

Project Report On
Deployment Challenge Optical Fiber

Submitted By:

Chandrashekhar Tripathi

(2K20/EMBA/10)

Under the Guidance of:

Prof. G.C Maheshwari



DELHI SCHOOL OF MANAGEMENT

Delhi Technological University

Bawana Road Delhi 110042

Jan-22/Jun-22

Certificate

This is to certify that the study report titled “Deployment Challenge Optical Fiber.” is a bonafide work carried out by Chandrashekhar Tripathi (2K20/EMBA/10) of EMBA 2020-22 and submitted to Delhi School of Management, Delhi Technological University, Bawana Road, Delhi-42 in partial fulfillment of the requirement for the award of the Degree of Masters of Business Administration.

Signature of Guide

Signature of Head (DSM)

Seal of Head

Place: New Delhi

Date:

DECLARATION

I, Chandrashekhar Tripathi, student of EMBA 2020-22 of Delhi School of Management, Delhi Technological University, Bawana Road, Delhi – 42, hereby declare that the dissertation report “Deployment Challenge Optical Fiber.” submitted in partial fulfillment of Degree of Masters of Business Administration is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge.

This report is not being submitted to any other University, for award of any other Degree, Diploma or Fellowship.

Place: New Delhi

Date:

Chandrashekhar Tripathi

(2K20/EMBA/10)

ACKNOWLEDGEMENT

I would like to express my sincere gratitude towards my Guide, Prof. G C Maheshwari (Professor, Delhi School of Management, DTU) for his support and valuable guidance throughout the duration of the project. I thank them for the constant encouragement and support at every stage. I also thank them for their patience for providing me with a goal oriented approach towards this project.

My sincere gratitude goes out to my colleagues whose participation in the project gave many valuable inputs for its completion.

Chandrashekhar Tripathi
(2K20/EMBA/10)

ABSTRACT

With modern development communication has become an integral part of human life and cannot be created for, the communication process involves the production of information, transmission, acceptance, and interpretation. In today's systems, a large bandwidth transfer bandwidth with low latency is a must. Optical Fiber is now a long-distance data transfer platform and has a high data transmission rate for telecommunication networks.

The Indian telecommunications industry has seen numerous developments. The industry has experienced steady growth over the past few decades. Infrastructure usage and competent management were required to sustain this expansion. Fiber optics has become the backbone of network and communication infrastructure, allowing for high bandwidth at the speed of current and new technologies. As the demand for new technology and services increases, fiber optics technology brings the promise of flexibility, disability, and a network platform full of unlimited services capabilities.

The report aims to investigate the challenges of using fiber optics in India, highlighting technical legal management challenges and recommendations for appropriate solutions. External concerns like as road construction excavation might exacerbate the difficulty of frequent fiber cutting.

A structured survey approach was conducted for this survey with the help of Telecommunication experts in the telecom industry in India. A simple questionnaire was used for conducting this survey and circulated among them for their valuable feedback.

Its high bandwidth capacity and low bandwidth feature make it easy to transfer high data rates. Because of their advantages over power transmission fiber optical has replaced comer wireless connectivity in the conventional network in many developing economies. It also highlights the challenges faced by network users in the implementation of fiber-optics technology across the country.

Table of Contents

1. Introduction	7
2. Background.....	8
a. Indian Telecom Industry.....	8
b. Role of Fiber in Indian Telecom Industry.....	9
3. Problem statement	10
4. Objectives of the Study.....	10
5. Literature Review.....	10
6. Research Methodology.....	22
7. Data collection.....	23
8. Data analysis.....	24
9. Findings and Recommendations.....	29
10. Scope of Optical fiber in future	30
11. Conclusion.....	32

1) Introduction

The telecommunications industry in India has undergone various steps of renovation throughout the entire year. In India, the mobile telecommunications industry first came into use in 1995. The method of transmission was to transfer microwaves but after a while, large organizations recognized the lack of use of microwave transfers during the end of the day infrastructure as a major task. Much of this disadvantage was to reduce radio frequency distances and environmental effects. The challenges created the assumption of fiber optics transmission in the late 2000s.

The roll-out of virtual network infrastructure within the telecommunications industry has caused tremendous development in commission delivery over the past few years. Nowadays, Optical fiber has become a common means of transmission due to providing uninterrupted and fast internet connectivity to end-users.

Optical fiber has always been a completely reliable transmission system for a permanent backbone network infrastructure. The possibilities of providing services with fiber optics cable to the end-user, without loss of quality or speed of data are guaranteed. The visible cable management during setup contributes significantly to the cable level and therefore explains the solar signal transmission.

FTTH deployment projects attracted great attention recently. FTTH networks were successfully deployed in several cities like Delhi, Mumbai, Hyderabad, Chennai, and many more cities in India. However, the general number of FTTH customers throughout India remains very limited. Usually, most network operators are not interested in any FTTH deployments because of the high initial cost and high maintenance. Both the legal situation is unclear and therefore the high expected costs create this. To build any conclusions reached

through FTTH submissions, a cost-effective, detailed data model with differences between referrals in several regions is required.

2) Background

a. Indian Telecom Industry

Radio, television, phone communications, and internet services are all provided by India's telecommunications business. People may now communicate around the globe and access limitless amounts of information because of the telecom industry's expansion and innovation. With OFC networks, broadband services in India are becoming the quickest and easiest to access. In India, in the last decade, many big telecom players merge, and some players out from the markets like Uninor, Aircel, etc. to present a huge product and service portfolio. New technologies and mergers are improving these firms' ability to seek new sources of revenue and possibilities to grow in an Indian market that is essentially mature.

The global telecom business is undergoing a revolution, intending to connect two-thirds of the world's population. Information and communications technology has advanced in such a stunning way over the last decade that the global telecom business is expected to expand. The rapid growth of this industry is enabled by significant economic development and a rising population.

India has a state of spatial connectivity to each other and to the center. While the OFC network exists to the point of blocking, network retrieval will still be delivered to the OFC cable network. Approximately 60-70% of tower backhaul connection is still a Microwave link and does not provide support for high bandwidth capacity. The best thing about fiber optic is that it has unlimited bandwidth power that will provide great internet speed. Without the governor's entry point, spectrum shortages are likely to increase steadily and as a result, OFC's need for retrieval and BTS access will increase.

b. Role of Fiber in the Indian Telecom Industry

The development of a fiber network is essential to improve the quality of telecom services and support the ongoing demand for the Internet, and shortly manage significant social and economic benefits for customers, organizations, and national governments.

