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THIS DRAFT THESIS REPORT IS PRESENTED TO THE DEPARTMENT OF ARCHITECTURE AS PARTIAL FULFILMENT OF THE REQUIREMENT FOR A POSTGRADUATE DIPLOMA IN ARCHITECTURE

BY

RICHARD APPIAH

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DECLARATION

I hereby declare that this submission is my own work towards the postgraduate diploma in architecture and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

Richard Appiah	[signature]	16th September, 2009.
Student Name and ID	Signature	Date

Certified by:

Dr. V. Kootin-Sanwu	[signature]	Sept 18th, 2009
Supervisor(s) Name	Signature	Date

Certified by:

....	....	....
Head of Dept. Name	Signature	Date

DEDICATION

This thesis is dedicated first and foremost to the Almighty God who has strengthened me throughout my studies on this thesis and to my wonderful father, Mr. Kwasi Appiah, Managing Director of K. Appiah Construction Limited and Miss Anita Abban of Women's World Bank, for or their care and help in this thesis.

ACKNOWLEGEMENT

I thank the Almighty God for giving me the strength to go through this dissertation in order to help me complete my two year degree programme.

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ABSTRACT

Increasingly, governments are realizing that Information Communications Technology (ICT) and computer literacy are key to developing a thriving and competitive economy. They recognize that citizens who use a PC at home are more likely to have the IT skills that are needed for employment.

Computer literate citizens find it easier to learn new work skills. They contribute more to the businesses that employ them and are more motivated. Their motivation drives productivity within the business - ultimately fuelling economic growth and a country's ability to compete in the global economy.

The Ghanaian government is therefore accelerating economic growth by offering incentives that make it easier for citizens and businesses to purchase or lease PCs for home use. This scheme - known as i-Advance Computer4all, is a Government Assisted PC Program (GAPP) and is being developed in conjunction with Intel, a world leader in silicon innovation, and Microsoft, the global leader in software development.

Employers will participate in i-Advance Computer4all because they see the incentives as a way of increasing employee loyalty and boosting the skills base of their business. Schools, colleges and universities are keen to become involved because students with a PC at home can tap into a much wider range of educational resources.

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CHARTER ONE

1.1 INTRODUCTION

Definition of Assemble Plant

A factory where manufactured parts are assembled (arrange or join) into a finished product.

Recent statistics by the Economic Commission for Africa, ECA, has indicated that African countries account for only 1% of the global internet users.

The study further revealed that Africa has a long way to go as far as the deployment of ICT for poverty reduction is concerned. While Africa's internet growth stagnates, internet is at geometric proportion in the developed economies of the world. According to the study, over the last decade, African countries have been striving hard to position themselves to deploy information Communications technology to break the digital divide.

According to the formal Vice President of Republic of Ghana, H. E Alhaji Aliu Mahama, systematic approaches to policy making aimed at internet accessibility to the rural areas through the construction of the rural tele-centres in Africa is considered laudable.

One important factor which has impact on development is the use of the internet. It is important for developing countries to realize that IT can only serve as a tool for economic development if it is treated as an investment good rather than consumption good.

This is particularly true if developing countries can focus on solution focused software development based on research and development.

African countries have not attained much as the usage of internet is mostly restricted to the urban areas. A similar study conducted by the Nigerian Information Technology Professionals in America (NITPA) has also revealed that Africa is far behind in the global information communication technology race.

The study was contained in a paper titled.The Future Generation of ICT Experts: Can Africa Lead the Way? which was presented by Prof. Manny Aniebonam of George Washington

According to Aniebonam, a quantified estimate of African Digital Divide parameter, NITPA studies, 2002, revealed that university graduates with IT skills in North America stood at 85 per cent while Africa has 5 per cent, a situation experts said will take Africa about 45 years to catch up.

The NITPA study further revealed that Africa is still grossly lagging behind in ICT as the ratio of PC in America is 85 per 100 household as against 3 per 100 household in Africa.

The study also revealed that Computer literacy in North America is higher compared to Africa as the ratio is 78 per 100 persons in North America while that of Africa is 5, a situation experts said, will take Africa about 25 years to catch up with North America.

Furthermore, North America is far ahead Africa in internet usage as the figure showed that internet use per 100 persons in North America is 87 while Africa is 4 per 100 persons. The study also revealed that IT is contributing 15 per cent to Economic growth in North America while in Africa; it is only 0.2 per cent.

Further still, the NITPA study revealed that in North America, 20 per cent of overall economic development is attributable to information technology while in Africa, it is 0.5 per cent. He noted that from every study, Africa is far behind in the global ICT race and falling further behind daily adding that a radical treatment is needed if we must catch up.

Aniebonam attributed infrastructure inadequacy, human capacity inadequacy, government policies, educational handicap, image, insecurity and institutional inadequacies as the greatest challenges facing Africa.

As in human capacity, he noted that 90 per cent of expert skills are imported while indigenous experts abound in diaspora. Many indigenous experts, are wishing to join those in diaspora as result of lack of enabling environment. He stated that capacity building and nation building for African Union (AU) nations must be co-ordinated, well planned and executed to be effective.

It will involve African experts in diaspora, government agencies, organizational entities, and objective non-governmental organisations (NGOs). The following parametres will be affected, using stated mode of practices.

Image building: promotion of African image at global levels through direct contacts with Africans in diaspora, collaborating with NGOs.

Policy initiatives: Addressing security issues, enabling environment, and functional legal system.

Organizational Alliance: Development of high level partnership of organisations, within each country and through AU.

Training: Education of African indigenes through established initiatives such as Teachers without Borders, NITPA, TTT initiative, global conferences, among others.

Africa, has come of age in its capacity but must seize the moment (with the emergence of AU and NEPAD) to effectively utilize its human resources.

1.2 PROBLEM STATEMENT

However, despite these massive investments in ICT infrastructure and ICT capacity building, Ghana still to a large extent is digitally isolated from the Global Village because it lacks the critical drive and strategies to harness the full potential of ICT for the socio-economic development of the country. These have been some of the challenges facing the full ICT deployment in the country.

Ghana spends so much in the importation of finished computers that decrease the Gross domestic product of the country. In effect more revenue is use to import these finish computers. In virtue of that if the country spend much on assembling computers rather than importing finish computer gadget the country stand a chance of generate revenue from assembling.

With the high demand on the ICT industry the country needs a lot of computers to serve as a tool in upgrading ICT education

1.3 JUSTIFICATION

Computers have become one of the common tools used by the global world in communicating. Industrial countries around the world increased their economy with the advent of the computer and electronics manufacturing and assembly. In Ghana, industries contribute about 25.4% of the economical wealth. With this contribution, If the country has to enter in the field of computer assembly, It will develop its industrial sector very well. It will drastically reduce foreign imports and hence improve the economy. The Gross Domestic product in this effect will be increased.

1.4 SIGNIFICANCE

If computers assembly plant is establish in Ghana, it will go a long way to provide job which has become the government biggest challenge in solving and educate the people in the country. It will serve as a tool in educating the youth and the old.

1.5 OBJECTIVES

To improve and encourage the use of computer in Ghana

To make computers more personal and affordable to the local people as well as work efficiently due to the tropical conditions under which they are assembled.

To ensure the transfer of its technology into the country,

Putting ICTs resources within the reach of all.

