ST. XAVIER'S COLLEGE

(Affiliated to Tribhuvan University)

Maitighar, Kathmandu

Case Study Report

on

Client Server Computing (ITC 224)

At

Bent Ray Technologies Pvt. Ltd.

Under the supervision of

Er. Samyam Maskey

Lecturer

Submitted by

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Submitted to

ST. XAVIER'S COLLEGE

Department of Computer Science

Maitighar, Kathmandu, Nepal

June ____, 2015

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On

Client Server Computing

A case study report submitted in partial fulfillment of the requirement for the degree of Bachelor of Information Management

Submitted by

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CERTIFICATE OF APPROVAL

The undersigned certify that they have read and recommended to the Department of Computer Science for acceptance, a case study report on the subject "Client Server Computing" submitted by Satya Prakash Joshi (4652/12), Harish Chand (4619/12) and Jonaam Bhurtel (4621/12) in partial fulfillment for the degree of Bachelor of Information Management.

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Sincere thanks to **Bent Ray Technologies Pvt. Ltd.** staff who listened and quenched our queries. We are grateful to the entire team of the company where we realized how the Client Server Computing is implemented and its necessity and helpfulness in real scenario where hundreds of networks are set up each day.

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ABSTRACT

Rapid growing technology challenges us in many different ways, accepting those challenges there has been a lot of research from past to till dates. People are expecting fast smooth, reliable, quality on their usability. Client Server Computing is also the most popular and rapid growing technology.

This Case Study is related to the Client Server Computing. People are not well familiar regarding these factors. Country like Nepal this would be the best invention and good staring. The aim of this report is to illustrate the project's subject matter, background of some companies, how these companies are using network development for their benefits and users service. And our main focus was on OS they use and topology they use.

This report would be much beneficial for organization and individuals interested in development in the client and server computing and its applications.

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ABBREVIATIONS

IT	:	Information Technology
SDLC	:	Software Development Life Cycle
OS	:	Operating System
KB	:	Kilobyte
E-MAIL	:	Electronic Mail
IBM	:	International Business Machine
UNIX	:	Uniplexed Information and Computing Service
ERD	:	Entity Relationship Diagram
MIS	:	Management Information System
DSS	:	Decision Support System
TPS	:	Transaction Processing System
OAS	:	Office Automation System
GIS	:	Geographical Information System
IDEs	:	Integrated Development Environment

CHAPTER 1

1.1 Background of the Study

Several years ago, most organizations had mainframe-based computing in which mainframe computers were connected to the dumb terminals. These terminals were unable to do any independent computing and had to totally rely on the mainframe for data processing. As years passed, development of personal computers led to the replacement of dumb terminals. However the main processing work continued to be performed on the mainframe computer. The improved computing capability of personal computer was ignored to great extent. After due course of time, many organization started to realize the potential of personal computer started to think about the possibility of using it either by haring, or by splitting some of the processing demands between mainframe and the personal computers. Client-server technology is the outcome of this development.

Client/server describes the relationship between two computer programs in which one program, the client, makes a service request from another program, the server, which fulfils the request. Although the client/server idea can be used by programs within a single computer, it is a more important idea in a network. In a network, the client/server model provides a convenient way to interconnect programs that are distributed efficiently across different locations. Computer transactions using the client/server model are very common. For example, to check your bank account from your computer, a client program in your computer forwards your request to a server program at the bank. That program may in turn forwards the request to its own client program that sends a request to a database server at another bank computer to retrieve your account balance. The balance is returned back to the bank data client, which displays the information for you.

The client/server model has become one of the central ides of network computing. Most business applications being written today use the client/server model. So does the internet's main programs, TCP/IP.

Background of the Company

Bent Ray Technologies is an IT company based in Nepal. It has already emerged as the fastest growing company in Nepal to provide quality IT solutions and outsourcing services. The company is promoted by innovative IT professionals, expertise manpower and a pool of unmatched talent. At Bent Ray Technologies, we deliver superior IT concepts and solutions for the competitive market.