In the current context, India has a fiber-based network comprising 40 lakh KMs compared to that targeted by the National Broadband Mission in the establishment of 70 lakh KMs of fiber optic network in 2024.

Optical fibers have become a new technology and represent the 'brick' or a key component of building a new "Optical Fiber Network" - connecting continents, creating possible simultaneous connections between millions of people with a transmission rate of Gbps. In addition, these fiber optical access networks connect organizations and homes thus resulting in the evolution of Fiber to the Home (FTTH) networks.

The various benefits of fiber cables such as high bandwidth, low transmission loss, speech protection, power separation, small size, low cost, signal security, durability, and flexibility, have paved the way for greater market growth of fiber cables achieved.

The Indian OFC market is gaining a good grip and is rising in various regions of the country. Also, the tradition of 'Work from Home which means WFH' has allowed the telecommunications industry to deliver and meet the huge demand for bandwidth with standard services.

This is a good harvest in the fiber cable industry, as telecommunications operators are busy maintaining quality service and looking for new solutions, especially in the broadband cable segment. Therefore, OFC's needs and associated resources will see significant progress globally in the coming years. OFC's global telecommunications market is expected to find growth in growing jobs and increase internet usage worldwide.

3) Problem statement

Currently, the optical fiber network has proved to provide a high bandwidth demand of cost-effective internet connection to the end-user customer at their doorstep. New and well-known telecom operators need to fulfill the end-user requirement of a secure and reliable high broadband network requiring them to sincerely think about the high volume optical-fiber deployment in their based systems. As a result, network operators have significant hurdles not only in terms of deploying an optical fiber network, but also in terms of deploying a cost-effective network of fiber cables, ducting, and joints to connect to end-users at their doorstep. The installation of optical fiber on the ground is a significant commitment and a long-term investment for a company.

4) Objectives of Study

The objective of this study Are:

- To analyze the Challenges of the Fiber network (Like Fiber to Home and mobile cell site connectivity through the optical fiber cable) deployment in India for the fulfillment of broadband demands
- To suggest how to reduce these challenges.

5) Literature Review

a. High-Speed connectivity(HSC) Needs

The benefits of the OFC network have been underlined by the increased need for high-speed connectivity around the clock, as well as an increase in the volume of voice traffic, texting, email, gaming, downloads, mobile internet access, and video streaming, and other services. Recognize the requirement for

network speed and connectivity 24 hours a day, 7 days a week, and make a real effort to make the communication network future-proof and dependable.

b. The Optical Fiber Cable Market

Many residential and industrial developments in India and throughout the world now demand OFC technology and wireless data connection systems. It is the market's progress and as the option continues to find advanced retailers willing to offer a “future” product to their clients. Several attempts are currently underway to make FTTB more cost-effective to use and better prepared to meet the most powerful forecasts.

The complete backbone, integration, and access network require telecom cables. Fiber to the Permits (FTTP), Fiber To The Home (FTTH) applications, and Fiber To The Building (FTTB) are some of the primary causes driving OFC demand. (Arthur Grimes, 2012)

c. Growth of Broadband Subscribers in India

Year	Subscribers in Million
2008	5.45
2009	7.84
2010	10.71
2011	13.13
2012	14.98
2013	55.20
2014	85.74
2015	136.53
2016	235.34
2017	362.86
2018	518.45
2019	661.94
2020	747.41

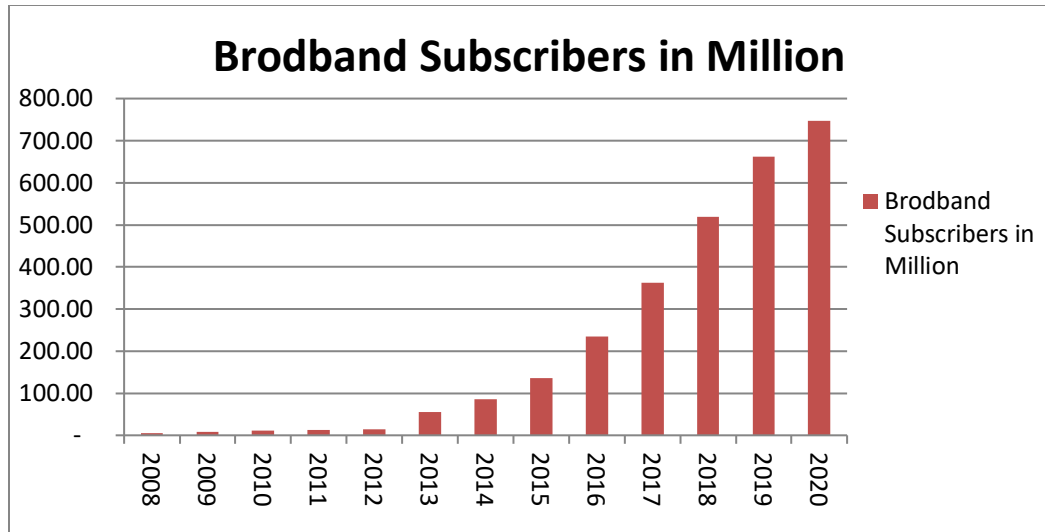


Table 1: Broadband Subscribers in India

Data Source: (www.trai.gov.in)

The above chart is showing the growth of Broadband subscribers in India in last 12 Year. The jumping the broadband subscribers no. from 10.71 M to 747.41M in last 12 year from 2010 to 2020. The subscriptions was increased exponentially in last decade.

d. Advantages of OFC

- Exceptional bandwidth
- Increased bandwidth is simple to accommodate.
- OFC can be used for Longer Distance data transmission: Optical fiber cables can transmute the data over a long distance with less power loss with more accuracy.
- Resistance to electromagnetic interference.
- Cable damage and secure transmissions are early detected.
- It has a variety of advantages over copper wires during installation because of its tiny size, lightweight, and high flexibility.
- The weight of optical fiber cables is very less because use plastic and hollow glass tubes use in OFC manufacturing.

(Gambhir, 2013)

e. Disadvantages of OFC

Though Optical fiber communication brings a lot of conveniences on the other side, we cannot ignore the disadvantages of them

- Optical fiber cables are more breakable than power cables because they are made of glass and the glass can be reacted with different chemicals including hydrogen gas so telephone operators need extra care during OFC deployment to the Underground.
- Optical fiber wiring is very difficult in terms of normal cable and if we bend the OFC cable too much, it will be a break. Fiber thread is at high risk of cutting or damage during installation or construction. Because of the problems mentioned above, it is difficult to put it at a low level.
- If long-distance light data transmission can be reduced and dispersed, this requires additional equipment to eliminate this effect.
- The cost of installation and installation after installation of the Optical fiber cable has increased concerning copper wire, otherwise, the installation of a fiber optic cabinet is still much higher than copper wire.

