath Gamini, 2014).

Therefore water supply projects are one of the major infrastructure development in Sri Lanka. The water supply and drainage functions are carried out by the NWS&DB which functions under the Ministry of Water Supply and Drainage. This ministry was established in 2007 separately for the subject area of water supply and drainage. The NWS&DB had its beginning as a sub department under the Public Works Department with responsibility for water supply and drainage systems of Sri Lanka. From 1965, it functioned as a division under various ministries until January 1975 when it was converted to a Statutory Board by an Act of Parliament.

There are 312 major, minor and small water supply schemes in operation under the NWS&DBs' purview. According to the statistics, 84.1% of the population have safe access to drinking water of which 43.5% is through the piped water supply system (NWS&DB, 2011).

The NWS&DB was provided with Rs. 18,862.20 million as foreign funds for capital works on water supply and sewerage projects. The GOSL contribution was Rs. 10,355.70 million as counterpart funds. In addition, Rs. 3,499.00 million of local consolidated funds were allocated for small and medium water supply projects. For the reconstruction of tsunami affected water supply systems, a sum of Rs. 523.00 million in foreign funds and Rs. 379.30 million in local counterpart funds were provided. For the purpose of water sector community facilitation a sum of Rs. 265.00 million in foreign funds and Rs. 880.00 million in local counterpart funds were provided (NWS&DB, 2013).

This shows that there are many water supply projects which are ongoing all around the country and will be implemented in future also. Therefore it is necessary to

improve performance of the water supply projects. Communication is considered as one of the critical success factors in construction projects and according to the literature there are 17 communication barriers that are identified in construction projects. These barriers have a significant effect on project performance. Water supply projects are more fragmented in nature and involve high uncertainty compared to building construction projects and it involves a lot of foreign and local external stakeholders. Further water supply projects technically differ from building construction projects. Hence it is important to have good integration between parties and knowledge development and innovation in water supply projects. There are no studies carried out regarding the mitigation of communication barriers in water supply projects. Therefore it is necessary to identify the communication barriers in water supply projects to improve effective communication.

### **2.11. Summary**

Construction projects are dynamic, fragmented and unique in nature. There are a lot of professionals with different backgrounds involved in different phases of a project. Due to its complex nature, communication plays an important role. Communication is a key factor for a construction project's performance. A construction project involves several phases and there are different stakeholders involved in every phase. Further communication media, channel, direction, network and formal and informal communication are important for effective communication. It is important to identify the effectiveness of communication and communication barriers and facilitators for the success of a construction project.

In the next chapter, design of research and research methodology will be explained.

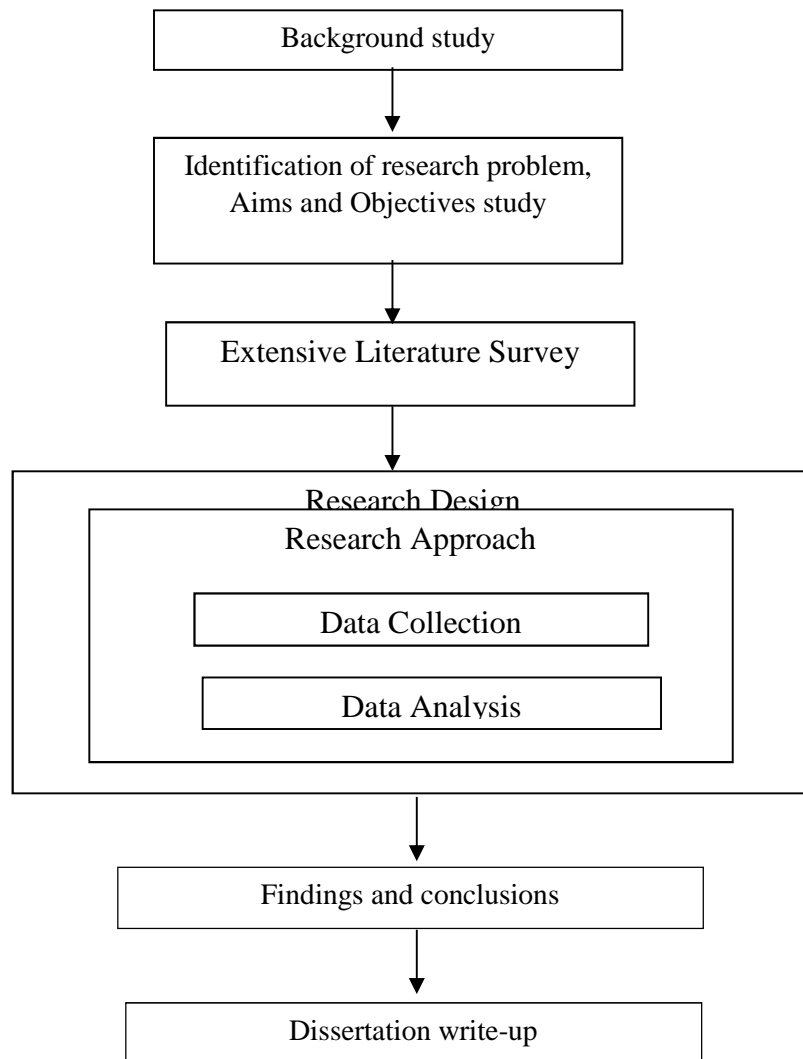
## CHAPTER THREE DESIGN OF RESEARCH AND RESEARCH METHODOLOGY

### 3.1. Introduction

This chapter discusses the methodology adopted for this research study. It illustrates the research process and subsequently describes the research design including research approach, data collection and analyzing techniques in detail.

### 3.2. Research Process

Research process consists of series of actions or steps necessary to effectively carry out research ( Pandey & Pandey, 2015). The research process for this particular study is illustrated in the following Figure 3.1.



**Figure 3.1: Research process of the Study**

### **3.3. Research Design**

A research design is a conceptual structure which a research would be conducted. Parahoo (1997) describes a research design as a plan that describes how, when and where data are to be collected and analyzed. The function of research design is to provide for the collection of relevant evidence with optimum effort, time and expenditure. It may be either a quantitative approach with emphasis on gathering of numerical data and focus on numbers or a qualitative approach with emphasis on analysis of complex data in terms of its content or native interpretation (Taylor, 2010). The following sections describe the research design of this research study.

### **3.4. Research Approach**

Research approaches are classified mainly into two categories namely the quantitative approach and qualitative approach. Creswell (as cited in Ramachandra, 2013) suggests that a quantitative study employs research strategies such as experiments and surveys, and collects data using predetermined instruments that yield statistical data. Further a qualitative study approach uses research strategies such as case studies, grounded theory, ethnography, content analysis and phenomenological data. Considering the nature of the research problem, it is obviously important to identify the communication barriers and facilitators in water supply projects in Sri Lanka to mitigate existing communication barriers. The approach which was selected as the most appropriate is the qualitative method since the problem domain is very vast and cannot be constituted as a clear cut boundary. Furthermore, the qualitative approach permits researchers to empathize and become close to participants, penetrate their realities and interpret their perceptions (Shaw, 1999). Apart from this, Zainal (2007) argued that the qualitative approach helps to explain the complexities of real life situations, which may not be captured through experimental or survey research or quantitative analysis. Taking these points into careful consideration, the qualitative research designs and methods of data collection were selected to achieve the aim of this study.

### **3.5. Data collection**

Shaw (1999) pointed out that the data collection methods used in qualitative research must allow the researcher to enter into the social world in which they are interested and to have an empathetic understanding of participant's personal feelings, opinions, and experiences of the social phenomenon under investigation. Hence semi structured



interviews was used to collect data in water supply project teams. Semi-structured interviews are non-standardized and qualitative interviews where the researcher aims to probe more about certain issues. This gives the researcher flexibility to cover certain themes and questions, and to incorporate and change questions according to the interview.

The interview method of data collection is supported by Karlsen, Graee and Massaoud (2008) who have emphasized that interviews are used to explore and probe in depth about those particular circumstances.