We are a process driven company committed to provide strategic, dynamic, reliable and secure solutions to our clients. We built a good return on investment (ROI) for our clients. We understand the value of QTC-Quality, Time and Commitment. We have our own tested methodology for development. We breakdown the task into smaller units and concentrate on every aspect of the product. We have always invested on updating our technical manpower to the recent tools of development. We often provide training to the new technologies.

Vision of Company

To establish an IT company which provides topnotch IT services to Nepal and offshore.

Goal of Company

To establish a team of qualified, dedicated and workaholic professionals which can provide strategic visioning and can pay our client good Return-Of-Investment.

Objectives of Company

- To provide complete solutions related to Information and Communication Technologies
- To work as consultant in software and hardware development, its maintenance, desktop publishing and web designing, network development and management.
- To develop quality software's that ease the daily transactions of corporate houses
- To provide training and mentoring and carry out research in above listed domain

Technologies Used by Company

Most of the software developers of Bent Ray are acquainted with the latest technical knowledge and are capable of switching their technical platform easily in the short span as per the requirements. Bent Ray is successful enough to develop products in different technical environments. Some of the technologies we are acquainted with are as follows:

1. Development Platform: C, C++, Visual Basic, Visual C++, JAVA, VB.NET, C#.NET
2. Web Based Development Platform: PHP, ASP, ASP.NET, JSP, ColdFusion
3. Database: Oracle, SQL Server, MySQL, SyBase, PostGRE
4. SSReporting: Crystal Report, iReport, MS Data Report

Introduction to Client Server Computing

A computer network diagram of clients communicating with a server via the Internet. The client–server model of computing is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients. Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system. A server host runs one or more server programs which share their resources with clients. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await incoming requests.

Examples of computer applications that use the client–server model are Email, network printing, and the World Wide Web.
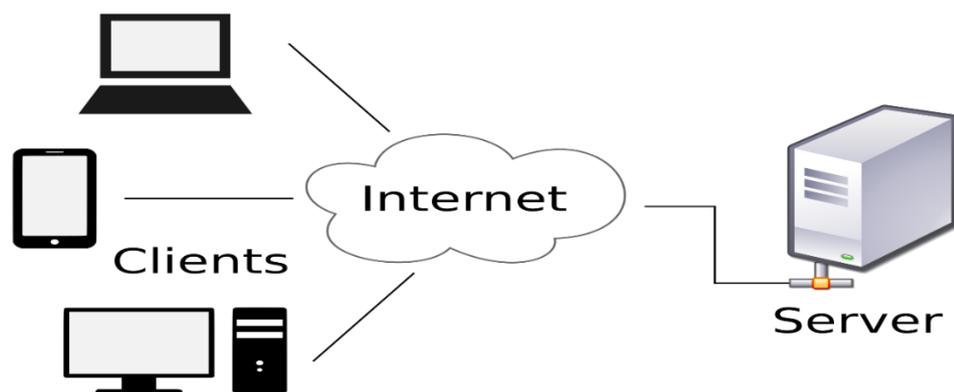
Client and Server Roles

The client–server characteristic describes the relationship of cooperating programs in an application. The server component provides a function or service to one or many clients, which initiate requests for such services.

Servers are classified by the services they provide. For instance, a web server serves web pages and a file server serves computer files. A shared resource may be any of the server computer's software and electronic components, from programs and data to processors and storage devices. The sharing of resources of a server constitute a service.

Whether a computer is a client, a server, or both, is determined by the nature of the application that requires the service functions. For example, a single computer can run web server and file server software at the same time to serve different data to clients making different kinds of requests. Client software can also communicate with server software within the same computer. Communication between servers, such as to synchronize data, is sometimes called inter-server or server-to-server communication.

Client Server Model

Client/Server Model is the basic idea where a host machine can act as either a client or a server. Client/server interactions underline all communication on the internet and the model is a standard for network-oriented computing. Generally, a host acting as a client is an information consumer and when acting as a server is an information provider. The server acts as a resource for all of its clients and provides a service for those clients.