(Jason, 2018)

f. FIBER OPTICS CABLE DEPLOYMENT STRATEGIES

In general, there are many types of installation of an Optical Fiber network. The environment, local development, corporate vision, and population all influence the sort of installation chosen. To ensure a successful installation important factors are carefully studied and easy maintenance afterward. As per our project experience, we can say that 60 to 80% of the Optical Fiber network deployment cost is due to community work, digging work, and civil infrastructure work and cables to community work, plumbing, and cables.

The following are the major two ways for deploying optical fiber networks:

1. Aerial Installation
2. Underground Installation

i. Aerial installation

Aerial Optical Fiber cable refers to a type of fiber optic fiber designed and used for outdoor installation between poles. For hanging Aerial cable we use a supporting wire called a gauge wire. Typically, they are usually made of heavy plastic jackets and sturdy steel handlebars. Selecting an OFC aerial, the construction of the aircraft will allow operators to use the existing pole without installing new infrastructure, and will also reduce installation costs through this method.

In particular optical fiber cables may not be strong enough to withstand direct installation of aircraft, as there is a special way to install this type of special optical fiber network deployment. The simplest solution to blow the standard OFC cable is usually a missing metal wire called gauge wire, it serves as cable support To support the optical fiber cable, the supporting cable must be robust enough. the distance between the frames of support. Caution should be exercised when installing OFC cables with a gauge measuring cable to contain variation in length, for example, due to airflow or temperature changes. Because OFC cables are not to be designed for stretch, as this would compress the fiber cable, flexibility should have to be provided at the bases to avoid friction in the base and in the fiber optic when the messenger length changes.

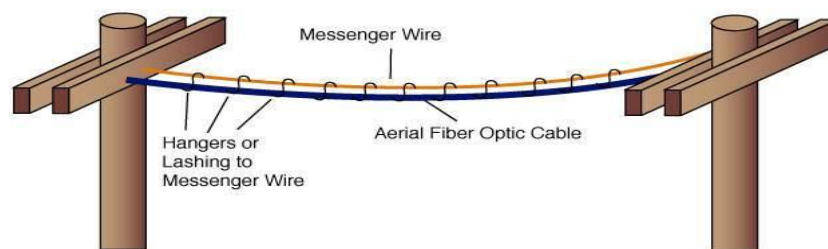


Fig 1: Aerial Optical fiber Installation

ii. Underground installation

Underground fiber cable inserts are installed in underground pipes. In large cities where there is limited space for telephone communication, it needs to be used effectively. In landscaping, the trench protects against physical and environmental impacts. The trench inside the landfill protects the cable from rock shifting, and/or mining, and digging another group. Underground drainage will make it easier to remove or upgrade. The new cable is inserted and the old cable is easily removed without cutting and digging the road which can be very expensive for any organization. The telecommunication circuits are made of plastic that is buried directly in the ground or placed in concrete. OFC has provided more use of existing underground tunnel space due to its smaller cable width and greater communication capacity.

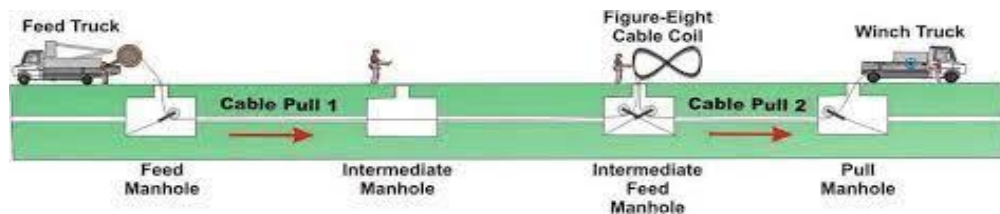


Fig 2: Underground Optical fiber Installation

(<https://www.stl.tech/>)

The most advanced drainage pipe/water pipe is designed to withstand the temperature, humidity, conduction, and acidity of the soil. OFC cables are available placed in the trench/hole installed is easy and convenient because metal cables can be used with unprotected fiber optic cables. The trench protects OFC cables as if they are exposed to an insensitive environment. Fiber cabling development is a hassle-free implementation as there is no need to dig installation trenches. (Owusu Nyarko-Boateng, 2020)

g. Fiber Deployment Challenges

i. Higher deployment Cost

Before providing fiber connection to the End-user department step, telecommunications operators first need to use the spinal network infrastructure in the area where the operator wants to provide their services. This first step in deploying the spine requires deciding on telecommunications such as procurement, what type of materials will be used for fiber transmission, what should be the cost of the project, how much resources can be used, resources are available in that area or not, how will spinal fiber work to generate revenue. Because there is a shortage of resources such as skilled workers and high-level workers especially internally such as villages or governor's areas. To do all this resource availability will increase the cost of shipping the fiber cable network.

ii. Lack of Urban Infrastructure Planning

Organized cities have ensured the sustainability of programs through political cycles, realizing that a consistent road map will make them more realistic. Investment is a long-term investment that benefits from the expected conditions. Proper planning is a benefit to reducing uncertainty and therefore the risk of uncertainty will decrease, over and over again, in cable care.

iii. Right of Way (ROW)

ROW and the acquisition of Earth to move the optical cable network on the highway or in the city center is expensive and time-consuming process. This process was often overlooked by the planning team that would cause delays in project delivery. Taking the permission from local authorities for laying the optical fiber cable on public road is very much difficult and complex process. Line management is required for the installation of optical fiber network infrastructure.

iv. Limitation of Skilled resources

Telecommunications engineers with experience in operating the cable network installation and repair. The installation of a new fiber-based network includes new skills and techniques such as fiber insertion, fiber hitting with tubes and fiber testing. These skills need to be acquired and validated in order to have enough skilled installers in order for the new network to be used effectively.

v. After-deployment fiber management

Management of Optical fiber is structured on basis concept of engineering for the purposes of protecting, operating, maintaining, repairing and rehabilitating the aging fiber network at a limited cost. Optical fiber network is an effective and efficient way of data communication to transfer various types of data such as voice, video and data. Because of the amount of telecommunications data, optical fiber is extremely important, as well as the migration from narrowband to broadband. As a result, corporations and end users alike must priorities proper infrastructure management.