To provide Information and Knowledge that will facilitate capacity building for ICTs products and services to create, identify, synthesize and disseminate Information and Knowledge on ICTs for Development; and to promote the use of ICTs throughout the country

Providing a plat for new ways of improving manufacturing in Ghana and the rest of the word

Provide employment opportunities for the people,

To boost the economic status of the country by improving the manufacturing industry.

And also create a platform for skills-training, and the capacity building of local citizens of the country.

1.6 SCOPE OF THESIS

The design seeks to establish the need for the design of a Computer Assembly plant to solve the growing information technology need of the country.

Prove computer assembly plant that will proved goods and services to Ghanaians and the rest of the world in information communication, technology equipment, thereby improving the use of it.

Design an assembly plant complete with

Production hall

Ware hose

Packaging

Buffer halls

Welfare block with canteen & first aid area

Maintain unit

Administration

Security post

1.7 TARGET GROUP

Ghanaians and the people around the sub regions of West Africa and Africa at large.

Student in general, thus from the primary through to the secondary and the tertiary

The working force, especially the office workers and the business oriented people.

For homes, thus the father down to the security personal at home.

1.8 CLIENT

Ministry of Communication and information a representative of Ghana government

A private sector company (Hp and Compaq)

1.9 CLIENTS BRIEF

Reception

Office

Coding and Programming sector

Assembling sector

Inspection and Checking sector

Stores

Packaging section

Parking space

And supporting facility like

Toilet,

Restaurant

1.10 SOURCE OF FINANCE

The project is to be finance by the Ghana government and the hp and Compaq computers.

Minor shear holder will be computer Users, Private Investors, Government Officials, Multilateral and computer software Institutions.

The concessionaire is required to inject capital, improve productivity and quality of service at a competitive price and lower total costs to the economy. The objective of all these activities is to enhance the value of computer assembly by putting them to their best and valuable use.

1.11 METHODOLOGY

Interviews

Photography

Research

Personal thought and observations

REFERENCES

Encarta Encyclopedia

Wikipedia Encyclopedia

http://www.ghanaweb.com

http://www.moc.gov.gh

CHAPTER TWO

2.1 ASSEMBLY LINE

Assembly Line, factory arrangement whereby the work in process passes progressively from one operation to the next until the product is assembled. [1]

2.2 MAJOR BRANCHES OF COMPUTER SCIENCE

Computer science can be divided into four main fields: software development, computer architecture (hardware), human-computer interfacing (the design of the most efficient ways for humans to use computers), and artificial intelligence (the attempt to make computers behave intelligently). Software development is concerned with creating computer programs that perform efficiently. Computer architecture is concerned with developing optimal hardware for specific computational needs. The areas of artificial intelligence (AI) and human-computer interfacing often involve the development of both software and hardware to solve specific problems[2]

2.3 ECONOMIC IMPROVEMENT OF COMPUTERS

Largely because of the success of endeavors such as the Research Triangle Park, North Carolina's economy has grown and diversified and the number of professional and high-tech jobs has increased rapidly. From 1990 to 1997 the state's economy grew by 31 percent, compared to 20 percent for the United States as a whole in the same period. The state seemed poised to continue its growth well into the 21st century, spurred in part by Dell Computer Corporation's decision in 2004 to build a manufacturing plant in North Carolina. [3]

[1 & 3] Encarta Encyclopaedia

2.4 SYSTEM OF ASSEMBLING

Rebotics :Another area of computer science that has found wide practical use is *robotics*—the design and development of computer controlled mechanical devices. Robots range in complexity from toys to automated factory assembly lines, and relieve humans from tedious, repetitive, or dangerous tasks. Robots are also employed where requirements of speed, precision, consistency, or cleanliness exceed what humans can accomplish. Roboticists—scientists involved in the field of robotics—study the many aspects of controlling robots. These aspects include modeling the robot's physical properties, modeling its environment, planning its actions, directing its mechanisms efficiently, using sensors to provide feedback to the controlling program, and ensuring the safety of its behavior. They also study ways of simplifying the creation of control programs. One area of research seeks to provide robots with more of the dexterity and adaptability of humans, and is closely associated with AI. [4]

Microsoft Encarta 2009.

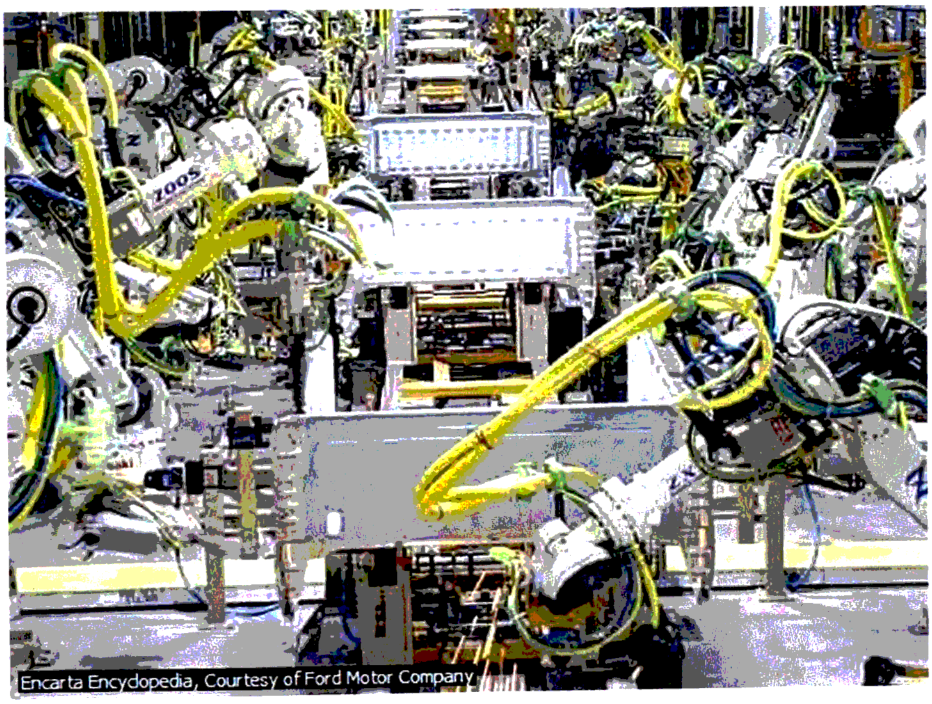

Figure 1: View of rebot computer assambly line

Figure 2. View of robot operating a machine with a superv

2.5 COMPUTER ARCHITECTURE

Computer architecture is the design and analysis of new computer systems. Computer architects study ways of improving computers by increasing their speed, storage capacity, and reliability, and by reducing their cost and power consumption. Computer architects develop both software and hardware models to analyze the performance of existing and proposed computer designs, then use this analysis to guide development of new computers. They are often involved with the engineering of a new computer because the accuracy of their models depends on the design of the computer's circuitry. Many computer architects are interested in developing computers that are specialized for particular applications such as image processing, signal processing, or the control of mechanical systems. The optimization of computer architecture to specific tasks often yields higher performance, lower cost, or both. [5]

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[2] & [5] "Computer," *Encyclopaedia Britannica Ultimate Reference Suite,* Chicago, Encyclopaedia Britannica, 2009