A host acting as a server typically interacts with multiple clients at one time. In client/server interaction, client software interacts with the server software so that both the client's host machine and server's host machine share the total computing load. Clients and servers are designed to form a seamless computing environment.
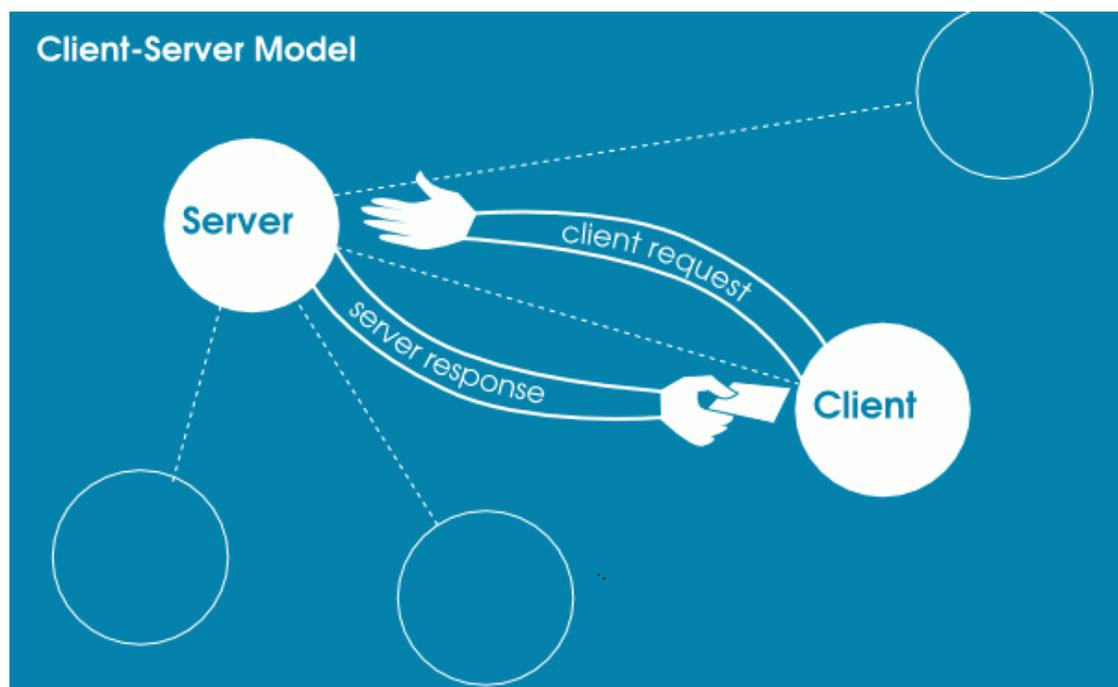
Client and Server Communication

In general, a service is an abstraction of computer resources and a client does not have to be concerned with how the server performs while fulfilling the request and delivering the response. The client only has to understand the response based on the well-known application protocol, i.e. the content and the formatting of the data for the requested service.

Clients and servers exchange messages in a request-response messaging pattern: The client sends a request, and the server returns a response. This exchange of messages is an example of inter-process communication. To communicate, the computers must have a common language, and they must follow rules so that both the client and the server know what to expect. The language and rules of communication are defined in a communications protocol. All client-server protocols operate in the application layer. The application-layer protocol defines the basic patterns of the dialogue. To formalize the data exchange even further, the server may implement an API (such as a web service). The API is an abstraction layer for such resources as databases and custom software. By restricting communication to a specific content format, it facilitates parsing. By abstracting access, it facilitates cross-platform data exchange.

A server may receive requests from many different clients in a very short period of time. Because the computer can perform a limited number of tasks at any moment, it relies on a scheduling system to prioritize incoming requests from clients in order to accommodate them all in turn. To prevent abuse and maximize uptime, the server's software limits how a client can use the server's resources. Even so, a server is not immune from abuse. A denial of service attack exploits a server's obligation to process requests by bombarding it with requests incessantly. This inhibits the server's ability to respond to legitimate requests.

When a bank customer accesses online banking services with a web browser (the client), the client initiates a request to the bank's web server. The customer's login credentials may be stored in a database, and the web server accesses the database server as a client. An application server interprets the returned data by applying the bank's business logic, and provides the output to the web server. Finally, the web server returns the result to the client web browser for display.