Optical fiber networks should be protected from intentional or accidental damage, cuts, bending, or any other type of unknown action where the fiber cable can be damaged.

(Owusu Nyarko-Boateng, 2020)

h. How to Improve Fiber Deployment Internally

Can we think about the world without internet connection?

It's hard to imagine or believe that it was a few year ago we were all disconnected, we could not reach anywhere in the world in a moment.

If we see in current days we are connected more then the earlier age where we are more deplanned on telephone line, paper writing medium. Also higher speed of internet has great impact on our modern lives more.

We are currently anticipating that the top companies will be paperless, transferring their data sheets to Hard-drive in large data management systems. To manage this data they use a different technology such as cloud-based technology. The importance of this technology is fast, the reliable connection has only increased.

This is the main reason why large organizations have changed the existing cable network in optical fiber networks so that connections speed and reliability should be increased.

Fiber optical networks, as we know they are faster, more reliable, and last longer than their wider network and will provide the continuous, fast connectivity that you need in today's business operations in these statistics.

Here's how.

- **Network with the speed of light**

The speed of optical fiber networks is highest with respect to any other network and it will go till Gb/s instead of MB per second in current scenario. Optical fiber cables made with the lot of narrow glass tube which can transmit the light over a long distance.

The light is travelling inside the glass tube is because of reflection of light and glass tube act as a mirror, light will fall on th glass wall and bounces along with wall of the cable.

- As we understand that the speed of light is faster around $3 * 10^8$ m / s, the speed of optical fiber communication is faster - much faster than out of copper copper internet connection
 - Resistive property of optical fiber with respect to electromagnetic interference (EMI).
 - Reliability on signal over a long distance.
 - Higher bandwidth
- (Canevaro, 2018)

i. Solution for Fiber Deployment Challenges

- **Higher deployment Cost**

As Telecom operators focus more on using fiber optical cables in their existing networks, telecommunications operators are more concerned about how they can reduce their shipping and storage costs so that they can increase their return on investment by a higher percentage.

- ✓ **Use Existing Infrastructure**

The maximum time and cost of end use of the network is close to the engineering aspect of the project work, such as installing a trench or digging a new channel / canal within an existing network. Where possible, the planning team goes to the full use of existing infrastructure or replaces the existing cable network with an optical fiber cable network as it is 65% of the total transmission cost.

- ✓ **Use existing other partners infrastructure**

Given that the cost of fiber transmission infrastructure is 65% of the cost of proper delivery so it will delay a lot of company money so it is the best way we can use to hire existing network infrastructure.

- ✓ **Use the right construction techniques**

If you need to start digging, be sure to use the right building methods, such as microtrenching, mole farming or direct drilling. This reduces costs and time by performing construction work quickly and efficiently, avoiding major disruptions to customers or your local area.

- ✓ **Minimize the skills required**

Human resource costs are one of the most important factors in the initial budget. In addition, there is a lack of many fiber skills, such as traction, which can delay the rate at which the extraction is released. Operators, therefore, need to consider desk installation where possible, while maximizing productivity and

ensuring reliability. Using pre-connected fiber is in the middle of this - it doesn't need to be cut and is proven to reduce the levels of skills needed within the first.

✓ **Focus on deployment speed**

Immediate use will provide as soon as the fiber network customer can afford new services. Therefore, look at ways in which you can set up certain equipment and methods while ensuring that staff is properly trained. This will ensure consistent, high-quality, fast-tracking delivery.

• **A lack of planning for urban infrastructure**

✓ **Linking urban planning and infrastructure network planning**

The structure is essential for building sustainable cities, and proper development is essential for building sustainable infrastructure. This document opposes the integration of different levels of infrastructure and urban planning into a coherent and sustainable approach that can be applied to any measure.

✓ **Urban Strategic Planning**

In cities, the strategic design focuses on establishing high-quality goals and selecting the optimum areas for an extension. A development plan, a basic strategy, or a comprehensive plan is the end outcome of a strategic planning process.

✓ **Planning Land-Use**

planning of Land use mainly affects law and policy, the use of planning tools such as government regulations, regulations, laws, codes, and policies that affect land use.

Residential, for buildings such as residences, single-family homes, and condos

- Commercial, real estates such as retail stores and office buildings
- Industrial, structural such as production plants and warehouses

- Municipalities, structures such as police stations and courts

- ✓ **Master Planning**

For greenfield development projects the basic planning was used, or the construction of uncultivated land - instead of replacing existing buildings or spaces, start over.

- ✓ **Development of Economic**

The growth areas were identified by economic development that will promote greater financial prosperity within the city, especially by attracting companies to build or relocate offices there. After that, those companies then hire local talent and transfer passengers to a new office.

- **Right of Way(ROW)**

- ✓ **Maximum Utilization of existing Infrastructure**

In most cases, all the infrastructure deployment will only focusing on digging the road, trenching the road, and blowing new duct inside this. By sharing and utilization of existing infrastructure, not just with other service providers, but also with utilities like power, water, and sewer, service providers can bring in efficiencies in deployment costs and reduce the danger of Right of Way.

- ✓ **Deploy a dedicated team for Right of way clearance**

Network operators need to deploy one dedicated team at every location for clearing ROW problem at ground level.

- ✓ **ROW process start in planning phase**

As we know that getting the Right of Way permission is major bottleneck for optical fiber network deployment and it will take long time to get the permission from different authority like, forest department, PWD, national Highway authority etc. Being the government department and there is lot of paper work and long process time so the network operator need to start the approval process

well in advance because they cannot start the work without approval from respective authority.

✓ **Use local resources for right of way clearance**

Most of the organization thinks that the government will easily provide ROW permission for network deployment, which is almost proven false for maximum time will cause the delay in project deployment . ROW is one of the major obstacles to the deployment of telecommunications networks because if operational planning has not been implemented, the ROW problem will arise completely after the start of deployment. The network operator must therefore use local resources to obtain ROW approval at the ground level.

• **Limitation of Skilled resources**

To overcome this problem of telecommunications operators, need to upgrade their equipment and allow contractors to open specialized fiber installation training centers.

A few examples of these programs are:

UAE Etisalat trained 2,000 technical personnel to manage fiber and opened the Etisalat Academy. Etisalat Academy is the largest center for development and training throughout the Middle East and North Africa.

BT UK had originally trained 4,000 engineers when it announced its release of super-fast broadband in 2009.