Computer Ownership Statistics Shows Computer per Inhabitant, Per Country

Posted on Dec 26, 08 11:11 AM PDT

Computer ownership

Computers per 100 people, 2006

1	Israel	122.1
2	Canda	87.6
3	Switzerland	86.5
4	Netherlands	85.4
5	Sweden	83.6
6	United States	76.2
7	Britain	75.8
8	Australia	75.7
9	Denmark	69.6
10	Singapore	68.2
11	Japan	67.6
12	Hong Kong	61.2
13	Austria	60.7
14	Germany	60.6
15	Norway	59.4
16	France	57.5
17	South Korea	53.2
18	Ireland	52.8
19	New Zealand	50.2
20	Finland	50.0
21	Estonia	48.3
22	Slovenia	40.4
23	Belgium	37.7
24	Italy	36.7
25	Slovakia	35.8
26	Spain	27.7
27	Czech Republic	27.4
28	United Arab Emirates	25.6
29	Latvia	24.6
30	Poland	24.2
31	Kuwait	23.7
32	Costa Rica	23.1
33	Macedonia	22.2
34	Malaysia	21.8
35	Croatia	19.9
36	Lithuania	18.0
37	Mauritius	16.9
38	Brazil	16.1
39	Hungary	14.9
40	Chile	14.1
41	Mexico	13.6
	Saudi Arabia	13.6
	Uruguay	13.6
44	Mongolia	13.3
	Portugal	13.3
46	Romania	12.9
47	Namibia	12.3
48	Russia	12.2

Source: "Pocket World in Figures", based on data from the International Telecommunication Union

The Economist published a list containing interesting figures for computer ownership per inhabitant, per country. Unfortunately, there are not enough details to have a definite comprehension of the situation, but it's still fun to watch. Israel would have 1.22 computers per person, 0.76 for the USA and 0.57 in France. It doesn't say how they compiled the data. Are these numbers what you expected?

2.6.0 FACTORY SYSTEM

Factory System, working arrangement whereby a number of persons cooperate to produce articles of consumption. Today the term *factory* generally refers to a large establishment employing many people involved in mass production of industrial or consumer goods. Some form of the factory system, however, has existed since ancient times. [6]

2.6.1 EARLY HISTORY

Pottery works have been uncovered in ancient Greece and Rome. In various parts of the Roman Empire factories manufactured glassware and bronze ware and other similar articles for export as well as for domestic consumption. In the Middle Ages, large silk factories were operated in the Syrian cities of Antakya and Tyre; and in Europe, during the late medieval period, textile factories were established in several countries, notably in Italy, Flanders (now Belgium), France, and England. [7]

[6-7] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

During the Renaissance, the advance of science, contact with the New World, and the development of new trade routes to the Far East stimulated commercial activity and the demand for manufactured goods and thereby promoted industrialization. In western Europe and particularly in England, during the 16th and 17th centuries, many factories were created to produce such goods as paper, firearms, gunpowder, cast iron, glass, items of clothing, beer, and soap. Although heavy machinery, operated by water power in some places, was used in a few establishments, the industrial processes were generally carried on by means of hand labor and simple tools. In contrast to modern mechanized plants with assembly lines, the factories were merely large workshops where each laborer functioned independently. Nor were factories the most usual place of production; although some workers used their employer's tools and worked on the premises, most manufacturing was done under the domestic, or putting-out, system, by which workers received the raw materials, worked in their own homes, returned the finished articles, and were paid for their labor. [8]

2.6.2 DEVELOPMENT OF THE FACTORY SYSTEM

The factory system, which eventually replaced the domestic system and became the characteristic method of production in modern economies, began to develop in the late 18th century, when a series of inventions transformed the British textile industry and marked the beginning of the Industrial Revolution.. These inventions mechanized many of the hand processes involved in spinning and weaving, making it possible to produce textiles much more quickly and cheaply. Many of the new machines were too large and costly for them to be used at home, however, and it became necessary to move production into factories. [9]

[8-10] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

One of the major technological breakthroughs early in the Industrial Revolution was the invention of a practical steam engine. When textile factories first became mechanized, only water power was available to operate the machinery; the factory owner was forced to locate the establishment near a water supply, sometimes in an isolated and inconvenient area far from a labor supply. After 1785, when a steam engine was first installed in a cotton factory, steam began to replace water as power for the new machinery. Manufacturers could build factories closer to a labor supply and to markets for the goods produced. The development of the steam locomotive and steamship in the early 19th century made it possible to ship factory-built products to distant markets more rapidly and economically, thus encouraging industrialization[11]

The Arkwright method of spinning was introduced into the U.S. in 1790 by Samuel Slater, a former apprentice in a British mechanized textile factory who started a factory in Pawtucket, Rhode Island. From that time on, mechanized textile factories sprang up throughout New England. In 1814, at a cotton mill established by the American industrialist Francis Cabot Lowell in Waltham, Massachusetts, all the steps of an industrial process were, for the first time, combined under one roof; here, cotton entered the factory as raw fiber and emerged as finished goods ready for sale. [12]

2.6.3 MASS PRODUCTION

Textiles, particularly cotton goods, were the major factory-made products during the early 19th century. Meanwhile, new machinery and techniques were being invented that made it possible to extend the factory system to other industries. The American inventor Eli Whitney, who stimulated textile manufacturing in the U.S. by inventing the cotton gin in 1793, made an equally, if not more important, contribution to the factory system by developing the idea of using interchangeable parts in making firearms. Interchangeable parts, with which Whitney began experimenting in 1798, eventually made it possible to produce firearms by assembly line techniques, rather than custom work, and to repair them quickly with premade parts. The idea of interchangeable parts was applied to the manufacture of timepieces from about 1820 on. Then, in the 1850s, at Waltham, Massachusetts, automatic machinery was used for the first time to make watches by consecutive process in a single factory. Thus, by the middle of the 19th century, American factories had begun to develop the outstanding feature of the modern factory system: mass production of standardized articles. [13]

The garment industries were revolutionized by the sewing machine, patented in 1846 by the American inventor Elias Howe, and underwent a tremendous expansion during the 1860s. Spurred by the urgent demand for uniforms during the American Civil War, clothing manufacturers developed standardized sizes, a prerequisite for mass production of ready-made garments. At the same time, the military demand for shoes stimulated the creation of shoe-sewing machinery to mass-produce footwear. [14]

2.6.4 MODERN DEVELOPMENTS

As the 20th century began, the factory system of production prevailed throughout the United States and most of Western Europe. It reached its greatest European development in Germany, England, the Netherlands, and Belgium, which became, to a great extent, importers of food and raw materials and exporters of factory-made commodities. In 1913 Henry Ford, the pioneer automobile manufacturer, made an immense contribution to the expansion of the factory system in the U.S. when he introduced assembly line techniques to automobile production in the Ford Motor plant. In time the factory system spread to the Orient, where cheap labor attracted capital from the industrialized countries of the West. Japan, which had begun to industrialize in the late 19th century, rapidly became the foremost industrial power of Asia and a serious competitor of the Western nations. [15]

[11-15] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

The general trend of development of the factory system has been toward larger establishments with greater capital investment per worker. In the U.S. the number of manufacturing establishments actually declined from about 500,000 in 1899 to about 325,000 in the early 1980s, but the number of workers employed increased greatly, as did the value added to the economy by manufacture. By the mid-1980s, however, many factories felt the impact of serious problems in manufacturing industries, especially in the production of textiles, steel, automobiles, machine tools, and electrical equipment. Of major concern was the proliferation of cheap foreign imports. Cuts in these industries have led to relocation of businesses and factory closings, with accompanying loss of jobs and even economic devastation in some regions. [16]