### **Interview process**

The focus of the interviews were on investigating communication barriers in water supply projects and to propose recommendations to overcome the same. A semi-structured interview approach was adopted to allow in-depth and free flow of information from interviewees. According to Baiden and Price (2011), a combination strategy should be adopted during the interview, which increases the richness of the data collected. Three approaches - informal conversation, interview guideline and standardized open-ended questions were used. Furthermore, an interview guide (refer Appendix A) was adopted to explore the stated phenomena.

### **Selection of respondents:**

The interviews were conducted with 10 respondents from project teams in water supply projects. Selection of respondents was limited to project team members from NWS&DB. Study was focused on client perspective. NWS&DB is the only client organisation for water supply projects in Sri Lanka. Hence, NWS&DB plays a key role in water supply project. Therefore communication process is important for NWS&DB project staff to effectively communicate with external and internal parties.

Respondents were selected based on the roles they play and project phases they involve in various water supply projects across the country. The respondents' details are given in Table 3.1. This enhance the validity of data collected. Therefore, altogether ten (10) interviews were conducted and the interviews took more than one to two hours.

During interviews, informal conversation on brief theoretical explanation has been delivered about effective communication and communication barriers. During the

interviews, note taking and tape recording (with prior approval from the interviewee) were done to maintain the accuracy of data collected. This blended approach improved the flexibility of the interview and enabled more relevant data pertaining to practice towards communication.

**Table 3.1: Detail of interview participants**

<b>Interviewees</b>	<b>Role</b>	<b>Involved Project Phase</b>
<b>101</b>	Project Director	Formulation to completion
<b>102</b>	Project Director	Implementations to completion
<b>103</b>	Deputy project Director	Implementations to completion
<b>104</b>	Project Engineer	Implementation to completion
<b>105</b>	Project Quantity surveyor	Implementation to completion
<b>106</b>	Project secretary	Formulation to completion
<b>107</b>	Assistant General Manager (Documentation)	Design and tendering stage.
<b>108</b>	Assistant General Manager	Planning to completion
<b>109</b>	Chief Quantity Surveyor	Design stage and construction stage
<b>110</b>	Premises manager	Design stage

### **3.6. Data analysis**

Quantitative data is analysed using thematic analysis, discourse analysis and content analysis. Further, among these methods thematic analysis enables data to be analysed under themes and this is considered highly qualitative compared to content and disclose analysis (Ramachandra, 2013). Thematic analysis is recognized in literature for its flexibility over discourse and content analysis as it does not fall into any extreme epistemological position (Braun and Clarke, 2006).

The data was collected through semi-structured interviews with water supply project participants. These interviews were organised under the themes identified based on literature survey findings in line with the research question. Under each theme, the view of a single participant was different from participant groups. They presented separately in order to compare and contrast views regarding the themes. Themes identified and the views of respective participant are given in the chapter four.

### **3.7. Summary**

This chapter provides a summarized outline of the research design and the research methodology. Moreover, qualitative as a research approach, Semi structured interviews as data collection technique, finally, thematic analysis as data analytical techniques are explained in a detail manner throughout this Chapter three. The next chapter will focus on research findings and the analysis of collected data.

## **CHAPTER FOUR**

### **RESEARCH FINDINGS AND ANALYSIS OF DATA**

#### **4.1. Introduction**

Chapter three focused on the method of study adapted in the research, whereas; the purpose of this chapter is to explain the findings through the qualitative study in detail.

First, a brief description about the selected interviewees is illustrated. The themes identified within the data are effectiveness of communication, communication barriers, and communication facilitators of water supply projects.

#### **4.2. Profiles of water supply project Participants of water Board**

The water supply project participants on the client's side were selected with due consideration to their backgrounds and field of involvement. Key persons, sectors and sub sectors of NWS&DB were considered in the selection of participants. In order to encourage participation, potential interviewees were sent brief outlines of the research objectives and key findings from the literature survey. The potential interviewees were further provided indicative questions via email at the time of invitation. Accordingly, through the solicitation process, 10 persons from different sections from the Water Board expressed their willingness to participate and share their views. Table 4.1 gives the profile of the interviewed water supply project participants.

As shown in the table, the project participants are Project Directors, Deputy Project Directors, and Assistant General Managers, Project engineers, Quantity Surveyors, Premises Managers, and Project Secretaries. The information used for the profiling of the interviewees included designation, the stage in which they are involved in the water supply project and their duties and responsibilities. Most of the participants are involved in the project from design to completion. The profile information of interviewees gives credibility to their opinions and helps to ensure data integrity and reliability.

**Table 4.1: Profiles of water supply project Participants of Water Board**

<b>Interviewees</b>	<b>Designation</b>	<b>Involvement in project phase</b>	<b>Duties and Responsibilities</b>	<b>Key information they need to perform their duties</b>
<b>101</b>	Project Director	Project formulation to completion of project	Function as the head of the PMU. Managing and co-ordinating the full range of project activities during the project cycle from preparation, implementation to completion, reporting, and winding up.	<ul style="list-style-type: none"> <li>• Work and financial progress of all chief of relevant section. Not clear</li> <li>• Getting approval from CMC to implement the project.</li> <li>• Getting approvals and as built drawings of underground utilities from relevant organisations. Not clear</li> <li>• Getting public concern.</li> <li>• All other details needed in time to time from head office, contractors, foreign funding agency.</li> </ul>
<b>102</b>	Project Director	Project construction to completion of project	Function as the head of the PMU. Managing and co-ordinating the full range of project activities during the project cycle from implementation to completion, reporting, and winding up.	<ul style="list-style-type: none"> <li>• Work and financial progress of all chiefs of relevant section.</li> <li>• Getting approval from RDA, PRDA to implement the project.</li> <li>• Getting approvals and asbuilt drawings of underground utilities from relevant organisations.</li> <li>• All other details needed from time to time from head office, contractors and foreign funding agency.</li> </ul>

<b>Interviewees</b>	<b>Designation</b>	<b>Involvement in project phase</b>	<b>Duties and Responsibilities</b>	<b>Key information they need to perform their duties</b>
<b>103</b>	Deputy Project Director	Project implementations completion of the project	Responsible for handling of the main component of the project or a geographically demarcated area of the project independently.	<ul style="list-style-type: none"> <li>• Work and financial progress of all chiefs of relevant section.</li> <li>• Getting approval from RDA, PRDA to implement the project.</li> <li>• Getting approvals and asbuilt drawings of underground utilities from relevant organisations.</li> </ul>
<b>104</b>	Project Engineer	Project implementation to completion of the project.	Project monitoring and reporting	<ul style="list-style-type: none"> <li>• Payment details from ADB</li> <li>• Getting Loan summaries from ADB</li> <li>• Procurement guidelines</li> </ul>
<b>105</b>	Project Quantity surveyor	Project implementation to completion of the project.	Approving monthly payment bills and approving variation orders.	<ul style="list-style-type: none"> <li>• Monthly bills from contractor.</li> <li>• Variation orders from contractor.</li> <li>• Type drawing from P&amp;D section of NWS&amp;DB.</li> <li>• Standard specifications from documentation section of NWS&amp;DB.</li> </ul>

<b>Interviewees</b>	<b>Designation</b>	<b>Involvement in project phase</b>	<b>Duties and Responsibilities</b>	<b>Key information they need to perform their duties</b>
<b>106</b>	Project secretary		Manage all secretarial support function to run an efficient project office and to support the project director and technical staff.	<ul style="list-style-type: none"> <li>• Getting physical progress of all sites under the project.</li> <li>• Getting financial progress of the project from relevant staff.</li> <li>• Getting possible time available of PM, CE to fixing meetings.</li> <li>• Follow up of any approvals and verifications from NWS&amp;DB head office.</li> </ul>
<b>107</b>	Assistant General Manager (Documentation)	Project design and tendering stage.	Responsible for standard bidding document, standard specifications, standard drawings and Bill of Quantities. Responsible for design manuals and Annual rate book.	<ul style="list-style-type: none"> <li>• Tender data from tender branch.</li> <li>• Specifications from suppliers.</li> <li>• Information from contractors.</li> <li>• Tender information from RSCs of NWS&amp;DB.</li> </ul>
<b>108</b>	Assistant General Manager	Project planning to completion of the project.	Co-ordinate with funding agency office.	<ul style="list-style-type: none"> <li>• Key information from funding agency regarding loans in project formulation stage.</li> <li>• Financial and Physical progress of Funded projects in timely manner.</li> </ul>

