A TECHNICAL REPORT ON STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME(SIWES)

UNDERTAKEN AT

4, BALARABE MUSA CRESCENT, VICTORIA ISLAND, LAGOS, NIGERIA.

BY

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CPE/15/2418

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS
OF THE BACHELOR'S DEGREE IN COMPUTER ENGINEERING

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DEPARTMENT OF COMPUTER ENGINEERING
FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Certification

This is to certify that this report is a detailed account of Students' Work Experience Scheme (SIWES) undertaken by Mr. JOHN OWOLABI IDOGUN with Matriculation Number CPE/15/2418 for a period of six months at ipNX Nigeria Limited, Victoria Island, Lagos State and has been compiled in accordance to regulations guiding the preparation of reports in the department of Computer Engineering, Federal University of Technology, Akure, Ondo State.

SIWES Coordinator's Signature	Head of Department's Signature

Student's Signature

Dedication

To my wonderful Guardians, benefactors and sponsors, Engr. & Mrs. Sunday Idogun: know that I unimaginably cherish the lessons you taught me which make me belief that with God, smart work, patience, and determination, anything can be achieved.

To all tech-savvies: we have got a lot to learn.

Idogun John O.

Acknowledgements

I owe a huge debt of gratitude to God Almighty for His unconditional and resilient love cum compassion towards me. He is deeply appreciated for the intellectual acumen He amply bestowed on me before, during and after this industrial training.

This project-based internship was made possible by funding from my Guardians, benefactors and sponsors, Engr. & Mrs. Sunday Idogun, my amiable sister, Mrs. Modupe Igbekoyi, and her husband, Mr. Idowu Igbekoyi, my great brother, Mr. Festus Idogun, and all my family members. You have all been awesome to me.

I would like to thank my industry-based supervisor, Oluboyo Charles Oluwaseun, for his encouragement, supports in all aspects, and timely help. I am favoured to have been under your tutelage. Special thanks are extended to Frances Nnamadim, a Business Analyst and UI/UX designer, who never seemed to be tired of imparting knowledge and writing comments as well as remarks, for discussions, feedback, ideas, and for help on the various projects done. I would also like to thank Amuche Benson-Onyeibor, who extended her generosity and was kind enough to offer comments and suggestions in the course of implementing some projects. My grateful thanks go to all the people at ipNX Nigeria Limited for the pleasant co-operation and hospitality they offered during my stay, particularly Shade Efiong-Bassey, the Human Resources Managers, and Administrators.

Finally, I want to thank Dr. (Mrs) Folasade Mojisola Dahunsi, Ag. Head Of Computer Engineering Department, Federal University of Technology, Akure, especially for help on getting Internship placement and superb cum expressive motherlike love.

Abstract

This paper reports a six-month Internship with the Research and System Architecture department at ipNX Nigeria Limited, Victoria Island, Lagos.

My tasks were to engineer, develop and deploy customer-centric software products while employing modern Software development paradigms and practices. Some projects require data visualization in which communication between Front-end and Back-end asynchronously JSON over XMLHttpRequest (XHR) using Asynchronous JavaScript and XMLHttpRequest (Ajax) while others involve implementing complex algorithms such as the Materialized Path Algorithm to provide some required complex features as contained in the Software Requirement Specification document. Such implemented complex features include but not limited to a Threaded Commenting System, Full-text search system using PostgreSQL's full-text search engine, a live chat system and other basic Create, Retrieve, Update and Delete (CRUD) processes using Flask and Django frameworks as well as PostgreSQL and SQLite databases. Most of the software projects were wholly written in Python, an interpreted, high-level, general-purpose programming language created by Guido van Rossum and first released in 1991 that lets one work quickly and integrate systems more effectively. Few other projects such as a Web crawler and Recommender system were implemented in Julia, a new programming language offering a unique combination of performance and productivity that promises to change scientific computing, and programming in general. Julia picks the best parts of existing programming languages, providing out-of-the-box features such as a powerful Read-Execute-Print Loop (REPL), an expressive syntax, Lisp-style metaprogramming capabilities, powerful numeric and scientific programming libraries, a built-in package manager, efficient Unicode support, and easily called C and Python functions.

System/Linux Administration works were also embarked upon ranging from deploying already developed applications to a Linux server using Apache2 and nginx to complying with versioning and back-end compatibility of resources. In cooperation with a notable senior staff in the department of Business Intelligence and Data Analytics (BIDA), I designed and developed from scratch a complex blogging web application primarily to bring together tech enthusiasts. Syntax highlighting was implemented using Primejs and Django-ckeditor was used as "What You See Is What You Get(WYSIWYG)" rich texts or documents editor.