Other important trends have been the rise to leadership positions of professional managers who treat factory organization and operation as a science, and the development and use of increasingly sophisticated equipment in modern factory operation. Some machines, aided by computers, semiconductors, and other technological innovations of the mid-20th century, are so nearly self-regulating that an entire factory may be kept running by a few people operating sets of controls. This method of production, called automation, has brought many economic changes, which eventually may be as basic as those resulting from the Industrial Revolution. [17]

2.6.5 WORKING CONDITIONS IN FACTORIES

The introduction of the factory system had a profound effect on social relationships and living conditions. In earlier times the feudal lord and the guildmaster both had been expected to take some responsibility for the welfare of the serfs, apprentices, and journeymen who worked under them (*see* Feudalism; Guild). By contrast, the factory owners were considered to have discharged their obligations to employees with the payment of wages; thus, most owners took an impersonal attitude toward those who worked in their factories. This was in part because no particular strength or skill was required to operate many of the new factory machines. The owners of the early factories often were more interested in hiring a worker cheaply than in any other qualification. Thus they employed many women and children, who could be hired for lower wages than men. These low-paid employees had to work for as long as 16 hours a day; they were subjected to pressure, and even physical punishment, in an effort to make them speed up production. Since neither the machines nor the methods of work were designed for safety, many fatal and maiming accidents resulted. In 1802 the exploitation of pauper children led to the first factory legislation in England. That law, which limited a child's workday to 12 hours, and other legislation that followed were not strictly enforced. [18]

The workers in the early mill towns were not in a position to act in their own interest against the factory owners. The first cotton mills were located in small villages where all the shops and inhabitants depended on a single factory for their livelihood. Few dared to challenge the will of the person who owned such a factory and controlled the lives of the workers both on and off the job. The long hours of work and low wages kept a laborer from leaving the community or being otherwise exposed to outside influences. Later, when factories were located in larger cities, the disadvantages of the mill town gave way to such urban evils as overcrowded sweatshops and slums. In addition, the phenomenon of the business cycle began to manifest itself, subjecting industrial laborers to the frequent threat of unemployment. [19]

2.6.6 REFORMS AND CHANGES

By the early 19th century the condition of workers under the factory system had aroused concern. One who called for reform was Robert Owen, a British self-made capitalist and cotton mill owner, who tried to set an example by transforming a squalid Scottish mill town called New Lanark into a model industrial community between 1815 and 1828. At New Lanark, wages were higher and hours shorter, young children were kept out of the factory and sent to school, and employee housing was superior by the standards of the day; yet the mill operated at a substantial profit. In Owen's day modern trade unions were beginning to develop in the British Isles, and he sought to organize them into a national movement. His aim was to improve working conditions as well as effect basic social and economic reforms. In his concern for the increasing differences between capital and labor, Owen was joined by such economic theorists as the Frenchmen Charles Fourier, Claude Henri de Saint-Simon, and Pierre Joseph Proudhon and the Germans Karl Marx and Friedrich Engels, each of whom analyzed the processes of modern industrial society and proposed social and industrial reforms. [20]

In time, organized protest forced owners to correct some of the worst abuses. Workers agitated for and obtained the right to vote, and they established political parties and labor unions. The unions, after a considerable struggle and frequent setbacks, won important concessions from management and government, including the right to organize workers in factories and to represent them in negotiations (*see* Trade Union; Trade Unions in the United States). Furthermore, issues and problems germane to the factory system came to figure prominently in the formulation of modern political and economic theory (*see* Labor Relations). In the Soviet Union, the factory became a social and political, as well as an industrial, unit (*see* Socialism; Union of Soviet Socialist Republics).

One of the important and often overlooked consequences of the factory system was its promotion of the emancipation of women. The factory created wage-earning opportunities for women, enabling them to become economically independent. Thus, industrialization began to change the family relationship and the status of women. *See* Women, Employment of.

[16-20] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

2.6.7 FACTORY INSPECTION

The inspection of factories by state agencies began in England in the early 19th century in response to public protest against the working conditions for women and child laborers. Later, wherever the factory system spread, governments eventually adopted regulations against unhealthful and dangerous conditions. Thus, a factory code became standard in every industrialized country. These codes provided for restrictions on child labor and hours of work, regulation of sanitary conditions, installation of safety devices and the enforcement of safety standards, medical supervision, adequate ventilation, the elimination of sweatshops, and the establishment of minimum wages. One important regulating agency was the International Association of Factory Inspection, established in 1886 by Canada and 14 states of the U.S. The International Labor Organization, acting in cooperation first with the League of Nations and later with the United Nations, correlated the regulation of factory conditions throughout the world. [21]

In the U.S., the federal government is responsible for regulating the working conditions in factories and most other places of employment. Prior to the early 1970s, each of the states regulates the inspection of factories within its own borders. In 1970 the Occupational Safety and Health Administration (OSHA) was established as an agency of the U.S. Department of Labor. OSHA gradúally took over the regulation of health and safety standards in the workplace. Although some states still maintain their own inspection plans, all are monitored by OSHA in order to keep stringent standards. A citation is issued for each violation and a fine may be imposed for a serious infraction. Factory inspection also includes examination of payrolls and employment records. Any establishment covered by the Fair Labor Standards Act is subject to review by the Wage and Hour Division of the Labor Department to ascertain whether employers are complying with regulations. [22]

[21 & 22] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

2.7.0 COMPUTER

Computer, machine that performs tasks, such as calculations or electronic communication, under the control of a set of instructions called a program. Programs usually reside within the computer and are retrieved and processed by the computer's electronics. The program results are stored or routed to output devices, such as video display monitors or printers. Computers perform a wide variety of activities reliably, accurately, and quickly. [23]

2.7.1 USES OF COMPUTERS

People use computers in many ways. In business, computers track inventories with bar codes and scanners, check the credit status of customers, and transfer funds electronically. In homes, tiny computers embedded in the electronic circuitry of most appliances control the indoor temperature, operate home security systems, tell the time, and turn videocassette recorders (VCRs) on and off. Computers in automobiles regulate the flow of fuel, thereby increasing gas mileage, and are used in anti-theft systems. Computers also entertain, creating digitized sound on stereo systems or computer-animated features from a digitally encoded laser disc. Computer programs, or applications, exist to aid every level of education, from programs that teach simple addition or sentence construction to programs that teach advanced calculus. Educators use computers to track grades and communicate with students; with computer-controlled projection units, they can add graphics, sound, and animation to their communications (*see* Computer-Aided Instruction). Computers are used extensively in scientific research to solve mathematical problems, investigate complicated data, or model systems that are too costly or impractical to build, such as testing the air flow around the next generation of aircraft. The military employs computers in sophisticated communications to encode and unscramble messages, and to keep track of personnel and supplies. [24]

[23-24] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

2.7.2 HOW COMPUTERS WORK

The physical computer and its components are known as hardware. Computer hardware includes the memory that stores data and program instructions; the central processing unit (CPU) that carries out program instructions; the input devices, such as a keyboard or mouse, that allow the user to communicate with the computer; the output devices, such as printers and video display monitors, that enable the computer to present information to the user; and *buses* (hardware lines or wires) that connect these and other computer components. The programs that run the computer are called software. Software generally is designed to perform a particular type of task—for example, to control the arm of a robot to weld a car's body, to write a letter, to display and modify a photograph, or to direct the general operation of the computer. [25]