<b>Interviewees</b>	<b>Designation</b>	<b>Involvement in project phase</b>	<b>Duties and Responsibilities</b>	<b>Key information they need to perform their duties</b>
<b>109</b>	Chief Quantity Surveyor	Design stage and construction stage of the project.	Responsible for preparation of total cost estimates, cost proposals to design and build project, BOQs ,Engineer’s estimates, annual rate book, input percentages and checking variation orders, cost proposals and doing work studies.	<ul style="list-style-type: none"> <li>• Set of drawings</li> <li>• Soil reports</li> <li>• Site conditions</li> <li>• Specifications</li> <li>• Contract data</li> <li>• Information from suppliers</li> </ul>
<b>110</b>	Premises manager	Design stage.	Land acquisition, land lease, land purchasing and field inspection, settlement of land disputes, co-ordination with the relevant divisional secretary, survey department, valuation department and relevant government organizations.	<ul style="list-style-type: none"> <li>• Details of land according to their requirement from Planning and design sections.</li> <li>• Survey plan of the land from survey department.</li> <li>• Validation report by valuation department.</li> <li>• Land possessing order by Divisional secretary.</li> </ul>



### **4.3. Present communication channels in water supply projects**

The channel must be appropriate to the content if communication is to be effective (Tai, Wang and Anumba, 2009). To enhance communication flow, parties have to create different communication channels (Cheng, Li, Love, and Irani, 2001). Therefore it is necessary to identify communication channels used in water supply projects to find effectiveness of communication.

According to the basic communication model Figure 2.1, encoded information is transmitted by a sender through a channel (PMBOK guide, 2013). The sender selects the most appropriate communication channel (or combination of different media) for the information which needs to be conveyed and messages are often more successfully conveyed if a variety of media are used (Torrington and Hall, 1998). According to the interviewees meetings, emails, letters, telephone, fax, computer networks are the widely used communication channels in water supply projects.

According to the project director (101) *“we are conduct meetings often with the site staff and contractors, external stake holders, funding agencies, project office staff which have good effect in reducing problems arising during the implementation of a project”*. Further other interview participants (103,104, 107,108) also mentioned that meetings are a highly used channel to communicate with other parties. The Project Director of the Northern Province water supply project (102) expressed *“most of the time we communicate with other stake holders and the head office of NWS&DB through telephone, emails and letters and we conduct progress meetings once a month with the office staff and contractor”*. Participants 105 and 109 mention they mostly communicate through documents, drawings, emails, letters and telephone. Further Participant 106 expressed that she mostly communicates with others by emails, letters and telephone. The Premises Manger (110) mentioned that they communicate with external stakeholders mainly through letters. Other than that they use telephone and emails and have meetings to some extent.

Interviewees 103,107 and 108 said that there are no difficulties in communication due to their channels of communication. Participant 103 expressed *“We use advanced communication channels facilities, hence there are no communication barriers due to communication channel”*. In contrast participant 104 articulated *“too many meetings results in a limited time to do project related work and sometimes other parties don’t accept the minutes of the meetings”*.

**4.4. Effectiveness of communication in water supply project**

According to Tai, Wang and Anumba (2009), effectiveness of communications is an indicator to measure the result of communications and the perception of the receivers on the information received is used to assess the effectiveness of communications. The perception of the receivers was divided into five aspects. They are information over load, accuracy, completeness, timeliness and lack of information. But lack of information and completeness are taken as one aspect. Therefore four aspects are considered for data collections. During data collection, the interviewees answered accuracy and completeness in jointly. Hence the analysis was done in three aspects; namely: information overload, accuracy and completeness of information and timeliness of information.

**4.4.1. Problems related to Information over loading in water supply project**

The interviewees’ suggestions regarding problems of information overloading are shown in Table 4.2.

**Table 4.2: Problems of information overloading in water supply project**

No	Problems of information over loading	Interviewees										
		101	102	103	104	105	106	107	108	109	110	Total
1	Not facing information over loading.											5/10
2	Receiving information from several sources.											1/10
3	Not having standard drawing.											1/10
4	Too many meetings											1/10
5	Not having decentralization of the section.											1/10
6	Handling lot of communication channels.											1/10

Five Interview participants mentioned that they have not experienced information overloading. Interviewee 101 stated *“I don’t face any information overloading, but my subordinate staffs may have the problem. Most of the project information come through the project secretary or other relevant project staff. Therefore mostly I receive necessary information only”*.

But interviewees 104, 106, 107,109 and 110 are mentioned that they face information overloading. Participant 107 expressed that *“when we get information from several sources, we face information overload. For example, we get the specification of a product from the contractor, supplier and the internet. Some information we get is unnecessary or wrong. This leads to neglecting of necessary information and contradiction of information. Therefore sometimes it leads us to make wrong decisions”*.

Participant 109 mentioned that *“mostly we are getting four or five times revised drawings for one work. Due to this we get confusion on selecting the actual drawing and sometimes some drawings will get displaced. This problem occurs because of not having standard drawing”*.

Further, participant 104 articulated that *“too many meetings lead to information overload. A lot of decisions are made during each meeting. This creates a lot of confusion. Some parties forget certain important decisions which were made during a meeting and don’t accept them after two or three days”*.

Interviewee 110 explained that *“there are a lot of external stakeholders (mostly Government bodies) involved in land the acquisition process. Therefore a lot of paper documents are received by us. Due to the centralized nature of our division, we are the only responsible body of the NWS&DB for land acquisition for all water supply projects in Sri Lanka. As we handle all these projects, we face a lot of information overload. Because of the sheer number of the documents we handle, some documents get lost or misplaced. Sometimes we forgotten some information also”*.

Participant 106 expressed that *“as the Project Secretary, most of the project information are received by me and distributed to relevant officers. I receive information through several communication channels. This causes information overload”*.

**4.4.2. Problems related to accuracy and completeness of information in water supply projects**

The interviewees' suggestions regarding problems in the accuracy and completeness of information are shown in Table 4.3.

**Table 4.3: Problems of Accuracy and completeness of information in water supply project**

No	Problems of Accuracy and completeness	Interviewees										
		101	102	103	104	105	106	107	108	109	110	Total
1	Unavailability or unsuitability of as built drawing of underground utilities from external stakeholders.											3/10
2	Project information are handled by one person.											1/10
3	Project design consultants are not available during construction stage.											1/10
4	Contractors are not submitting necessary information for giving approvals.											1/10
5	Not giving instructions in proper way.											2/10
6	Not having standard documents and drawings.											2/10
7	Not giving appropriate information by staff.											5/10

Three interviewees stated that they face problems due to the lack of and inaccuracy of information during pipe laying. This they said is because the details of underground utilities from other external authorities are mostly inaccurate. Project director 102 expressed that *“asbuilt drawing of underground utilities from external stakeholders such as Telecom, Electricity Board, and RDA (Road Development Authority) are not available or not suit to present site condition. Therefore contractors need to carry out trial pits frequently. This creates a delay and additional cost to project”*. Opinion of these three participants regarding this problem is due to changes in site conditions and the lack of record keeping of external stake holders.

It was identified information regarding project are not shared to other subordinate staff and handled by one person, this create inadequacy and inaccuracy in project information for the project staffs. Project director 102 express this as *“I take over the project when the previous project director left from the project, therefore I was not in involved in the project from the initial stage, hence it is very difficult to finding previous project information (Example details about the discussions with contractor at negotiation stage) and the other project staffs also not aware of those details. This situation creates some conflicts with contractor”*.

According to participant 104 *“in our project design works are done by consultant during design stage, after completion of design stage the consultants left from project. And at construction stage lot of inaccuracies and incompleteness in drawing and contract documents were identified. These problems are unable to clarified or discussed with consultants due to their unavailability in construction stage. Since it cause lot of variation and delays in project”*. Hence in water supply projects information generated by one party is deliver to other party, this create problem when proper communication is not between the parties.