(Owusu Nyarko-Boateng, 2020)

6) Research Methodology

The responses from the audience was selected by Quantitative research method. The material assembled is correct knowledge about the topic. The authentic information can

be obtained in a heterogeneity of methods using the quantitative research method, inclusive of: Structural Survey, experiment, Existing data, conservation. Structured survey is one of the expressive survey designs which involve collecting data in order to answer the questions raised in the survey. Structural Surveys contain the list of questions in the form of multiple-choice or ratings asked from the selected audience. In this study, this research method was appropriate to be utilized to identify the problems of Challenges faced by telecom network operates at the time of optical fiber network deployment. The targeted responded selected from the telecom industry audience having a great experience in optical fiber network deployment in a different phases like construction, planning, operation and maintenance.

a. Collection of Data

For this survey, a structured survey approach was used with the help of Telecommunication experts in telecom Industry in India. The survey which I conducted is include the optical fiber deployment engineer, O&M engineers, deployment planning and architectural engineer and some managers and Above. This survey was conducted using a simple questionnaire that was distributed among them for their useful comments. A total of 10 questions were distributed among the targeted audience out of these 61 participants responded. The responses from all of them were much excellent, accordingly, the questions were circulated in the field of optical fiber network deployment to the target group to answer.

Participants were made fully aware that participation in the study was voluntary, that their circumstances and anonymity would be respected, that the study results would not jeopardize their honesty, and that the study would be managed all alone and unbiased for educational purposes in the end.

b. Analysis of Data

A survey outcome was studied and utilized the statistical package for the social science analytics tool. This section assesses responders' overall understanding of fiber optic deployment and management.

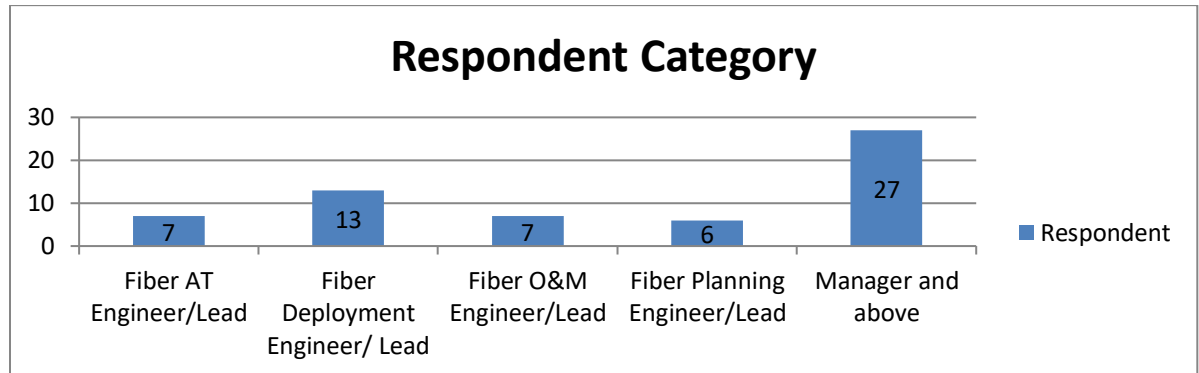


Fig 3: Category of respondent

As per the 61 responses received and also got confirmed that all the respondents have the knowledge of Optical fiber and they all are from the telecom optical network field.

- Knowledge of optical fiber deployment management

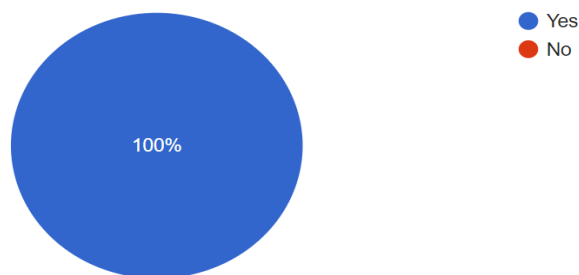


Fig 4: optical fiber deployment knowledge

Above chart shows that all 61 respondents have the optical fiber deployment and management expertise. All the respondents are from the technical field from the telecom sector.

- The Risk of public fiber deployment

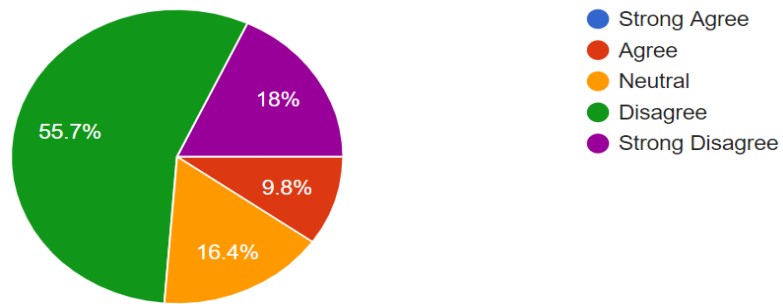


Fig 5: Risk of fiber deployment

Figure 2 shows the assess the risk of deploying optical fibre cable in a city or public area. As per the response receive that 55.7% and 18% are disagree and strongly disagree respectively, 16.4% are neutral in this case and 9.8% is agree that the optical fiber may harm to general public..

Digging tunnels for fiber optic cable transmission has risks. The trenches were left for a few days while a cable was installed. This situation is very dangerous for the general public because people are injured in many cases due to long-term tape warnings.

- Coordination with local Authorities:

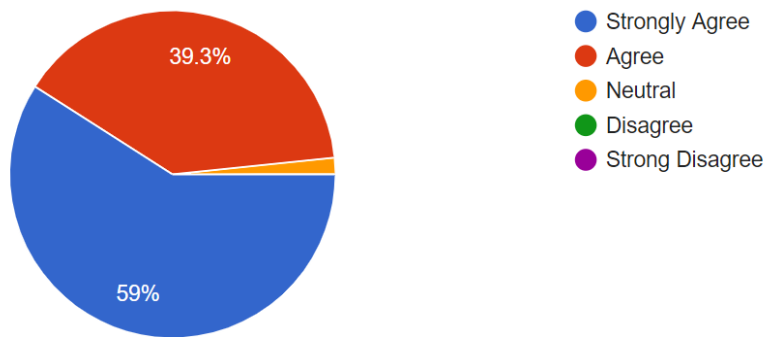


Fig 6: Coordination between local Authorities and Telecom operators

As shown in Fig 3, 59% and 39% respondent accept that there should be a strong coordination between telecom operator and local authorities so that the field level execution will not be hamper because of the local issue.