2.8.1 THE OPERATING SYSTEM

When a computer is turned on it searches for instructions in its memory. These instructions tell the computer how to start up. Usually, one of the first sets of these instructions is a special program called the operating system, which is the software that makes the computer work. It prompts the user (or other machines) for input and commands, reports the results of these commands and other operations, stores and manages data, and controls the sequence of the software and hardware actions. When the user requests that a program run, the operating system loads the program in the computer's memory and runs the program. Popular operating systems, such as Microsoft Windows and the Macintosh system (Mac OS), have graphical user interfaces (GUIs)—that use tiny pictures, or icons, to represent various files and commands. To access these files or commands, the user clicks the mouse on the icon or presses a combination of keys on the keyboard. Some operating systems allow the user to carry out these tasks via voice, touch, or other input methods. [26]

2.8.2 COMPUTER MEMORY

To process information electronically, data are stored in a computer in the form of binary digits, or bits, each having two possible representations (0 or 1). If a second bit is added to a single bit of information, the number of representations is doubled, resulting in four possible combinations: 00, 01, 10, or 11. A third bit added to this two-bit representation again doubles the number of combinations, resulting in eight possibilities: 000, 001, 010, 011, 100, 101, 110, or 111. Each time a bit is added, the number of possible patterns is doubled. Eight bits is called a byte; a byte has 256 possible combinations of 0s and 1s. *See also* Expanded Memory; Extended Memory.

A byte is a useful quantity in which to store information because it provides enough possible patterns to represent the entire alphabet, in lower and upper cases, as well as numeric digits, punctuation marks, and several character-sized graphics symbols, including non-English characters such as p. A byte also can be interpreted as a pattern that represents a number between 0 and 255. A kilobyte—1,024 bytes—can store about 1,000 characters; a megabyte can store about 1 million characters; a gigabyte can store about 1 billion characters; and a terabyte can store about 1 trillion characters. Computer programmers usually decide how a given byte should be interpreted—that is, as a single character, a character within a string of text, a single number, or part of a larger number. Numbers can represent anything from chemical bonds to dollar figures to colors to sounds.

The physical memory of a computer is either random access memory (RAM), which can be read or changed by the user or computer, or read-only memory (ROM), which can be read by the computer but not altered in any way. One way to store memory is within the circuitry of the computer, usually in tiny computer chips that hold millions of bytes of information. The memory within these computer chips is RAM. Memory also can be stored outside the circuitry of the computer on external storage devices, such as magnetic floppy disks, which can store about 2 megabytes of information; hard drives, which can store gigabytes of information; compact discs (CDs), which can store up to 680 megabytes of information; and digital video discs (DVDs), which can store 8.5 gigabytes of information. A single CD can store nearly as much information as several hundred floppy disks, and some DVDs can hold more than 12 times as much data as a CD.[27]

2.8.3 THE BUS

The bus enables the components in a computer, such as the CPU and the memory circuits, to communicate as program instructions are being carried out. The bus is usually a flat cable with numerous parallel wires. Each wire can carry one bit, so the bus can transmit many bits along the cable at the same time. For example, a 16-bit bus, with 16 parallel wires, allows the simultaneous transmission of 16 bits (2 bytes) of information from one component to another. Early computer designs utilized a single or very few buses. Modern designs typically use many buses, some of them specialized to carry particular forms of data, such as graphics.[28]

2.8.5 INPUT DEVICES

Input devices, such as a keyboard or mouse, permit the computer user to communicate with the computer. Other input devices include a joystick, a rodlike device often used by people who play computer games; a scanner, which converts images such as photographs into digital images that the computer can manipulate; a touch panel, which senses the placement of a user's finger and can be used to execute commands or access files; and a microphone, used to input sounds such as the human voice which can activate computer commands in conjunction with voice recognition software. "Tablet" computers are being developed that will allow users to interact with their screens using a penlike device.[29]

[25-29] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

2.8.6 THE CENTRAL PROCESSING UNIT

Information from an input device or from the computer's memory is communicated via the bus to the central processing unit (CPU), which is the part of the computer that translates commands and runs programs. The CPU is a microprocessor chip—that is, a single piece of silicon containing millions of tiny, microscopically wired electrical components. Information is stored in a CPU memory location called a register. Registers can be thought of as the CPU's tiny scratchpad, temporarily storing instructions or data. When a program is running, one special register called the program counter keeps track of which program instruction comes next by maintaining the memory location of the next program instruction to be executed. The CPU's control unit coordinates and times the CPU's functions, and it uses the program counter to locate and retrieve the next instruction from memory.

In a typical sequence, the CPU locates the next instruction in the appropriate memory device. The instruction then travels along the bus from the computer's memory to the CPU, where it is stored in a special instruction register. Meanwhile, the program counter changes—usually increasing a small amount—so that it contains the location of the instruction that will be executed next..This entire sequence of steps is called an instruction cycle. Frequently, several instructions may be in process simultaneously, each at a different stage in its instruction cycle. This is called pipeline processing. [30]

2.8.7 OUTPUT DEVICES

Once the CPU has executed the program instruction, the program may request that the information be communicated to an output device, such as a video display monitor or a flat liquid crystal display. Other output devices are printers, overhead projectors, videocassette. [31]

[30 -31] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 200

2.9.0TYPES OF COMPUTERS

2.9.1 DIGITAL AND ANALOG

Computers can be either digital or analog. Virtually all modern computers are digital. Digital refers to the processes in computers that manipulate binary numbers (0s or 1s), which represent switches that are turned on or off by electrical current. A bit can have the value 0 or the value 1, but nothing in between 0 and 1. Analog refers to circuits or numerical values that have a continuous range. Both 0 and 1 can be represented by analog computers, but so can 0.5, 1.5, or a number like p (approximately 3.14). [32]

A desk lamp can serve as an example of the difference between analog and digital. If the lamp has a simple on/off switch, then the lamp system is digital, because the lamp either produces light at a given moment or it does not. If a dimmer replaces the on/off switch, then the lamp is analog, because the amount of light can vary continuously from on to off and all intensities in between

Analog computer systems were the first type to be produced. A popular analog computer used in the 20th century was the slide rule. To perform calculations with a slide rule, the user slides a narrow, gauged wooden strip inside a rulerlike holder. Because the sliding is continuous and there is no mechanism to stop at any exact values, the slide rule is analog. New interest has been shown recently in analog computers, particularly in areas such as neural networks. These are specialized computer designs that attempt to mimic neurons of the brain. They can be built to respond to continuous electrical signals. Most modern computers, however, are digital machines whose components have a finite number of states—for example, the 0 or 1, or on or off bits. These bits can be combined to denote information such as numbers, letters, graphics, sound, and program instructions. [33]

[32-33] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

2.10.1 THE FUTURE OF COMPUTERS

In 1965 semiconductor pioneer Gordon Moore predicted that the number of transistors contained on a computer chip would double every year. This is now known as Moore's Law, and it has proven to be somewhat accurate. The number of transistors and the computational speed of microprocessors currently doubles approximately every 18 months. Components continue to shrink in size and are becoming faster, cheaper, and more versatile.