Participant 103 added *“there are delays in work due to not giving approval by NWS&DB for supply of materials (DI pipes, valves, fittings, etc.) because necessary literatures (Catalogs, menu, technical details, etc.) are not submitted by contractor properly and in addition when contractors not submitting method of statement in correct way it will cause delays in approving method of statement. This incompleteness of information can occur when we have not requested the correct information clearly from contractor”*. Further participant 105 mention incompleteness of information are occur during variation because

the instructions are not given in proper way (not giving written instructions). In addition participant 106 articulated “*Project staffs must have good awareness about the project because when an information is requested by other party during the absent of relevant officer the substitute staff must able to give write information if not, wrong information will mislead the other party to take wrong decision*”. Participants 107 and 108 also mention when the information is requested form right person will cause incompleteness and inaccuracy in information.

Further Project director 101 agreed inaccuracy of information during variation will cause payment delays and disputes in water supply project. Further participant 105 also expressed as “*not having standard drawing and BOQs (Bill Of Quantities) and not giving the feed backs from projects to design section of NWS&DB cause inaccuracy of information*”.

Participant 110 expressed “*in design and build contracts, selected land for acquisition will get changed while acquisition process is in action because not received suitable technical information and survey plan of the lands. This will cause repetition of work, time wastage and delay in work*”. In addition participant 109 also revealed the same incompleteness of information received will cause additional work load and wastage of manpower. Further they mention these problems are arise due to the design engineers not having clear understanding of the project.

#### **4.4.3. Problems related to timeliness of information in water supply projects**

Almost all the interview participants suggest there are delays in receiving some information in time and these cause problems in projects. Altogether, six (06) problems relating to timeliness of information was identified as given in Table 4.4.

**Table 4.4: Problems of timeliness of information in water supply project**

No	Problems of Timeliness	Interviewees										
		101	102	103	104	105	106	107	108	109	110	Total
1	Getting approvals from external stake holders.											4/10
2	Getting approvals and instructions from Head office of National water supply and Drainage Board.											4/10
3	Delay in giving instruction to contractor on site.											1/10
4	Lack of knowledge in contractual and payment procedure of the project.											1/10
5	Not familiar with accessing emails.											1/10
6	Lack of good record keeping.											1/10

According to the Table 4.4 three participants explain there is delay in getting approvals from other government authorities to do excavation in existing roads, which cause major delays to start the works. The Deputy Project Director (103) mentions as *“there are lots of delays in getting approvals from RDA or PRDA (Provincial Road Development Authority) because they not having a proper understanding of our work and implying conditions to do the work”*.

Further, Premises manger (110) stated there are lot of external stakeholders are participating in land acquisition process it make lot of time delay in information transferring because of their unawareness of work procedure and not giving priority to our subject due to their own work load.

Further four participants (refer Table 4.4) mentioned delay in getting approvals and instructions form head office of NWS&DB in time due to information transmitted in long

path and information are jammed in one place. This was expressed by 104 as “*Project Director not having the authority give important approvals and instructions those are mainly given by NWS&DB head office. Which come through long path of chain of command (Chairmen, GM, Adl.GM (water supply project), DGM), Project Director, Project Engineer) and in addition to that all information are address to Project Director then the project director will distribute to relevant project staff some time these information are stuck in project director’s table*”. Participant 102 also suggested there are delays in getting approval to payments due to the lack of knowledge in contractual and payment procedures of the project and lack of mutual trust between project staff and NWS&DB head office staff.

Project director 101 agreed delays in giving approvals for contractors by site staff will cause delays and disputes in water supply project.

According to participant 107 delays in receiving information from other sections of the organization is due to lack of good record keeping. Further the participant mention communication media not have that much of influence in delay in receiving information in right time.

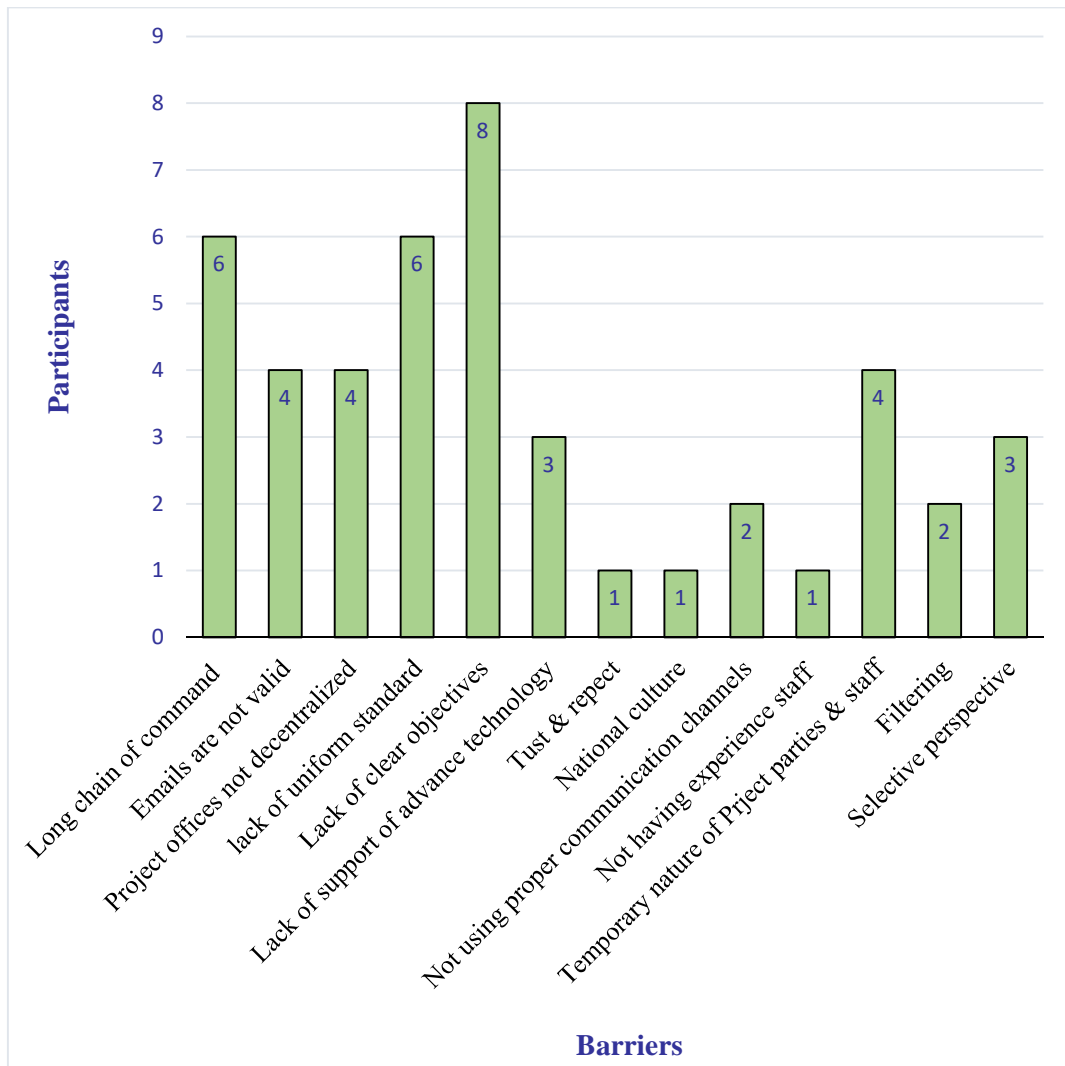
Project secretary (106) expressed “*one of my responsibilities is sending relevant project information in time to stakeholders as they requested. I can receive these information after prepared by responsible officer and checked by their superiors in the project. Since one of those officer is absent then the information are get delay this make unpleasant situation to stakeholders*”. Participant 106 further pointed out that project staff are not familiar with accessing emails, because any request of information forwarded through email to relevant officer, he/she will not aware of it until request is send by paper or oral. This also cause delay in receiving information in time.

#### **4.5. Communication barriers in Water supply Projects**

The interviewees disclosed 13 barriers to effective communication in water supply projects

View of the interviewees regarding these communication barriers are explain below.





**Figure 4.1: Communication barriers in water supply projects**

❖ **Information transferring through long chain of command**

Six interview participants (102, 104,106,108,109,110) are mention information transmitted through long chain of command is one of the main barriers to communication in water supply projects. This makes time delay in implementing some important decisions. Further interview participant104 express “*most of the approvals and instruction are come through long chain of command from NWS&DB is one of the main barriers to communication*”. Interview participant 106 additionally mentions “*if a document sent for approval to head office of NWS&DB it need a follow up until it received. Otherwise it will get struck in any sections*”.