- Consultation with Road department before planning the rollout:

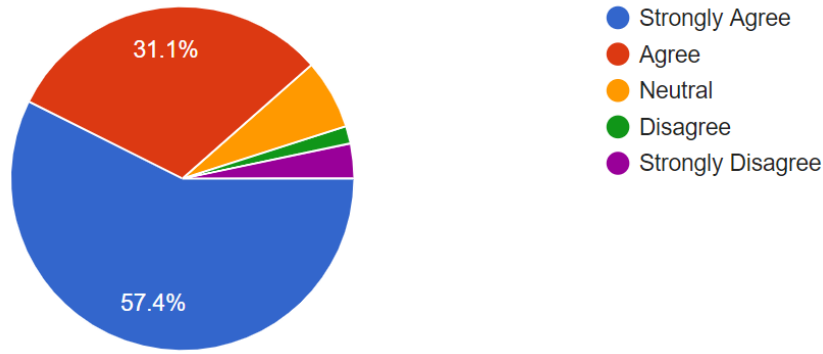


Fig 7: Consultation with Road department

Fig 7 clearly indicate that , 57% respondent is strongly agreed and 31% are agree that the planning team should be take consultation with road department so that planning team will be well equipped with in future expansion of the road so that they will make necessary precaution at the time of planning.

- Use Best practice for fiber deployment:

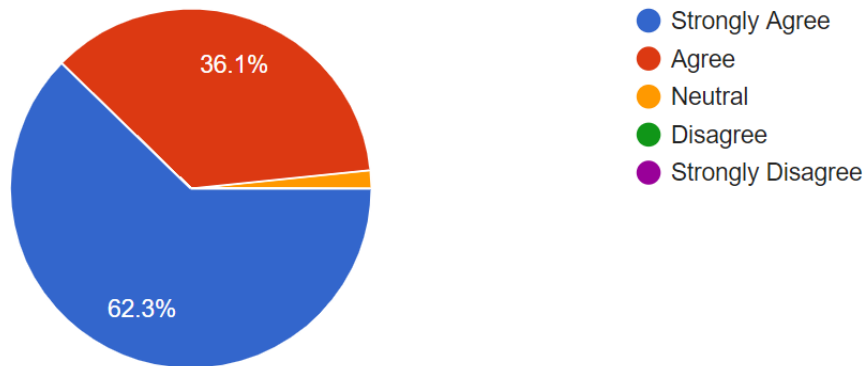


Fig 8: Utilization of best practice for fiber deployment

Above Fig 8 shows that 98% of respondent is suggesting that network operator should use their best practice for optical fiber network deployment so that network should deploy in faster mode for capitalization of investment.

- Best Deployment technique for fiber deployment rollout

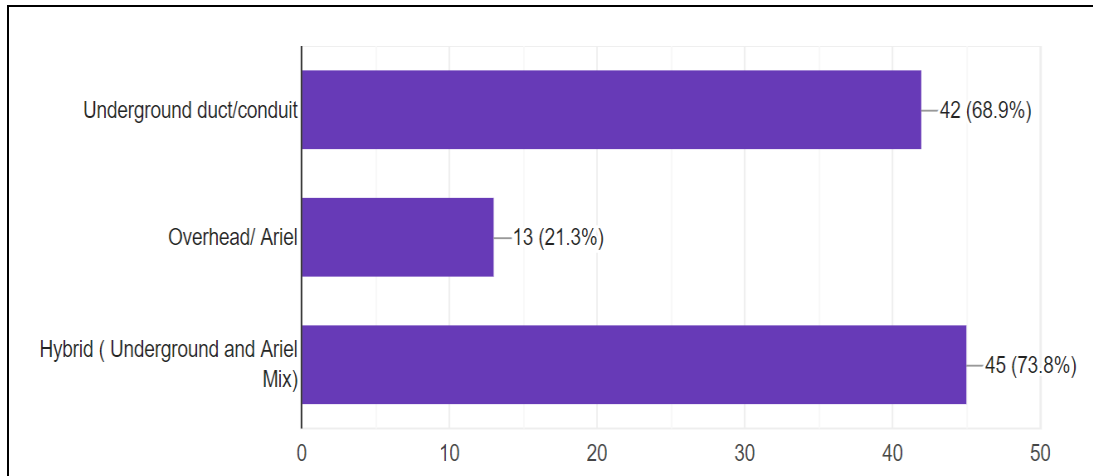


Fig 9: Best deployment technique for fiber rollout.

Asking from respondent that which technique is best for optical fiber deployment i.e. Underground, Ariel or Hybrid(Mix of both of them). As per the response receive that 70% is agree with Underground and 54% is agree with hybrid technique.

- Reason for the fiber cut:

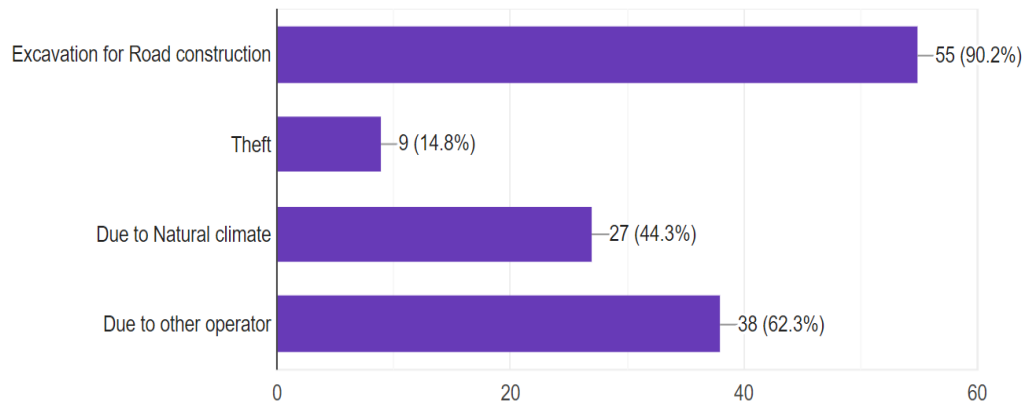


Fig 10: Major cause of fiber cut.

As we have seen the Fig 10 that the major cause of the fiber cut again and again is excavation for road construction. This is because of lack of urban infrastructure planning.