With their increasing power and versatility, computers simplify day-to-day life. Unfortunately, as computer use becomes more widespread, so do the opportunities for misuse. Computer hackers—people who illegally gain access to computer systems—often violate privacy and can tamper with or destroy records. Programs called viruses or worms can replicate and spread from computer to computer, erasing information or causing malfunctions. Other individuals have used computers to electronically embezzle funds and alter credit histories (*see* Computer Security). New ethical issues also have arisen, such as how to regulate material on the Internet and the World Wide Web. Long-standing issues, such as privacy and freedom of expression, are being reexamined in light of the digital revolution. Individuals, companies, and governments are working to solve these problems through informed conversation, compromise, better computer security, and regulatory legislation. .[34]

Computers will become more advanced and they will also become easier to use. Improved speech recognition will make the operation of a computer easier. Virtual reality, the technology of interacting with a computer using all of the human senses, will also contribute to better human and computer interfaces. Standards for virtual-reality program languages—for example, Virtual Reality Modeling language (VRML)—are currently in use or are being developed for the World Wide Web.

Other, exotic models of computation are being developed, including biological computing that uses living organisms, molecular computing that uses molecules with particular properties, and computing that uses deoxyribonucleic acid (DNA), the basic unit of heredity, to store data and carry out operations. These are examples of possible future computational platforms that, so far, are limited in abilities or are strictly theoretical. Scientists investigate them because of the physical limitations of miniaturizing circuits embedded in silicon. There are also limitations related to heat generated by even the tiniest of transistors.

Intriguing breakthroughs occurred in the area of quantum computing in the late 1990s. Quantum computers under development use components of a chloroform molecule (a combination of chlorine and hydrogen atoms) and a variation of a medical procedure called magnetic resonance imaging (MRI) to compute at a molecular level. Scientists use a branch of physics called quantum mechanics, which describes the behavior of subatomic particles (particles that make up atoms), as the basis for quantum computing. Quantum computers may one day be thousands to millions of times faster than current computers, because they take advantage of the laws that govern the behavior of subatomic particles. These laws allow quantum computers to examine all possible answers to a query simultaneously. Future uses of quantum computers could include code breaking (*see* cryptography) and large database queries. Theorists of chemistry, computer science, mathematics, and physics are now working to determine the possibilities and limitations of quantum computing.

Communications between computer users and networks will benefit from new technologies such as broadband communication systems that can carry significantly more data faster or more conveniently to and from the vast interconnected databases that continue to grow in number and type. [35]

[33-35] Snyder, Timothy Law, "Computer," *Microsoft Student Encarta Encyclopaedia*, Redmond, WA, Microsoft Corporation, 2008

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CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter basically describes the media through which the research was carried out. Different approaches and methods were used to get the needed information. However, the limitations and constraints of these methods cannot be overlooked.

3.2 METHODOLOGY

The main methods that were employed in gathering the required information include: interviews, issuing of questionnaires, internet, reading books and articles related to the topic, personal thoughts and observations, photographs. These methods have been grouped under: field research and desk research.

3.3 FIELD RESEARCH

This took place over a period of time which included surveys into the area of study. For instance, site surveys were carried out to ensure that the location of the project was critically analysed.

Also a survey involving five companies was conducted. The companies include: Masai Computers, Fair Green Computers, Danny Praise Computers, Dealer Computers and Omatek Computers. The survey was conducted with the aid of questionnaires to ascertain the demand and use of computers in the country. Photographs were taken at various points for visual references. Due to the unwillingness of Ghanaians to respond to survey questionnaires an approach was also adopted which involved frequent visits and interviews to the stakeholders.

3.4 DESK RESEARCH

This was basically about reading related books, articles and journals. The internet was a useful tool in gathering the required information about the topic.

3.5 LIMITATIONS AND CONSTRAINTS OF THE RESEARCH

Unwillingness of people to respond to questionnaires and interviews

Apathy on the part of personnel of companies interviewed. People were reluctant to release information for fear of informing competitors about their operations

CHAPTER FOUR

4.0 RESEARCH FINDINGS AND DISCUSSION

4.1 CASE STUDIES

4.1.1 OMATEK COMPUTERS GHANA LTD.

Omatek Computers Ghana Ltd, a subsidiary of Omatek Ventures Ghana Ltd, the brand owner and the other brand builders (OEM Partners) assembles very high quality Omatek brand of computers, casings, speakers, notebooks and other digital entertainment products in the country. It was established in September 2007.

4.2 LOCATION

The factory is located in Accra to be precise Ridge area. This is a mixed zoning area with both civic and residential facilities. One important thing about the location of the plant is: its proximity to the trade centres in Accra.

Figure 3: View of the main entrance of the factory facility

4.3 SPATIAL ORGANISATION

The factory has the following facilities:

- Managerial Offices
- An Accounts Section
- Logistics Room
- Main Production Hall
- Quality Check
- Reception/Showroom
- Storage

The first point of call is the reception/showroom. This is an open space with a wooden platform on which their products are exhibited. There is a waiting area within the reception. From the reception the next space is the logistics room. This is also within the reception area with a wooden partitioning separating it.

The production hall overlooks the reception/ showroom. It is located just after the logistics room. The quality check is after the production hall. This is where they do testing of raw materials and finished products. It serves as an intermediary check before and after the production process.

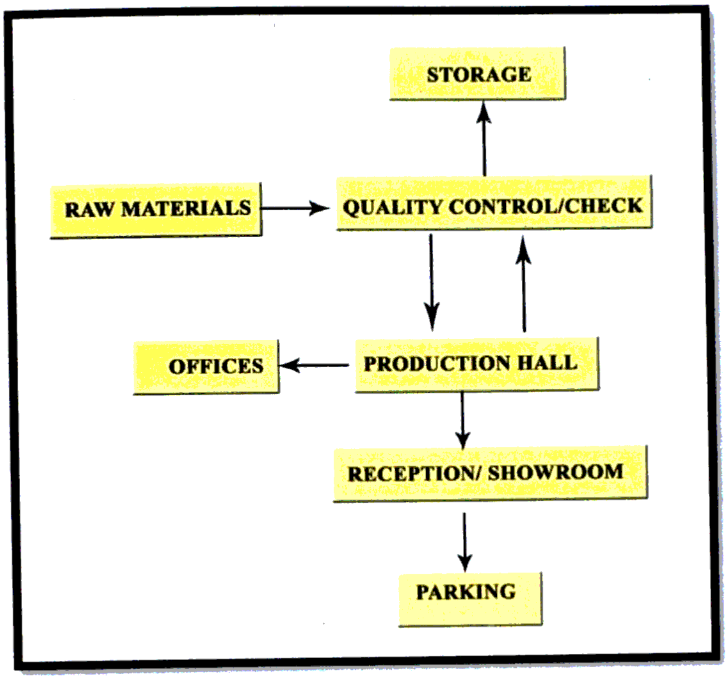


Figure 4: Spatial relationship/organisation of the factory

Figure5: View into entrance of the production hall

4.4 STORAGE

Storage of raw materials is done within the production hall. But there is a separate location for finished products which is accessed from behind the building. The rest of the spaces are managerial offices with an accounts section. The offices see to the administrative running of the factory.