In contrast to this 107 mention information transmitted through long chain of command will facilitate filtration and reduce mistakes and it will accommodate more ideas of superiors.

❖ **Emails are not considered as valid documents**

Paper written approvals and instructions are considered as valid order for implementation, this identified as a communication barrier by four participants (102,104,106,108). Interview participant 104 mention *“if the orders are given informally by telephone it cannot be implement until the written approvals are received. Further emails orders also not considered as valued order by NWS&DB thus we have to wait until paper orders are received. But in the side of ADB (Asian Development Bank) emails are considered valid documents almost all instructions and approvals are communicated by email.”* Further interviewees 106 and 108 mention *“in most all information are communicate with ADB through email”*. Participant 102 pointed out due to the project distance communication through letters take lot of time duration and facing problems to conveying urgent matters.

❖ **Project offices are not decentralized**

Three Interviewees (102,109,110) suggest centralization of authority of project office is a communication barrier in water supply project. Due to this free flow of information is restricted. Some superiors reluctant delegate authorities and reveal project information to other project staff. According to interviewee 102 *“ if the Project director is not share project information and authority to other subordinate staff, then it will be very difficult to handle the project when the Project Director is absent or left from the project.”* Further participant 110 mentioned as *“we getting very large amount of information from all water supply projects and relevant stakeholders because our office is not decentralized and we have limited staff only. Therefore we face information over loading”*,

❖ **Not having Uniform standards**

According to six interviewees (102,103,105,107,108,109), not having standard documents create errors in documents, difficult to understand by other parties and repetition of work. Interviewee 102 expressed as *“same information requested by different parties in different format. Due to the limitation in project staff this cause unwanted work load and stress to staff”*. Further participants 105 and 108 also mention the same. Interviewees 107 and 109 explain not having standardization will result receiving unnecessary information”.

❖ **Lack of clear objectives**

Eight Interviewees (101, 102,103, 106,107, 108, 109, and 110) described if not having clear intention will cause barrier to communication. Participant 103 expressed as *“If the*

*project staff are not requested the relevant information clearly the contractor is unable to submit necessary information on time*". Further Participant 108 expressed as *"the person who not understand the work properly then he is unable give correct information, this cause misunderstanding between staff"*. Further 107 also agreed unclearness will cause to receive unnecessary information. In addition 101,102 and 103 explain lack of clear understanding of work cause delays in giving approval by external stakeholders. Interview participant 102 mention *"high rank officers in NWS&DB head office are changing rapidly thus new officers are not aware about all project information which makes delays in project"*.

❖ **Lack of support of advance technology**

According to participants 101, 104 and 106 project staffs are reluctant to use advance IT technology to make the communication effective. Interviewee 106 expressed as *"when information is forwarded to project staff by email they are not aware about that until hard copy is sent to them. A new IT communication system was introduced to project but the project staffs not show any interest to learn about it and use it, therefore the system become redundancy"*.

❖ **Trust and respect**

Project director (102) expresses *"when a payment for contractor is checked and approved by all relevant officers and sent to the finance section of NWS&DB head office, they reluctant to precede it until get an order from minister level. This is happing for almost every payment to contractor of the project and the feedback about the payment also not given to the project this make disappointment to project staff."* Further she mention there should be trust and respect between parties to have good communication.

❖ **National culture**

Project director 101 expressed as *"national culture also affect communication in our project, because there are lot of foreign parties are involved in the project. For an example not giving firm answer to a problem and not communicating in proper manner with other party"*.

❖ **Not using proper communication channels**

Interviewee 104 and 105 mention if the communication is through improper channels it will cause inaccuracy and incompleteness in information. Participant 104 expressed as *"lot of project meeting will cause unavailability of time to concentrate on other project"*

*documents and sometimes project parties not accept the meeting minutes, they are expecting written orders”.*

❖ **Not having experience staff in project**

Interview participant 103 mention *“NWS&DB not have proper transferring system, therefore staff are not familiar with both design, construction and operational work of water supply project. This cause problems in contract documents and during the construction unable to give proper instructions to contactors”.*

❖ **Temporary nature of Project staff**

Interviewees 102,103,104 and 107 mention, most of the staff in projects are temporary, thus when the project come to completion stage the temporary staffs leaving from project. Since it is very difficult manage the projects during completion stage because its hard gets the necessary project information on time and unable to give project feedback to NWS&DB.

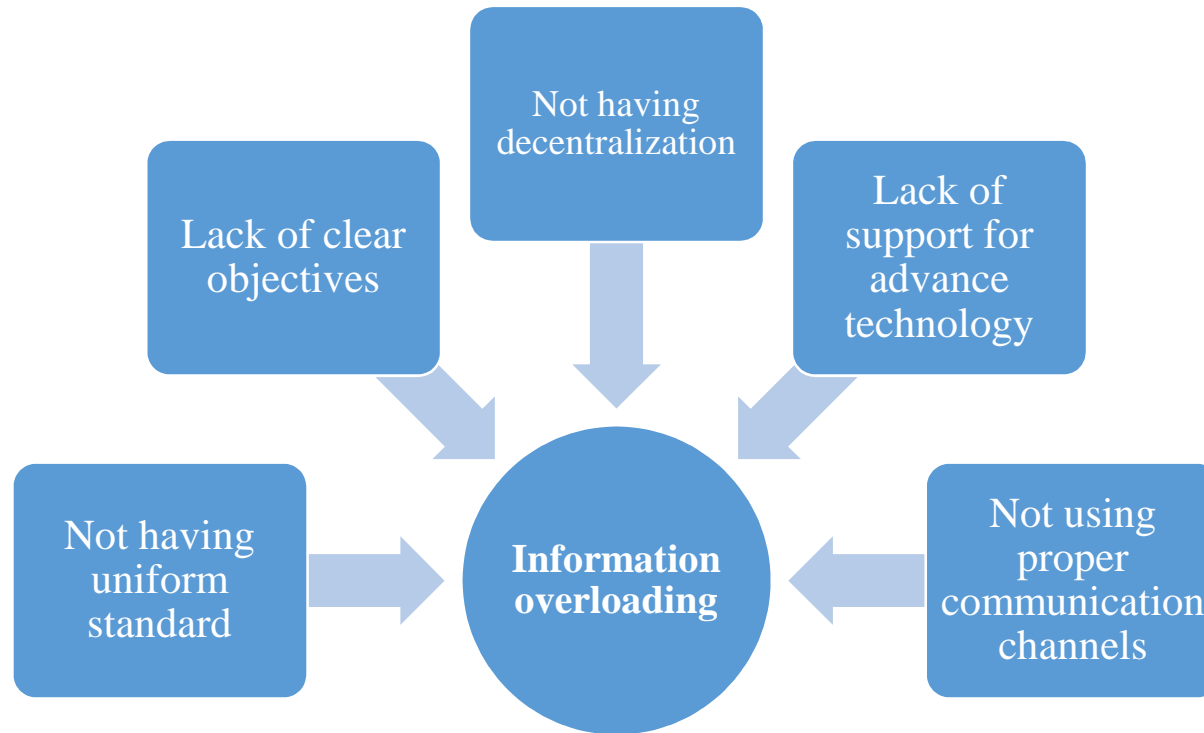
❖ **Filtering**

Interviewees 101 and 108 suggest filtering as a communication barrier in water supply project. Therefore some time actual information are not take in to consideration.