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Chapter 1

Introduction to SIWES Program

1.1 Background

The Student Industrial Work-Experience Scheme (SIWES) is an undergraduate training programme with specific learning and career objectives geared towards the development of occupational and industrial competencies of the participating students. It is a requirement for the award of degrees and diploma to all students of tertiary institutions in Nigeria pursuing courses in specialized engineering, technical, business, applied sciences and applied arts. The scheme is a three-party program which involves the student, the tertiary institution, and the industry,and it exposes students to practical knowledge of their course of study. Furthermore, SIWES is a general programme cutting across over 60 programmes in the universities, over 40 programmes in the polytechnics and about 10 programmes in the colleges of education. Thus, SIWES is not specific to any one course of study or discipline. Consequently, the effectiveness of SIWES cannot be looked at in isolation with respect to a single discipline, hence it is better explored in a holistic manner since many of the attributes, positive outcomes and challenges associated with SIWES are common to all disciplines participating in the scheme. Hence, the approach of this report is to look at SIWES as a general study programme cutting across several disciplines. Furthermore, the report gives details of the industrial work experience gained at ipNX Nigeria Limited, Victoria Island, Lagos state.

1.2 Brief History of SIWES Program

The Students' Industrial Work-Experience Scheme (SIWES) started with about 748 students from 11 institutions of higher learning in 1974. By 1978, the scope of participation in the scheme had increased to about 5,000 students from 32 institu-

tions. The Industrial Training Fund, however, withdrew from the management of the scheme in 1979 owing to problems of organizational logistics and the increased financial burden associated with the rapid expansion of SIWES. Consequently, the Federal Government funded the scheme through the National Universities Commission (NUC) and the National Board for Technical Education (NBTE) who managed SIWES for five years (1979 – 1984). The supervising agencies (NUC and NBTE) operated the scheme in conjunction with their respective institutions during this period

1.3 Scope of SIWES

The decree which legislates this scheme does not give a time confinement or restriction to its implementation but it is a relative assignment. This implies that each school has the mandate with respect to her academic calendar to categorically state when the scheme will be undertaken but must ensure that the required period of training is satisfied thus.

1.4 Aims and Objectives of SIWES

The objectives of SIWES as stated in Information and Guideline for SIWES (2002) are:

1. To provide an avenue for students in higher institutions to acquire industrial skills and experience in their approved course of study.

2. To prepare students for the industrial works situation which they are likely to meet after graduation.

3. To expose students to work methods and techniques in handling equipment and machinery not available in their institutions.

4. To provide students with an opportunity to apply their knowledge in real work situation thereby bridging the gap between theory and practical.

5. To enlist and strengthen employers' involvement in the entire educational process and prepare students for employment in Industry and Commerce.

Chapter 2

ipNX Nigeria Limited

2.1 History and Corporate Profile

2.1.1 History

With its headquarters at 4, Balarabe Musa Crescent, Victoria Island, Lagos and several branch offices in Lagos, Ibadan, Abuja, Kano and Port Harcourt, ipNX Nigeria Limited is a leading provider of infrastructure-based telecommunication and information technological services based here in Nigeria. With more than a decade of experience, the company was formed by the divestment of the telecommunications services division of Telnet Nigeria Limited and has been in operations for over fifteen (15) years. ipNX Nigeria Limited started as a business division of Telnet Nigeria Limited - the leading indigenous Telecommunication and Information Technology Services Company in Nigeria. Telnet started business in 1987 as telecommunications engineering company and grew into other areas of information technology as technology evolved and opportunities arose. A major part of the business of telnet was providing data communication services, mainly wide area networks to Corporate communities in Nigeria in the Oil and Gas as well as Financial Services industries. Since NITEL was the monopoly provider of telecommunication services in Nigeria due to government regulation, these networks had to be built with NITEL facilities. In December 1992, the Federal Government of Nigeria deregulated the telecommunications industry, thereby opening it up to competition and other organizations were allowed to provide telecommunications services. Telnet saw this as an opportunity to improve its services to its customers and started to build its own communications network using radio and VSAT (satellite) technologies. The radio networks are utilized for communications between locations in the same metropolitan area while VSAT networks were mainly used to provide long distance communications.