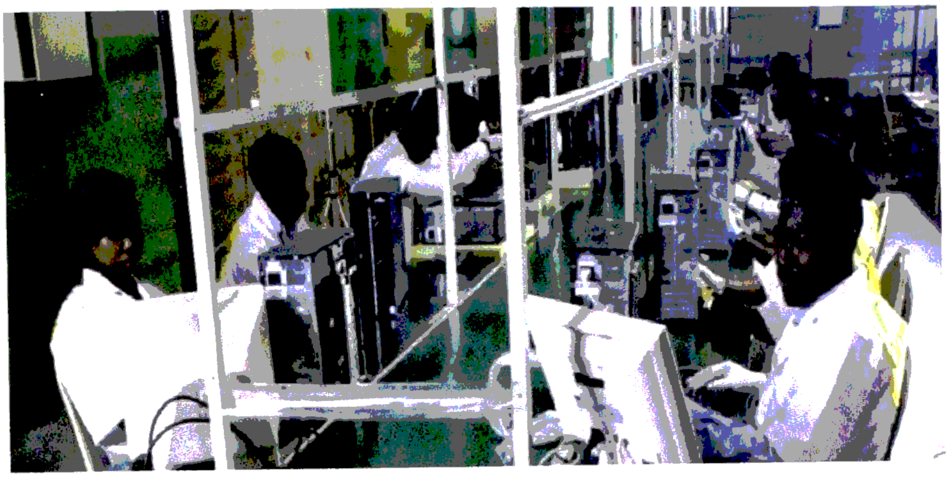


Figure 6: A view into the production hall

4.5 SECURITY

The form of security employed is by the use of security personnel who monitor activities of staff and visitors who come into the facility. There is no form of CCTV.

4.6.0 LESSONS FROM THE STUDY

Use of artificial ventilation (air-condition) since components need specific conditions and temperature. The air condition also ensures a dust free condition in the production hall. This is very necessary because the components are very sensitive to dust and can be destroyed when it gets into contact with dust.

4.6.1 MERITS

There is no definite lobby (clean lobbies) before you access the production hall.

Inadequate parking spaces.

There are no changing rooms for the workers.

Lack of ancillary facilities like rest room, common room for staff, canteen etc.

There is no definite access for raw materials.

Inadequate security.

Poor location as an industrial building.


Figure 7: Picture of the testing room


Figure 8: Workers in the production hall


Figure 9: The assembling process


Figure 10: Testing Room

4.7 DELL COMPUTER ASSEMBLY PLANT, MALAYSIA

The facility is located on an island in Malaysia; Bayan Lepas, Penang. It has facilities like an airport and a harbour very close to it which makes its location very strategic. This facilitates the transport of raw materials and finished products to and from the factory respectively. It has extensive parking both on the site and outside the site. The parking space located outside the facility is a few meters away. There is also a loading bay for loading and offloading of goods. There are two security post /checkpoints; one overlooks the service parking and the other is in charge of the visitors parking.

All the facilities in the factory are located within one big structure. It houses the administration unit, the production hall and other ancillary facilities. The administration is located at the front whilst the production hall is located at the rear.

It employs a post modernism style of architecture with extensive glazing at the front.

Figure 11: Layout of the factory (shown edged red)

Figure 12: Front facade showing extensive glazing

Figure 13: View of the entrance

Figure 14: Picture of the visitors parking

4.8.0 LESSONS FROM THE STUDY

4.8.1 MERITS

There are adequate parking spaces for the factory.

The factory is strategically located; proximity to an airport and a harbour.

Well defined accesses, two main entrances at the front.

There is adequate security.

There is adequate artificial lighting as a supplement in the production hall.

4.8.2 DEMERITS

Design of structure increases cost due to the use of expensive artificial ventilation (air condition) and artificial lighting.

The facility lacks soft landscaping. The facility is dominated by hard landscaping, this produces excessive solar radiation.

Figure 15: Packaging Materials

Figure 16: View into production hall showing machinery for assembling

Figure 17: Testing/Initialisation of materials

Figure 18: Control centre; this also serves as a customer service centre

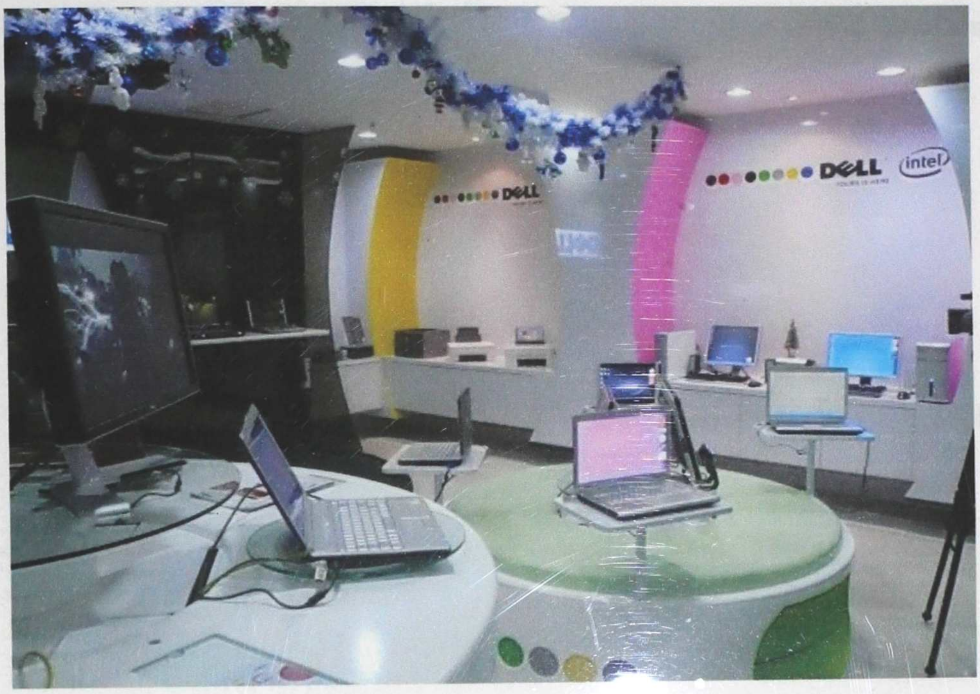


Figure 19: A view into the showroom/exhibition room

Figure 20: Workers undergoing training

4.9.0 CONCLUSION FROM CASE STUDY

From the case study, much deflects were seen. The following are some of the disadvantage found.

Much of the computers were assembled by hand.

The area did not have enough off loading area.

The reception was very small and did not have much area for people to site.

The facility did not also have research lab with is the secrete of these foreign computer company successes.

Services unit and after sales service were not present as well.

4.9.1PROVISION OF PARKING SPACES

Parking space is an issue at omatek Ghana limited. Parking space is not enough for costumers and staff. They had one parking space for both customers and staff and even offloading and reloading.

4.10 TECHNICAL STUDIES

In an industrial design one of the major or main factors that influence a good design is the flow of work (production cycle) without any interruption.

In the case of a computer assembly plant, the assembly line process is a major concern. The efficiency of the factory is paramount in the design. To achieve the most efficient of all the production cycle of the factory should be free from interruption and obstruction. Its space should link it in a w ay t hat, the clear production line will be obvious in it production duties and the steps it moves to, from one stage to the other

The following are some of the technical consideration of my design.