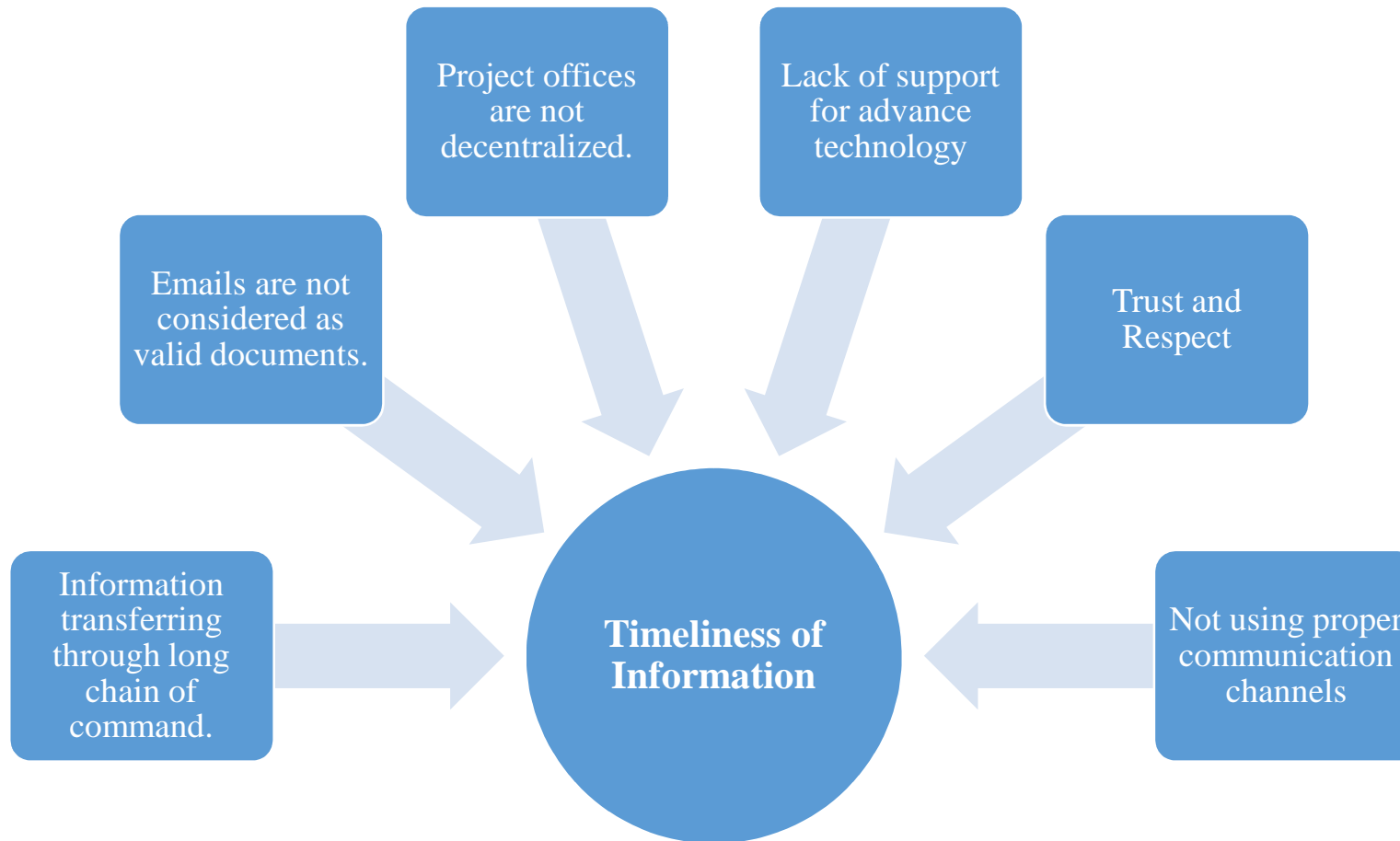
❖ **Selective perspective**

Interview Participant 104,107and108 mention some time people interpret the information according to their previous experience. Interviewee 107 expressed as *“if a new change is introduced in contract document, the most of the staff are not consider that change and they just do the work as what they did in earlier”.*

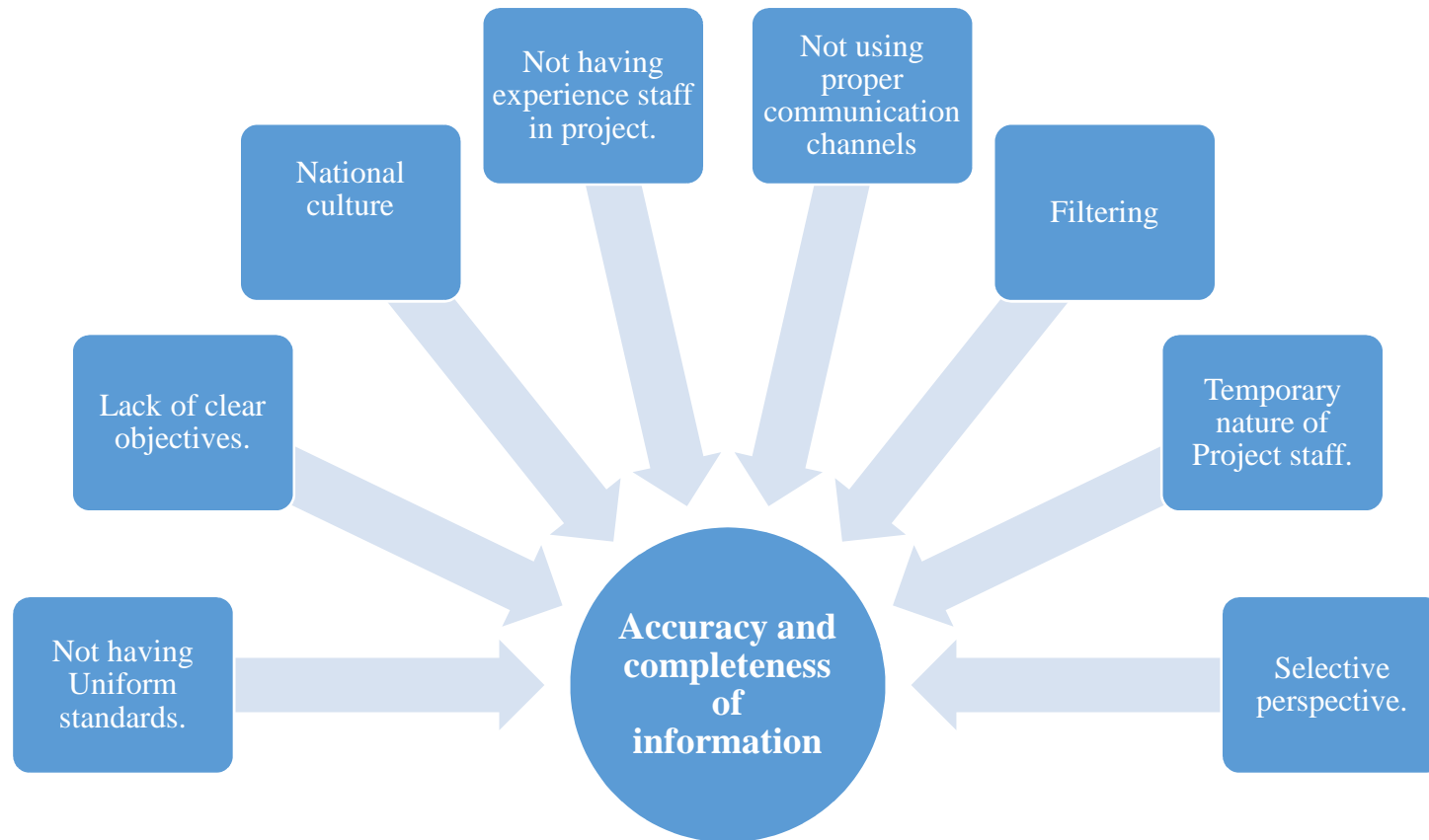
According to the reasons which are given by interviewees regarding information over loading, timeliness of information and accuracy and completeness of information, there are five communication barriers are identified as causing information over loading( as shown in Figure 4.2), six communication barriers are identified as affecting timeliness of information(as shown in Figure 4.3) and eight communication barriers are identified as affecting accuracy and completeness of information (as shown in Figure 4.4).



**Figure 4.2: Communication barriers which are causing information overloading**



**Figure 4.3: Communication barriers which are affecting timeliness of information**



**Figure 4.4: Communication barriers which affecting accuracy and completeness of information**

#### **4.6. Existing Communication Facilitators in Water Supply Project**

Most of the interview participants suggest there are some communications facilitators are implemented in water supply projects to make effective communication.