The corporate organizations used the networks provided for both private voice and data communications.

In 2001 Telnet decided to separate the infrastructure based business from the engineering (or knowledge) based business. This was done to:

- To allow Telnet Nigeria Limited provide engineering services to other infrastructure based service providers who might see Telnet as a competition.

- To allow other investors to invest in the infrastructure based business, which is very capital intensive.

The infrastructure based Services Company within Telnet was therefore detached from the group to form a new company – "Netco Services Limited". Some of the Nigerian Communications Commission (NCC) licenses with Telnet were transferred to Netco and Netco obtained some additional licenses from the Nigerian Communications Commission (NCC). In total Netco has:

- Regional 3.5GHz FWA (Fixed Wireless Access) licenses in Lagos, Cross River, Bayelsa and Abuja.

- National VSAT license.

- Internet Service Provider License.

Unfortunately, a subsidiary of the Nigerian National Petroleum Company (NNPC); the National Engineering and Technical Company had also been known in the Nigerian environment with the acronym Netco and this caused a bit of confusion in the market place, hence in April 2003 the name of the company was changed to ipNX Nigeria Limited.

ipNX has now obtained additional frequencies from the NCC to be used to provide consumer and small businesses with Internet and Data Communications. These have been allocated to Lagos, Abuja (FCT), Cross Rivers and Bayelsa States with an opportunity to go to other states in Nigeria after we have started providing services in these locations.

2.1.2   Corporate Profile

ipNX is one of Nigeria's fastest growing Information and Communications Technology companies, serving a multitude of needs across enterprises, small businesses and residents with innovative, world-class services.

Our ability to identify, satisfy and exceed today's market needs is a testament to over a decade of experience, our commitment, drive and passion realized through highly skilled and well seasoned professionals.

As a pioneer and a leading Fibre-To-The-Home (FTTH) operator in Nigeria, we currently provide a number of solutions to various industries and market segments using industry-leading technology (such as our very own Fibre-To-The-Home (FTTH) cable technology) as our core access network infrastructure and fixed wireless radio services (via licensed frequency).

We also proffer complementary IT solutions, with a view of covering key commercial and suburban regions.

2.2 Why ipNX?

At ipNX, we pride ourselves on being game changers. We value smart, talented, hardworking people who stand tall and resolute amidst challenges. If great ideas thrill you, then you will fit in with us at ipNX. You will enjoy a stimulating environment, totally cool colleagues and all the opportunity your drive can handle.

2.2.1 Our Culture

Everyone in ipNX has the mindset of the explorer. We are always bold. We are to known venture into unknown and uncharted territories, yielding technology - enabled communications solutions that deliver optimal value to our stakeholders.

We constantly innovate and break boundaries. We are relentlessly customer obsessed, starting all we do with our customer in mind.

At ipNX, each employee takes personal responsibility and full accountability for upholding a culture that is inclusive, ethical and supportive of our corporate vision, goals and value.

2.2.2 Our Guiding Principles

We don't go out of our way to be different - We are. Our exciting and unique office culture is driven by who we are in the real world. From the word go, we focus on providing every person, every home and every business in Nigeria with world-class information, communication and entertainment services, while having fun.

Customer Obsession

At ipNX we obsess about our customers, and how to meet their requests. We pay attention to every detail that concerns them, with patience, true care, concern, constant follow up and follow through. We start and end all we do with our customers in mind.

Explorer

We are willing to try something new, venture into unchartered territories. Have a Sense of adventure, dare to be different. Be bold!

Can Do Spirit

Anything is possible! With hard work and strong commitment there is nothing we cannot achieve.

Teamwork

By working together, complementing each other's diversity, we achieve more.

Innovation

We constantly innovate in our processes, technology, products and services to deliver value.

Continuous Improvement

We continuously look to improve everything we do. Speed matters in business. We push relentlessly for desired outcomes and focus on results. . . the process is not the output! We value calculated risk taking.

Bias for Action

Speed matters in business. We push relentlessly for desired outcomes and focus on results. . . the process is not the output! We value calculated risk taking.

Excellence

We are committed to relentlessly pursue excellence.

Continuous Learning

We will continuously improve our skills and knowledge in order to remain the best at what we do.

Respect for the Individual

Creating an open and enabling environment where different opinions can be expressed without fear. We value the contribution of everybody at every level. We treat our colleagues, whether supervisors, peers, or subordinates, with courtesy and respect, without harassment, or physical or verbal abuse. We acknowledge our rights to diversity yet are united in achieving our corporate goals.