In each step of this sequence of client–server message exchanges, a computer processes a request and returns data. This is the request-response messaging pattern. When all the requests are met, the sequence is complete and the web browser presents the data to the customer.

Multitier Architecture

In software engineering, multi-tier architecture (often referred to as n-tier architecture) is a client–server architecture in which presentation, application processing, and data management functions are physically separated. The most widespread use of multi-tier architecture is the three-tier architecture.

N-tier application architecture provides a model by which developers can create flexible and reusable applications. By segregating an application into tiers, developers acquire the option of modifying or adding a specific layer, instead of reworking the entire application. A three-tier architecture is typically composed of a presentation tier, a domain logic tier, and a data storage tier.

While the concepts of layer and tier are often used interchangeably, one fairly common point of view is that there is indeed a difference. This view holds that a layer is a logical structuring mechanism for the elements that make up the software solution, while a tier is a physical structuring mechanism for the system infrastructure.

Three-Tier Architecture

Three-tier architecture is a client–server architecture in which the user interface (presentation), functional process logic ("business rules"), computer data storage and data access are developed and maintained as independent modules, most often on separate platforms. The three-tier model is a software architecture pattern.

Apart from the usual advantages of modular software with well-defined interfaces, the three-tier architecture is intended to allow any of the three tiers to be upgraded or replaced independently in response to changes in requirements or technology. For example, a change of operating system in the *presentation tier* would only affect the user interface code.

Typically, the user interface runs on a desktop PC or workstation and uses a standard graphical user interface, functional process logic that may consist of one or

more separate modules running on a workstation or application server, and an RDBMS on a database server or mainframe that contains the computer data storage logic. The middle tier may be multi-tiered itself (in which case the overall architecture is called an "n-tier architecture").

Presentation Tier

This is the topmost level of the application. The presentation tier displays information related to such services as browsing merchandise, purchasing and shopping cart contents. It communicates with other tiers by which it puts out the results to the browser/client tier and all other tiers in the network. (In simple terms it is a layer which users can access directly such as a web page, or an operating systems GUI)

Application Tier

The logical tier is pulled out from the presentation tier and, as its own layer, it controls an application's functionality by performing detailed processing.

Data Tier

The data tier includes the data persistence mechanisms (database servers, file shares, etc.) and the data access layer that encapsulates the persistence mechanisms and exposes the data. The data access layer should provide an Application Programming Interface (API) to the application tier that exposes methods of managing the stored data without exposing or creating dependencies on the data storage mechanisms. Avoiding dependencies on the storage mechanisms allows for updates or changes without the application tier clients being affected by or even aware of the change. As with the separation of any tier, there are costs for implementation and often costs to performance in exchange for improved scalability and maintainability.

Chapter 3: Literature Review

The aim of this project was to know the essence and aspects of operating system in various real world organizations. We chose "Bent Ray Technology" as our study matter. In this organization we consulted with system supervisor to know the implementation of various technologies and the future development of software system in this organization. For this, we prepared questionnaire and also researched over this matter using various resources.

Moreover, we would like to express our sincere gratitude to staff working there as they helped us to discuss real world problem while implementing software develop system in their organization such as deadlocks and starvations. This really allowed us to know and experience practically what it feels like to work in real world situation.

2.3 Research Methodology

Research can be defined as a process of steps used to collect and analyze information to increase our understanding of a topic or issue. It consists of three steps: Pose a question, collect data to answer the question, and present an answer to the question. The techniques and the guidelines which we use to collect, store, research, analyze and then to write report is coined as **research methodology**. All these are a part of our research on the case study of Client Server Computing at **Bent Ray Technologies.** Following are the procedures of our research methods and data collection and observation to find the concrete evidence.

2.3.1. Interview

An **interview** is a conversation between two or more people where questions are asked by the interviewer to elicit facts or statements from the interviewee. The qualitative research interview seeks to describe and the meanings of central themes in the life world of the subjects. The main task in interviewing is to understand the meaning of what the interviewees say.