- Deployment of strong ROW team

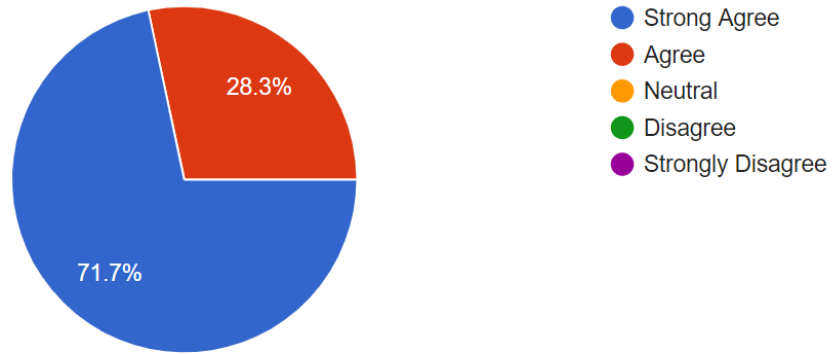


Fig 11: ROW team deployment.

As we know that the optical fiber deployment network executed at field level and for field level execution there is a lot of obstacles at ground level due to local public issue and getting the deployment permission from local authority telecom network should be deployed a strong team who can manage these all type of such issues.

- Major challenges for fiber deployment:

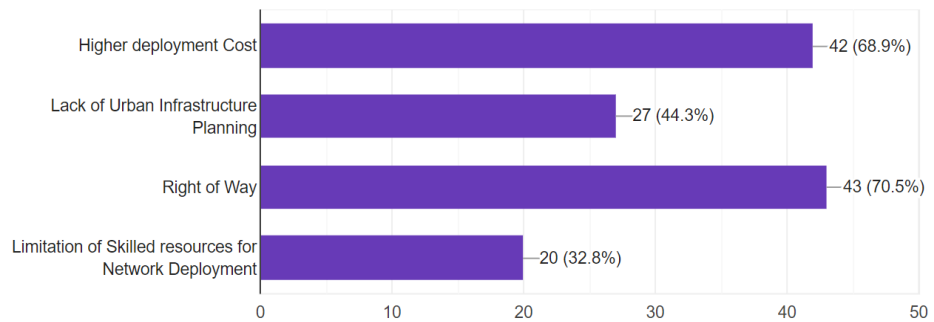


Fig 12: Major Challenges

As shown in Fig 12 asking from respondent that major challenges for optical fiber network deployment and came to understand that High deployment cost and Right of way are the major challenges will response about 70%

- General awareness program regarding importance of fiber deployment to local public

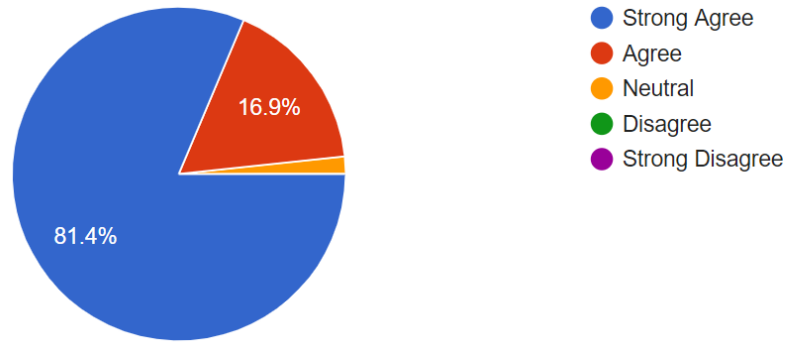


Fig 13: General awareness program

As per the above figure shows that 81% strong agree and 17% is agree on that the telecom operators should initiate the general awareness program for importance of optical fiber network so that the general public understand the value of the optical fiber network and support their team for fiber rollout at ground level.

7) Findings and Recommendations

As we employed purposive sampling by surveying the telecom experts like engineers mangers, coordinators and got a valuable response from all of them. Everyone having the knowledge of optical fiber network deployment and management below is my finding as per the survey data.

Optical fiber deployment is not risky for public and for the opinion for agrees as risk due to optical fiber deployment because of road digging hurdle due to construction.

There should be some strong coordination between telecom operators and local authorities like local corporators, MLA, traffic police and other, ore department so that work will execute smoothly.

Deployments planning team should have consult with the road department for their future road expansion plan, so that the network planning team should take proper precaution and amend their plan for long run.

Telecom operators should use their best practice and best resources for deployment of optical fiber network.

As per survey came to understand that the underground and hybrid technique is best for fiber network deployment.

Major cause for the fiber cut is road construction. This is because of lac of urban infra structure planning and least coordination with local road department.

There should a strong ROW team at ground level so that they can manage day to day hurdles in project rollout at ground level.

There are 4 major challenges, higher deployment cost, improper urban infra structure planning, Right of way and limitation of skilled resources, out of these 4 the major bottleneck is higher deployment cost.

Also telecom operators should initiate the awareness program to local public so that they can understand the importance of optical fiber network and it will help in their life.

8) Scope of Optical fiber in future

No doubt that fiber optic connectivity plays a vital role in the future for data transmission. Technology enhancement and developing demand for fiber optic communication have nourish the evolution of fiber optic communication. It is introduced in such a way that it continues in the future, as fresh and more progressive communication technology is developed. The anticipated future fiber-optic communication trends are as follows.

- The goal is set for all fiber optic communication for completely in the optical domain, as a result, it is applicable in an all-optical communication network. In the optical domain, all signals are executed, with no electrical manipulation. Recently, the electrical domain processes the communications and switched the communication.; firstly the optical signals are necessarily transformed into electrical signal before being processed and routed to their final goal. after processing and routing the signals are re-converted to optical signals and then forwarded to their destination.

This optical to electrical transformation, and vice versa, adds network latency and hence restricts the capacity to attain very high data rates.

- Because of Dense Wave Division Multiplexing (DWDM), Multi-terabit transmission is feasible. The demand for additional bandwidth around the world has prompted interest in multi-terabit optical networks. There are now four terabit networks available, each with a data throughput of 40 gigabits per second and 100 DWDM channels. Researchers plan to achieve even higher bandwidth using 100Gb/s. Much more bandwidth will be available in the future as the price of fiber optic components continues to fall.
- The intelligent optical network. Traffic engineering, dynamic resource route allocation, bandwidth on demand, scalable signaling capabilities, special network management control protocols, wavelength wholesale, wavelength rental, differentiated services for a variety of Quality Service levels, and so on are the future applications of optical network development. Sometimes will take more time for implementation at the level of the network before the intelligent optical network. first, it will be implemented in long-haul networks, then at the network edge.
- The limits forced by flaws in the transmission means of communication are being discovered in the field of ultra-long-range optical transmission. Researchers are exploring the possible achievements of soliton propagation due to the abortion of the dispersion effect. To progress in the direction of infrastructure with the most suitable state for a light pulse to travel, In between the electromagnetic light wave and the transmission mode a good knowledge of interaction is required.
- The expansion of current semiconductor lasers is one of the developing trends to a broader range of lasing wavelengths. The shorter wavelength lasers that attain high output power are the best examples of high-density optical applications.
- When compared to alternative data communication methods such as polymer optical fibers, wireless communication systems, copper cables, and glass fiber have numerous advantages. Polymer optical fibers are easy to use and cheaper and highly flexible for connecting plugs.