Professionalism

At all times, we will exhibit strict compliance to the tenets of our profession and work environment.

Integrity

We deliver on promises to ourselves, clients and colleagues, holding ourselves to high levels of ethical behavior.

Ownership

Ownership is about taking responsibility and accepting accountability. I am accountable for the timeliness and quality of an outcome designated to me, even when working with others.

Frugality

We will achieve more with less, without compromising on quality. Our frugality inspires us to be resourceful, innovative and self-sufficient.

Exciting Work Environment

We believe our workplace should also be fun and creative, making it a place where people want to be every minute; where ideas thrive. This makes us more productive and keeps us engaged. We work smart . . . and we play smart.

2.2.3   Training And Development

We recognize at ipNX that learning improves and drives the company to its success. Our commitment to learning and development at ipNX is not just lip service but an actual dedicated effort that strengthens and empowers our employees throughout the duration of their career with us.

We offer amazing internal resources that include:

- ICademy online

- Employee development programmes

- Mentorship programmes

- Leadership development programmes

2.2.4   Compensation and Benefits

Work can be demanding but fun. However, at ipNX, we ensure that you stay rewarded for your performance and contribution. Compensation is determined by a number of factors including company performance, divisional performance, and individual performance.

Our benefits generally include:

- Insurance

- Paid vacation time

- Paid paternity and maternity leave

- Other position specific benefits, amidst other options

2.2.5   Corporate Social Responsibility

Our aim is to support our communities by empowering them primarily through technology-enabled. Leveraging on technology, we contribute to the growth of the young population preparing them for independence and helping them to become useful members of society while achieving self-actualisation.

Through the use of technology, we provide educational services that close the gap between our children and children in a more developed economy.

Over the years, ipNX has improved the quality of education in the communities where she has done business.

2.3   Vision Statements of ipNX

To be the preferred communications and IT enabler in Africa and beyond. We will do this by providing services with boundless possibilities.

2.4   Mission Statements of ipNX

Leveraging technology to create innovative solutions that help mankind thrive.

We will revolutionize communications and IT through continuous innovation; providing the highest quality of service that will give our customers unsurpassed value in a cost effective and responsible manner. We shall attract the best talent and provide the enabling environment for our staff to exploit their full potential. Our value creation shall provide prosperity to all stakeholders and the community in general.

2.5   Core Credentials

Over 15 years experience

Trustworthy and devoted

More than 5,000 large and small business customers

Over 800km of cutting-edge fibre-optic cable infrastructure

ipNX is also the dependable service provider to the financial services sector, connecting all banks in Nigeria, Central Bank, InterSwitch & NIBSS.