Interviewing, when considered as a method for conducting qualitative research, is a technique used to understand the experiences of others. Interviewing differs from other methods of data collection in that it is often more exploratory in nature, and allows for more flexibility. Thus interviewing is most effective when the goal of said

research is to gain insight into the "subjective understanding" of those around us. By asking participants "why" we are enabled to not only observe their behavior but to subsequently understand the meaning that underlies that behavior, and to have this meaning explained to us in the participant s own words.

2.3.2. Questionnaire

A **questionnaire** is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Although they are often designed for statistical analysis of the responses, this is not always the case. The questionnaire was invented by Sir Francis Galton.

Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. However, such standardized answers may frustrate users. Questionnaires are also sharply limited by the fact that respondents must be able to read the questions and respond to them. Thus, for some demographic groups conducting a survey by questionnaire may not be practical.

2.3.3. Field research

Field research or **fieldwork** is the collection of information outside of a laboratory, library or workplace setting or in our case the IT department of Bent Ray Technologies. The approaches and methods used in field research vary across disciplines. Field research involves a range of well-defined, although variable, methods: informal interviews, direct observation, participation in the life of the group, collective discussions, analyses of personal documents produced within the group, self-analysis, results from activities undertaken off- or on-line, and life-histories. This is all to get the firsthand experience of software development at the Bent Ray Technologies.

When conducting field research, keeping an ethnographic record is essential to the process. Field notes are a key part of the ethnographic record. The process of field notes begin as the researcher participates in local scenes and experiences in order to make observations that will later be written up. The field researcher tries first to take mental notes of certain details in order that they are written down later.

2.3.4. Internet

The resource "INTERNET" is used to further broaden our vision, knowledge, idea and experience on the case. It not only acts as the powerful source to help us understand the client server computing and software development as well as to create the simplified report to be understandable by the commoner. It is an unlimited source of information and ideas which serve to facilitate the case of our study.

1.3 Objectives of the Study

This is case study produced in relation to our 6th Semester group project "Client Server Computing". This document covers the details of our findings and implementation of our work regarding various software development and its applications. Client Server Computing is the study and an application of engineering to the design, development, and maintenance of software.

- To improve in design and interactive debugging.
- To identify applications of subjects Client Server Computing.
- To identify different type of the products or services provided by the development company.

- To find the procedures of developing application for mobile, desktop, enterprise.

- To know how the companies, industries and institutions are implementing software development life cycle phases.
- To identify the IDE, frameworks and build tools used for creating and developing software's and applications.
- To understands user's conceptual model and development of better specifications.

1.4 Significance of the Study

This case study report discloses the application of "Client Server Computing" and software development in the Nepali companies and industries. This report will be helpful to identify how the organization is working and how they are getting benefits from these subjects, how the software development technologies on these subjects are developing. Mainly this report will help in the field of software development, we have

done the research on the basis of real world situation and this data will help to get the knowledge about process, tools and methods of software development. Mostly this report is very useful for students like us as we got unforgettable experiences.

1.5 Limitations of the Study

- Half of our study was based on the secondary data.
- Since the case study period was short, due to lack of time the detailed and elaborated study was not done.
- As being student, there is no full accessibility with the system mechanisms of the organization, hence requirement analysis and other required analysis become insufficient.
- Organization has its own rules and regulations binding inside these, with limited accessibility have to work under their keen supervision.

Computer Network & Models

A computer   network or data   network is   a telecommunications   network which allows computers to exchange data. In computer networks, networked computing devices pass data to each other along network links (data connections). Data is transferred in the form of packets. The connections between nodes are established using either cable media or wireless media. The best-known computer network is the Internet.

Company mostly using remote data model. This is one of the most popular model in client server computing. Where the latest models are distributed data and fat client model and thin client model.

Thin Client

A thin client is a stateless, fan less desktop terminal that has no hard drive. All features typically found on the desktop PC, including applications, sensitive data, memory, etc., are stored back in the data center when using a thin client.

A thin client running Remote Desktop Protocols (RDP), like Citrix ICA and Windows Terminal Services, and/or virtualization software, accesses hard drives in the data

center stored on servers, blades, etc. Thin clients, software services, and backend hardware make up thin client computing, a virtual desktop computing model.