9) Conclusion

The massive fiber deployment that has occurred over the past decade and the expected strong deployment for future with a robust network to support demand for new services for telecom operators. For smooth deployment and mitigate the upcoming challenge the study will help to telecom operators. Findings from this study indicate that the biggest challenges of optical fiber network deployment is high deployment cost of project which will reduce by using the existing network infrastructure, Use proper skilled manpower defect cost over a time period will reduce. To the best of my knowledge, I suggest other points to reduce deployment costs such as using another operator's infrastructure, faster deployment so that revenue can generated as soon as possible. The next challenge that make a greatly affect the Right of Way (RoW) at the ground level for network deployment. Therefore, it is recommend that there should be a strong liaisoning team at ground level which has a strong coordination with local authorities for smooth and fast network deployment. Also that RoW team consult with the traffic department for better planning over time. The lack of processes and best practices for fiber cable transmission is a primary reason of frequent fiber failures, according to the analysis presented in this article. Optical fiber technology is a new technology that is essential to India's economic progress. Furthermore, India's fiber optics administration is threatened by a lack of norms and policies for fiber control and management. Finally, there are almost no fiber engineers with the necessary technical competence. This degrades the quality of the work, putting the fiber cables at risk of attack and damage.

Bibliography

- ✚ Arthur Grimes, C. R. (2012). The need for speed. impacts of internet connectivity on firm productivity , 187-201.
- ✚ Canevaro, M. A. (2018, Sep 18). <https://info.aldensys.com/>. Retrieved from <https://info.aldensys.com/: https://info.aldensys.com/joint-use/3-challenges-of-fiber-deployment-and-how-to-improve-the-process>
- ✚ Gambhir, A. (2013). OPTICAL FIBER COMMUNICATION. MERITS AND DEMERITS OF OPTICAL FIBER COMMUNICATION .
- ✚ <https://www.stl.tech/>. (n.d.). www.stl.tech. Retrieved from https://www.stl.tech/optical-interconnect-products/optical-fibre-cable/pdf/Underground_Installation_of_Optic_Fiber_Cable_Placing-_New-_Final.pdf
- ✚ Jason. (2018). The Advantages and Disadvantages of Fiber Optic Transmission. <https://community.fs.com/>.
- ✚ Owusu Nyarko-Boateng, F. E. (2020). Fiber optic deployment challenges and their management in a developing country .
- ✚ Stevens, A. G. (2012, April). Journal of Productivity Analysis. The need for speed: impacts of internet connectivity on firm productivity , vol. 37(2), pages 187-201.
- ✚ [www.gccu.generalcable.com](http://gccu.generalcable.com). (n.d.). Retrieved from http://gccu.generalcable.com/FOOutdrPT7web/fo_outdr_pt7_lms_gcc_fiber_optic_cable_outdoor_pt7_p012.htm
- ✚ www.trai.gov.in. (n.d.). Retrieved from <https://www.trai.gov.in/release-publication/reports/telecom-subscriptions-reports>
- ✚ http://www.iaeng.org/publication/WCE2014/WCE2014_pp438-442.pdf

Questionnaire

- ❖ Name:
- ❖ Designation:
- ❖ Knowledge of fiber deployment and management
 - Yes
 - No
- ❖ Is there any Risk of fiber deployment to the public
 - Strong Agree
 - Agree
 - Neutral
 - Disagree
 - Strong Disagree
- ❖ There should be a strong coordination between Telecom operators and local authorities
 - Strong Agree
 - Agree
 - Neutral
 - Disagree
 - Strong Disagree
- ❖ Take consultation with Road department before deployment planning
 - Strong Agree
 - Agree
 - Neutral
 - Disagree
 - Strong Disagree
- ❖ Network operator should use the best practice for fiber deployment
 - Strong Agree
 - Agree
 - Neutral
 - Disagree
 - Strong Disagree
- ❖ Best deployment technique for fiber rollout
 - Underground duct/conduit
 - Overhead/ Ariel
 - Hybrid (Underground and Ariel Mix)
- ❖ What are the major cause of fiber cut
 - Excavation for Road construction

- Theft
 - Due to Natural climate
 - Due to other operator
- ❖ There Should be one strong ROW team along with Deployment team
 - Strong Agree
 - Agree
 - Neutral
 - Disagree
 - Strong Disagree
- ❖ As per your understanding which one is major challenge for fiber deployment
 - Higher deployment Cost
 - Lack of Urban Infrastructure Planning
 - Right of Way
 - Limitation of Skilled resources for Network Deployment
- ❖ Telecom operators should initiate some general awareness program regarding importance of fiber deployment to local public
 - Strong Agree
 - Agree
 - Neutral
 - Disagree
 - Strong Disagree

PAPER NAME

Chandrashekhar_2k20emba10.docx

WORD COUNT

6524 Words

CHARACTER COUNT

36512 Characters

PAGE COUNT

32 Pages

FILE SIZE

480.6KB

SUBMISSION DATE

May 8, 2022 8:24 PM GMT+5:30

REPORT DATE

May 8, 2022 8:25 PM GMT+5:30**● 7% Overall Similarity**

The combined total of all matches, including overlapping sources, for each database.

- 1% Internet database
- 1% Publications database
- Crossref database
- Crossref Posted Content database
- 6% Submitted Works database

● Excluded from Similarity Report

- Bibliographic material
- Quoted material
- Cited material

● 7% Overall Similarity

Top sources found in the following databases:

- 1% Internet database
- Crossref database
- 6% Submitted Works database
- 1% Publications database
- Crossref Posted Content database

TOP SOURCES

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	University of Kufa on 2021-08-02 Submitted works	2%
2	Owusu Nyarko-Boateng, Faith Edem Bright Xedagbui, Adebayo Felix Ad... Crossref	<1%
3	University of Greenwich on 2017-05-22 Submitted works	<1%
4	summit.sfu.ca Internet	<1%
5	University of Glamorgan on 2022-03-13 Submitted works	<1%
6	University of the Cordilleras on 2022-04-10 Submitted works	<1%
7	KIET Group of Institutions, Ghaziabad on 2019-01-25 Submitted works	<1%