➤ Meetings

Project director (101) mention meeting is a very good communication facilitator in their project. He express as *“we have meetings to reduce the communication problem. There are staff meeting, project meeting, site meeting, and national committee meetings. In addition meeting with external stake holders also support to reduce the quarrels with external parties”*. Interview participants 102,103 and 110 also suggest meeting with external stakeholders will expedites the work. Interviewee 107 stated *“meeting will provide opportunity to everyone to share problems, ideas, knowledge and understand each other in the team”*. But contrast to this participant 104 asserted too much of meeting will cause limited time to concentrate on other works. Although most of the participants are affirm meetings are reduce communication problems in water supply projects.

➤ Advance communication technology

Interviewees 101,104,106,107and 108 suggest there are some advance communication technologies are implemented to reduce the communication barriers in the projects. Participant 101 stated *“We use emails, SMS, Viber to circulate massages within the project and mostly we communicate with ADB office is by emails and recently we introduced new computer network program called ‘Share Point’ to our project but our staffs are not familiar with it, but we try to implement it early as possible.”*

Further interviewee 104 mention that in their project office also they introduced a computer network system called ‘project management and monitoring system’ which make communication ease. But due to some incompleteness of the system it is not in use properly. However 104,106 and 108 agreed NWS&DB side, emails are consider informal method of communication media because paper written documents are considered formal



documents. Further participant 106 stated “*even though information are circulated by emails project staff are not show attention for that because they are not familiar with accessing emails and further project staff are reluctant to use advance communication system*”.

Participant 107 explain “*most of our documents are published in websites. Internal document can be access by all National water supply and Drainage Board staffs in all regions and others like standard bidding documents and standard specifications are available for access of every external or internal person*”. This will facilitate to retrieve any information at any time.

Participant 103 mention all technological communication facilities like telephone mobile phone, fax, emails, and computer network are available in NWS&DB and water supply project. But the staff should properly use those to improve effective communication.

- Standardization of project documents

Project director (102) mention “*in our project the contractors are maintaining standard system to monitor monthly weekly plans and progress which make easier to monitor the project.*”

- Decentralization in project office

Project director (102) expressed as “*I delegate most of the responsibilities to subordinate staff and share project documents to relevant officer. This increase the project awareness to all project staffs and minimize the unnecessary confusion with other parties*”.

#### **4.7. Mitigating communication barriers in Water supply project**

All interviewees accepted there are communication barriers in water supply projects and they suggest mitigating measures according to giving priority to the communication problems they are facing. View of the interviewees regarding these communication facilitators are explain in Figure 4.5.



**Figure 4.5: Facilitators to effective communication in water supply projects**

➤ **Standardization in project documents**

Standardization in project documents is one of the most commonly described facilitator by interviewees. This was identified as adopting uniform standard for water supply project drawings, bill of quantities, specifications, contract documents and progress reports, etc. Interviewees 102,104,105,107, 108 and 109 mentioned about standardization of project documents to reduce communication barriers in water supply projects. Participant 104 expressed as “*when we have a standard contract documents, this will reduce errors in documents and drawing further it will make easy to understand by all project parties. In addition standardization should be implemented to project consultants also*”. Interviewee 102 and 108 mention if we have uniform standard to present project information this will reduce unnecessary work load and stress. Interviewees 105,107 and 109 accept standardization of project documents will reduce errors, incompleteness and information overloading.

➤ **Decentralization of project office**

Decentralization of project office was the other most commonly mentioned facilitator along with ‘standardization in project documents’. Here, decentralization of project office was identified as dispersing functions, powers and responsibilities to all project staffs away from a central location of project office. Interviewees 102,104,106,108,109 and 110 are expressed decentralization of project office will enhance free flow communication among project staffs this will reduce delays in receiving necessary information, increase the project awareness to all project staff and reduce the problems due to information overloading. And Project director (102) express “*by delegate responsibilities to other project supporting staffs will make them aware about project information this will reduce the problem arise due to absents or departure of a project staff. This also helps to transfer project feedback to others*”.

➤ **Implementing training programs in communication**

Conducting training programs or workshops regarding communication for all project staff to improve communication skills was one of the two commonly mentioned facilitators by the interviewees (see Figure 4.5). Interviewees 101,102,103,106, and 108 suggested training program in communication is very important for all project staff. Participant 101 suggested “*it is necessary to make priority to communication problems in projects and conduct training program to change attitude and culture of the staffs regarding communication.*” Interviewee 102 expressed “*it is necessary to conduct workshops in communication to all project and NWS&DB staffs to improve effective communication and it will improve understanding between projects and NWS&DB staffs*”. Further participant 103 articulated “*we have almost adequate communication technologies in water supply projects but development to human resources regarding communication is necessary*”. Interviewee 108 also stated “*work shop on communication is important; because most of the staffs are unaware of communication barriers and not understand they also contribute to*

*generate communication problems in project, therefore improving communication skills will improve free flow information and reduce unnecessary quarrel between staff". Participant 106 express "I have five years' experience in a large contracting company, where every year they conducting training on communication, according to my experience I realized training regarding communication very important to NWS&DB and water supply project staff, this will enhance staffs 'communication skills and it will stimulate staffs to practice advance communication technology.*

➤ **Standard system to share data**

One of the second ranking facilitator mention by the participants is Standard system to share data. By Storing project data in a standard system and update them regularly will make easy to access project information by all project staff and project related parties at any time and to receive the real time information. 101, 102, 104, 106, and 108 are explained standard system to store and share project data is facilitate effective communication in water supply project. Interviewee 101 expressed as "*we are making effort to implement data sharing system which will improve effective communication among project staffs*". Further participant 104 also mention they are trying to implement the project management and monitoring system. This system will reduce lot of communication problems in their project. Participant 102 and 108 explained if the project information are stored in standard system and facilitated to access by all project parties will make communication more effective and reduce unnecessary work load and waste of human resources.

➤ **Appointing permanent NWS&DB staff to project office**

Some participant explain Placing permanent staff of NWS&DB to project office rather than recruiting temporary project staffs will improve effective communication. Participants 103 and 104 expressed appointing permanent NWS&DB staff to project office is also reduce communication barriers in water supply project. they explain by

appointing permanent NWS&DB staffs to project will reduce the inaccuracy and incompleteness of information, because they have better experience and knowledge in water supply project work and they can give correct instruction to other parties. Further this will reduce the difficulties of getting of necessary information in time during completion stage of the project due to the departures of relevant staff from project. In addition, this will help to transfer the feedback of the project to NWS&DB.

➤ **Standard record keeping system**

This means standard record keeping method to handling all project related records. Some participants mention Standard record keeping system also facilitates effective communication in water supply projects. Participants 107 and 108 express standard record keeping system will reduce delays in information receiving and this will reduce errors and incompleteness of information.

#### **4.8. Discussion of Findings**

Dainty, Moore, and Murray (2006) mention to enhance communication flow, parties have to create different communication channels. According to research finding meetings, telephone, emails, letters, fax, and network are used in water supply projects. Further meetings known as more effective communication channel in water supply projects and most of the participants are mention meeting is existing effective communication facilitator.

Form literature study effectiveness of communication is identified by receiver's perspective. It is measured under five aspect, they are completeness, accuracy, information overload, lack of information and timeliness. According to these aspect effectiveness of communication in water supply projects were identified. Finding shows there are eighteen problems in communication. Out of those five problems causing information overloading, seven problems are related to completeness and accuracy of information and balance six are related to timeliness of communication.

There were eighteen communication barriers were identified by literature survey (refer Table 2.2). But according to research finding there were thirteen barriers were

identified in water supply project. Within them Lack of clear objective was take the priority and information through long chain of command and not using proper communication channel are considered second important communication barrier.

There are twelve communication facilitators were identified in literature review and there were six communication facilitators were identified by interview research. Decentralization of project office and standardization of project documents are the leading communication facilitators to effective communication in water supply projects. These facilitators identified by literature study in chapter two also. Love, Gunasekaran and Li (as cited in Love, Irani, and Edwards, 2004) explained replacing traditional project structures with a horizontal orgainsation structure founded on multi-disciplinary team approach can improve communication and reduce the barriers to information flow in project. Perumal and Abu Bakar (2011) revealed good document standardization and the usage of communication instruments will create better understanding among stakeholders in construction industry. And good standardization process ensures timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information.