2.6   Services

Broadband Internet

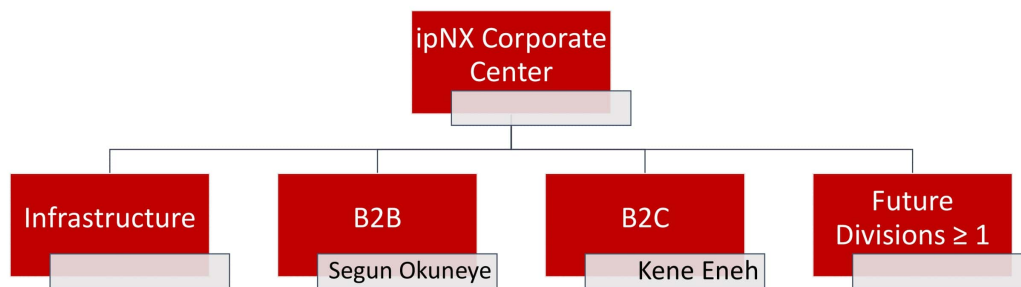IP-VPN/MPLS

IP Wholesale

Telephony

Collocation & Hosting

Unified Communication
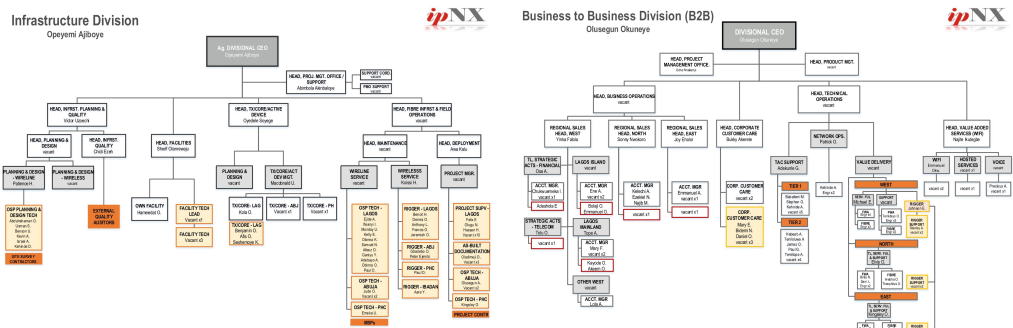
Cloud Computing

2.7   ipNX Organogram

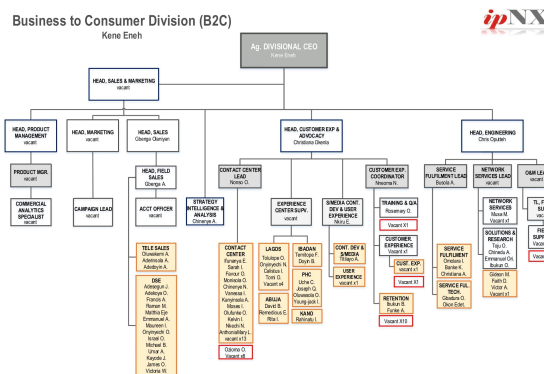### *ip*NX NEW OPERATING MODEL

February, 2019.

Figure 2.1: ipNX Main Organogram

(a) Infrastructure Organogram   (b) Business Division(B2B) Organogram

(c) Retail Division(B2C) Organogram

2.8   ipNX Departments And Divisions

ipNX provides a range of network connectivity, and delivery of internet, telephony, television as well as cloud-based software application services for our clients. These services are delivered by teams working across multiple divisions and departments.

2.8.1   ipNX Departments

Human Capital Management

Our Human Resource team brings out the best potential in every staff because here ipNX, our people matter. Their talent, commitment, energy – plus the million and one things they bring to our business- makes us who we are. The way you think matters to us. we value creative thinking. So far, it has helped us recreate rules and we want more of it. If you like adventure, if you don't give up, if you are focus on getting results, we want you at ipNX.

Finance

We would be nowhere without the expertise and insight of our finance teams. Our various teams include: Financial Accounting Revenue Assurance Treasury Billing The teams are there to understand, support and challenge the business, making sure we are doing everything we can to run efficiently by providing the financial expertise required to grow our business to profitable levels and heights. If you have an eye for numbers and a brain for planning, what are you waiting for?

Legal, Risk And Compliance

Our Legal area has a big impact on our actions. Fortunately, we can rely on the counsel, creative thinking and sound judgment of the Law, Risk and Compliance team to unravel the finer points and keep us on the right track. If you know you are a champion of business integrity; are good at building constructive business relationships with our customers, partners, local communities, or the government; strive to protect and promote innovation, enterprise, then join us for a career with our LRC team.

Customer Experience & Advocacy

When our customers need support and advice, or they want to get something sorted out, they deserve the right help, right on time. Everyone in customer service loves to make a difference because they strive for excellence. They won't stop until they

can see the smile of satisfaction on the customer's face. Very simply put, we obsess over our customer. On joining the Customer service team, you will be the voice of ipNX. And whatever the next call brings, your goal remains the same; to delight and dazzle with your knowledge and commitment. If you can throw in some pleasant surprises along the way, everyone is a winner.

Health, Safety And Environment

ipNX Health, Safety and Environmental team is responsible for development, oversight, and management of environmental health and safety programs that protect the ipNX working environment, provide safe and healthy conditions for work and comply with applicable laws and regulations. It is the team's goal is to pro vide responsive service and critical support to ensure that ipNX is a safe and healthy environment in which to work, study, and live. If you are an expert in what you do and love safety, apply to join our HSE team.

Marketing

ipNX Marketing Department plays a massive role in promoting the mission and business of ipNX. ipNX Marketing team's main focus is to understand our customers, their values, and perception and make sure they get it – through our amazing services because ipNX was born to disrupt – but with a purpose. If you can wow our customers with ipNX brand, you might just fit right in with this team.

Internal Audit

Our Internal Audit team provides ipNX with unbiased, objective and constructive views that help companies succeed. Our internal audit team examines and evaluates the policies, procedures and systems which are in place to ensure the reliability and integrity of information, compliance with policies, plans, laws and regulations; the safeguarding of the assets; and the efficient use of resources. We are looking for professionals who take pride in their work.