Thin clients are used as a PC replacement technology to help customers immediately access any virtual desktop or virtualized application. Thin clients provide businesses a cost-effective way to create a virtual desktop infrastructure (VDI). Thin clients are utilized in various industries and enterprises worldwide that all have different requirements but share common goals. The cost, security, manageability, and scalability benefits of thin clients are all reasons that IT personnel are exploring –and switching– to thin clients.

Fat Client

A fat client (also called heavy, rich or thick client) is a computer (client) in client–server architecture or networks that typically provides rich functionality independent of the central server. Originally known as just a "client" or "thick client" the name is contrasted to thin client, which describes a computer heavily dependent on a server's applications.

A fat client still requires at least periodic connection to a network or central server, but is often characterized by the ability to perform many functions without that connection. In contrast, a thin client generally does as little processing as possible and relies on accessing the server each time input data needs to be processed or validated.

TCP/IP

An industry standard suite of protocols providing communication in a heterogeneous environment. It provides a routable, enterprise networking protocol and access to the Internet and its resources

TCP/IP is based on a four-layer reference model. All protocols that belong to the TCP/IP protocol suite are located in the top three layers of this model.

As shown in the following illustration, each layer of the TCP/IP model corresponds to one or more layers of the seven-layer Open Systems Interconnection (OSI) reference model proposed by the International Standards Organization (ISO).

Application Layer

- Contains logic needed to support the various user application
- The presentation and session function of OSI layer are also incorporated in application layer of TCP/IP model.
- For each different type of application a separated module is needed.
- Application layer protocols of TCP/IP models are FTP, HTTP, SMTP, DNS, TELNET File transfer protocols.

Transport Layer:

- Reliable delivery of data inspective of nature of application that are changing data.
- It also deals with quality of servers flow control and arrows control.
- The widely used transport layer protocols are TCP/UDP. UDP stands for User datagram protocols. TCP stands for Transfer Control Protocols

Internet Layer

- Implemented in end system and router.
- It takes segment from transport layer and frames packet by adding some header than it sends those packets.
- It allows the host to insert packets into any network and have them to deliver independently to the destination

Network Access Layer

- In TCP/IP mode data link layer and physical layer formally group together to become network access layer.
- TCP/IP doesn't define any specific protocol at physical and data link layer the existing data link and physical standards can be used.
- It supports all standards and prosperity and protocol.

CHAPTER 4:

Epilogue

4.1 Result

Bent Ray Technologies Pvt. Ltd. provides services software development service. The only one central base of Bent Ray at Lalitpur, Nepal. Bent Ray Technologies takes information from their valuable customers and they will design and develop their needs as a software.

The application of system development is to provide better way to do work on office and it will help to do work fast. By using developed software they will proving better way to communicate with their customers. Development of software is for data and user security

The software development mechanism is SDLC phases and development models. Developer will develop & test software then only software will be released. Those who don't know programming language they can't develop software's.

4.2 Critical Analysis

Bent Ray Technologies Pvt. Ltd. is one of the renowned premium software development company in Nepal. Despite its present height of success, it is seen that it has not yet used as much the common general feature like development and testing of software and long term support with customer. The system structure is defined according to software development phases. System analyst will analyze problem and requirement of software to develop and solve the problem. The employees are basically assigned to develop part of software's and if all the part developed then after they will combine all the parts all together to create one particular software. Company will provide die hard support to their customer because it is the work of software development and maintenance. After the completion of software they will give that software to customer and customer will analyze software, if they found any errors and lack of feature they will ask company to resolve and add new features on that software. If they have their own software engineer they will give software source to

their own engineer. Due to ease of use and fulfillment of their required jobs, customers widely go to Bent Ray to develop their own software.

4.3 Conclusion

This case study was successful experience gaining new knowledge and skills were most achievements. Within this short span of time, various software development activities had been observed and learnt, which taught the significance of relation, leadership traits and other managerial and software development skills.

The greatest thing that was learned during case study is how to accomplished the task doing it in team, how to make best use of internet, how to use of different tools to gain efficiency, how to do code so that are in standard according to coming new technologies.

Finally, internship program has increased skill to communicate and report to those parties in time regarding any kind of issues that are dealt in the organization and buildup the confidence level to work in team and real world projects.

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