Implementing training programs regarding communication and standard data sharing systems are identified as another important communication facilitators to water supply project. Respondents explain training on communication will increase communication skills of staff. In Literature Cheng, Li, and Love,( 2000) mention as effective communication skills can help organizations to facilitate the exchange of ideas and visions, which can reduce misunderstandings and encourage mutual trust. Further Love, Irani, and Edwards, (2004) the utilization of ICTs within project will enable team members to have a greater accessibility to one another and this may enable greater degree of interaction between team members. This will contribute to an effective communication process in the project.

#### **4.9. Summary**

This chapter is explained descriptive way on research findings and analysis of data. Firstly, the effectiveness of communication in water supply projects was analysed. Then the communication barriers and facilitators were find out. And finally discussion is done between literature finding and data collected by interview survey. The conclusion and recommendations of this research will be on chapter four.

## **CHAPTER FIVE**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1. Introduction**

This chapter mainly provides conclusions and recommendations on the findings of the multiple case analyses carried out in the previous chapter. Recommendations have been given as implications to the theory and implications to the profession of project management and construction industry. In addition, the limitations of the research and further research directions are also discussed within this chapter.

#### **5.2. Summary of Research**

The aim of the research was to investigate how communication barriers could be mitigated in water supply projects in Sri Lanka. Having focused on such an aim, four objectives were formulated. The first objective was successfully achieved through the literature survey and other three objectives were achieved by the qualitative study. The interviews carried out in the qualitative study showed findings consistent to the literature synthesis regarding effectiveness of communication but also raised some contradictory findings. Data collection was done by semi-structured interviews with ten participants from water supply projects.

#### **5.3. Conclusions**

The first objective was to review important, effectiveness, channels, media and directions, formal and informal barriers and facilitators of communication together with project stages and stakeholders in the construction project. This objective was successfully achieved through a comprehensive literature survey, which was carried out by referring journals, conference papers, books and other publications. Construction projects are unique from other projects because of its fragmented nature, product is on-off, huge number of professionals and parties come into play in different phases of the project and due to that the risks associated with the projects are high. Due to this complex nature, communication becomes very important in these projects. Effective communication will result mutual trust and coordination between project members, reduce variation and rework, no-dispute performance, reduce delays, project success and knowledge development and innovation.

Further communication is identified as a process in which information is encoded and imparted by a sender to a receiver via a channel/medium. And communication channels are referred to as the conduit through which the message passes. In addition the channel must be appropriate to the content if communication is to be effective. face to face, telephone, fax, emails, computer networks and letters are commonly used communication channels in construction projects. Further the media most appropriate for transferring message will depend upon the nature of the information and recipient, and the outcomes desired from the communication. Some common media are verbal, written, audio, electronic and visual.

There are two type of communications, which are formal and informal communications. Both are required in an organisation for efficient functioning of the organization. There are four direction of communication, which are downward, upward, lateral and diagonal and further vertical flow of communication has been known to be associated with information loss. And three types of communication networks are identified as chain network, wheel network and all channel network. Effective communication networks will reduce miscommunication among parties.

There are eighteen communication barriers are identified in construction project from literature. Out of those 'not using proper communication channels between the various parties' is identified by more authors comparatively. And twelve communication facilitators are identified, among those 'Good document standardization and the usage of communication instruments'; 'utilization of ICTs within project' and 'organizing frequent meetings with a strong focus on clear communications and alignment of all team members' were mentioned by more authors.

In this light, the qualitative study was carried out in Water Board Projects to achieve the second and third objectives. Objective two was to explore the effectiveness of communication in water supply projects. This was achieved through interviews. By analyzing interview research findings, effectiveness of communication in water supply project in Sri Lanka was identified. It was found that timeliness of information and accuracy and completeness of information and information over loading were particular problems that affected the effectiveness of communication in water supply projects. Further third objective which is to analyze the barriers to effective



communication in water supply projects in Sri Lanka also identified. There are thirteen communication barriers were identified in research findings and among those 'lack of clear objective' is identified as most common barrier. In addition suggestions of facilitators for effective communication in water supply projects also explained by interview participants.

The fourth objective was to propose measures of mitigation and facilitators/enablers to improve effective communication in water supply projects in Sri Lanka. According to the content analysis to interview data facilitators to effective communication in water supply project was identified. There are six communication facilitators identified and within those 'decentralization of project office', 'standardization of project documents' are considered as most agreed communication facilitators for water supply projects .

#### **5.4. Recommendations**

Considering the findings of this research, following is recommended as implications to the project management professionals and construction industry.

❖ **Decentralization of project office**

This facilitates to share necessary project information with all project staff and this enable free flow of communication. This build up trust and ensure that everyone is aware of the project objectives.

❖ **Training programs in communication is very important for all project staff**

This enables to improve communication skills and change the attitudes of project staff. Therefore free flow of information will be enhanced among the project staff.

❖ **Standardization in project documents**

This make easier to understand information by all project parties and minimize inaccuracy and incompleteness of information and can also reduce information over loading.

❖ **Appointing permanent NWS&DB staff to project office**

This can improve the design, construction, operational knowledge of project staff therefore they can give correct instruction to other project stakeholders and this also facilitates to transfer project feedback to future projects.

❖ **Standard system to share data**

This facilitates easy access of project information by all project related parties and minimizes the delays in giving necessary information required by other parties.

❖ **Standard record keeping system**

This also reduces delays in giving necessary information request by other parties and reduces the inaccuracy of information.

### **5.5. Limitations of the Research**

❖ This study is consider the human aspects of communication.

❖ This research is done only for the design and construction phases of water supply projects, whereas the other areas also having the similar complexity.

❖ As the National Water Supply and Drainage Board is the only client for the water projects in Sri Lanka, when receiving the client's perception in data collection, all the respondents were from NWSDB.

### **5.6. Further Research Directions**

Following could be given as suggestions for further research, which emerged out of the study carried out in water supply projects.

❖ **Knowledge management practices in Water Supply project in Sri Lanka**

During the Data collection it was identified knowledge transferring from project to future projects and NWS&DB is very limited. Therefore, it will be valuable conduct study on knowledge management on water supply projects.

❖ **Develop an effective team communication management process for water supply projects under public private partnering (PPP)**

This study does not consider about procurement methods of the projects, thus as next step of this research could be developed a water supply project team communication management process with considering PPP. Because in future most of the water supply project will be implemented under public private partnering (Identified during interviewing NWS&DB professionals) as per the roadmap of NWS&DB. Therefore, the literature on this research can be used for the next development.

❖ **Other project implementations to use the same study approach**

This study is confined to Water Supply projects however, there are other projects implemented island-wide. This study could be used to validate the other project implementations such as highways projects and ICT projects etc.

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## **Annexure A: Interview Guide**

### **Interview Guide**

#### **Demographics**

1. Please explain your designation and role in Water Board?
2. Are you involved design and / or construction stage of water supply project?
3. If yes; can you briefly explain your duties and responsibilities in design stage?
4. If yes; can you briefly explain your duties and responsibilities in Construction stage?
5. What are the key information you need in performing your duties?
6. Are you satisfied with the accuracy of information necessary for your work?
7. If not. What are the reasons for inaccuracy of information?



8. Are you getting necessary information at the right time to perform your work efficiently?
9. If not what are the reasons for delay in getting necessary information?
10. Are you satisfied with the completeness of information received for your work?
11. If not what are the problems you facing due to incomplete information?
12. Are you facing information overloading during receiving information for your work?
13. What is the reason for information over loading?

**To identify the available communication facilitators in water supply project.**

14. In your opinion what are the main barriers / difficulties for effective communication in water supply projects?
15. What are the mechanisms available in water supply projects to improve communication with other parties?

**To identify the further communication facilitators to reduce existing communication barriers.**

16. What are the mitigation measures reduce existing communication problems in your project according to your experience?

17. What extent do you use following communication media in exchanging information?

Frequency of occurrence: 1- Very low, 2- Low, 3- Medium, 4- High, 5- Very high

- Face to face (Meetings)
- Telephone
- E-mail
- Letters
- Fax
- Computer net work
- Video conference