Corporate Services

Our Corporate services are made up of Human Capital Management, Administrative Services, Facility Management, etc. They provide services to our people. They make sure we get the best employees who remain the best employees on top of their game; they make sure we have both the physically and mentally enabling environment to support and push out our creativity. At ipNX, we want to work with people who

know the next best idea is just around the corner – and who have the ambition, creativity, and passion for going after it.

Supply Chain Management

Our SCM team helps cordinate and integrate seamless information, material and finance flow from suppliers to customers, so that we have an excellent customer service, an ideal inventory management and low unit cost. At ipNX, our SCM team has the prime responsibility of integrated planning, sourcing and deployment of material connected to our network services . If you know you have the expertise for this job, why not join our SCM team.

Information Systems And Technology

As an organization that is in love with leading edge innovation and services, it is no wonder that our IS&T team plays a crucial role. The team provides exceptional technological services and support. Our team enables efficiency, productivity and simplicity both internally and externally, helping us to grow. Joining our IS&T team means you will help keep our internal IT running smoothly by creating and maintaining our systems and applications.

Fibre Project And Rollout

Our Fibre Project and Rollout team are our hunchos when it comes to rolling out our network fibres direct to business areas and homes. If you have a passion for success and want to make a difference for customers every day, join our Fibre Project and Rollout Team.

Admin Services

Every organization needs somebody to coordinate it. That job is for the ipNX administrative team. The administrative team brings its conscientious planning, attention to detail and flexible thinking to the heap of projects. They help make sure things run like a well-oiled clock. This means organizing everything from staying on top of day to day administration, prioritizing and managing real estate and other assets, getting involved in team strategy and company – wide objectives. If you want to join our administration team, there is always plenty of opportunity to make your mark.

Research And System Architecture

The ipNX Research and System Architecture team is reinventing the technology world every day. The Research and System Architecture team is in charge of all our research and development and are also responsible for coming up with tomorrow services that meet the needs for our today's customers. They look for ways to do it cheaper, faster, and better. We are looking for those who have the drive and passion for technology.

2.8.2 ipNX Divisions

Infrastructure Division

ipNX network is always on duty, always in demand. That means it has to be reliable. This all comes down to the diligence and support of our network services team. Whether fixed-voice and data; mobility; and IT services, they make sure our network is ever available. This means our customers' experience is in their hands. They are there to trouble shoot malfunctions and make the network service bigger, better, faster and stronger. If you are someone who can resolve issues, develop ideas to enhance a growing network and most importantly, work with the ipNX team and embrace the values we uphold, then you have what it takes to be part of ipNX community.

Retail Division

Business Division

Chapter 3

Project Design

[Must be present in FYDP-1 Report and also in Final Report]

Every chapter should start with 1-2 sentences on the outline of the chapter.

3.1 Requirement Analysis

3.2 Methodology and Design

You have to mention alternate solutions that you have considered. Why you have selected the specific solution, etc.

3.3 Summary

Chapter 4

Implementation and Results

[Must be present in Final Report. Incomplete version might be included in FYDP-1 Report, however it is optional.]

Every chapter should start with 1-2 sentences on the outline of the chapter.

4.1 Environment Setup

4.2 Evaluation

4.3 Results and Discussion

4.4 Summary

Chapter 5

Standards and Design Constraints

[Must be present in FYDP-1 Report and also in Final Report]

Every chapter should start with 1-2 sentences on the outline of the chapter.

5.1 Compliance with the Standards

Only mention the standards that are related to your project. This list is not complete.

5.1.1 Software Standard

5.1.2 Hardware Standard

5.1.3 Communication Standard

5.2 Design Constraints

Only mention the design constraints that are related to your project. This list is not complete.

5.2.1   Economic Constraint

5.2.2   Environmental Constraint

5.2.3   Ethical Constraint

5.2.4   Health and Safety Constraint

5.2.5   Social Constraint

5.2.6   Political Constraint

5.2.7   Manufacturability and Cost Analysis

5.2.8   Sustainability

5.3   Summary

Chapter 6

Conclusion

[Must be present in FYDP-1 Report and also in Final Report. Might be incomplete in FYDP-1 Report.]

Every chapter should start with 1-2 sentences on the outline of the chapter.

6.1 Summary

6.2 Limitation

6.3 Future Work

References