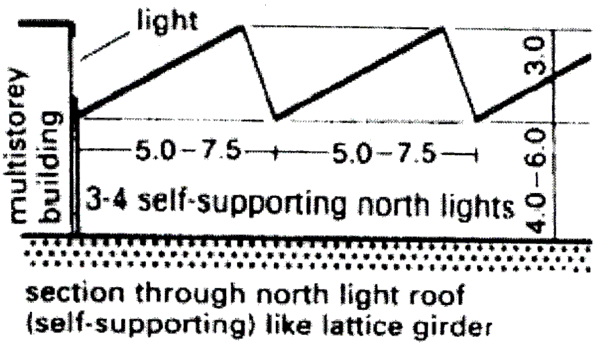


Figure 21: Sky lighting

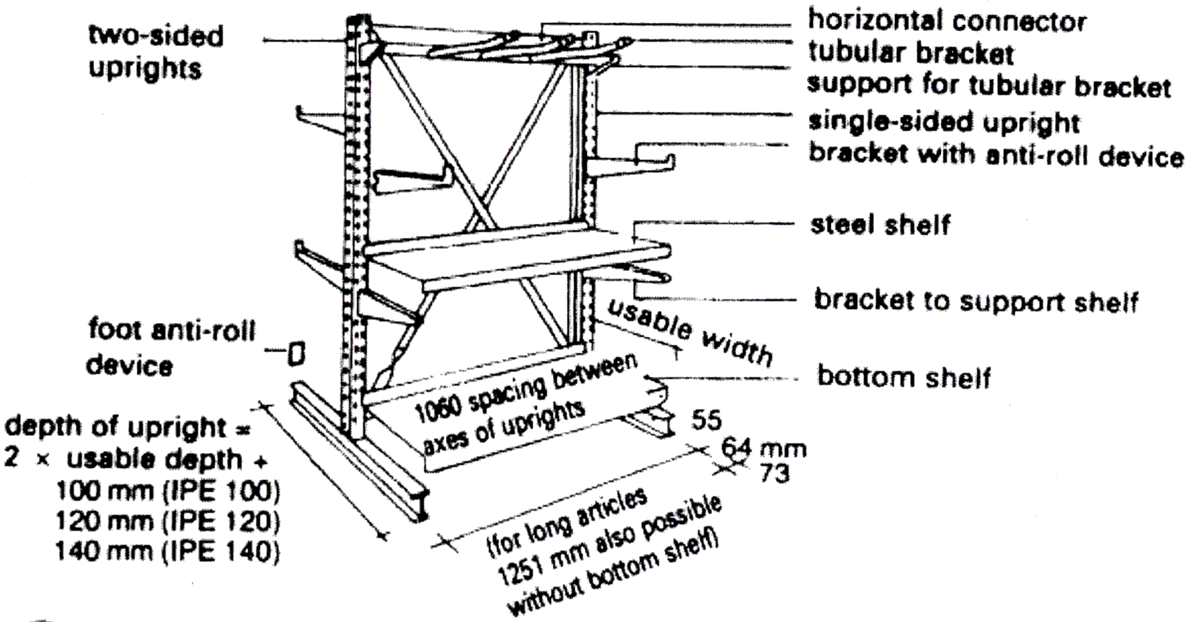


Figure 22: Rack System use in the production line to sack computer for testing

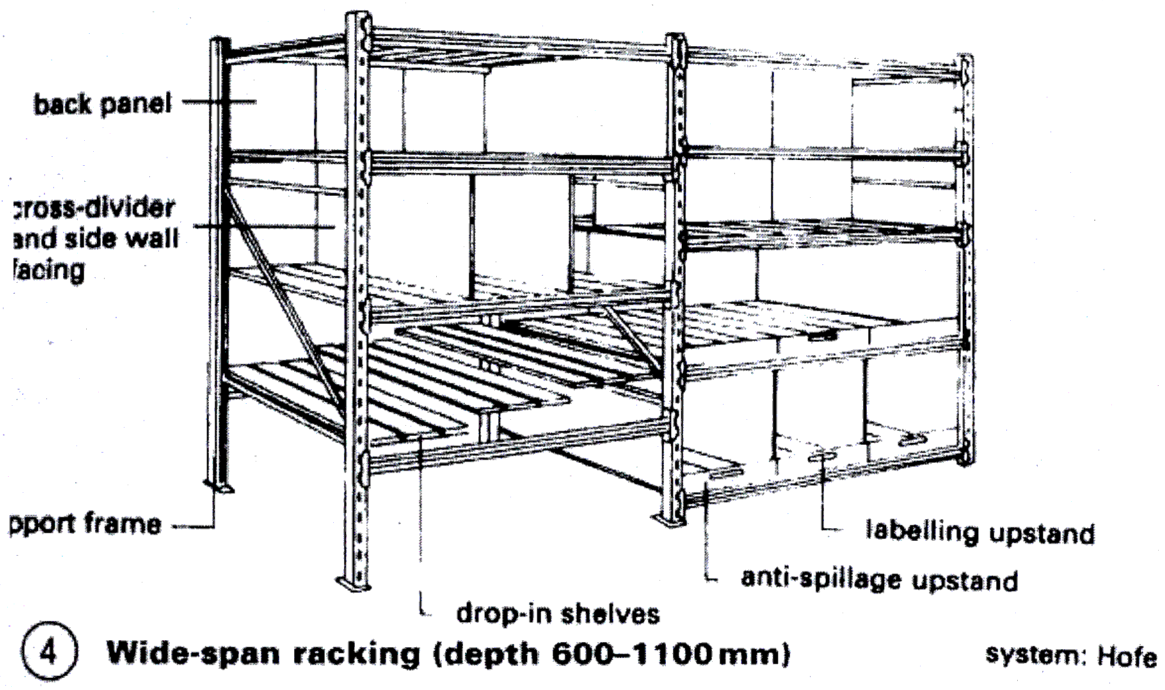


Figure23: Temporal Storage rack

4.11 PRE PRODUCTION ACTIVITIES

Before any goods can be render to a satisfactory condition, the raw materials needs to be protected well from damages and faults. It require standard and to ensure that, it has to be stored under good condition of which it is made for and also from a dust free atmosphere.

4.12 MECHANICAL OR MACHINES FOR A COMPUTER ASSEMBLY PLANT

The following are some of the machine use in assembling

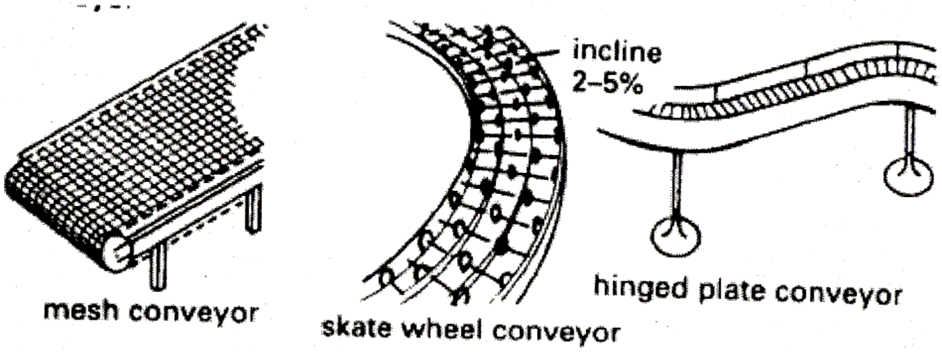


Figure 24: Conveyer belt system in carrying goods

Robot assembly (example, fixers, screwing and pressure applying machines). Robots are especially useful in performing activities on an assembly line that humans find repetitive and monotonous.

Trolleys

Motor trolleys

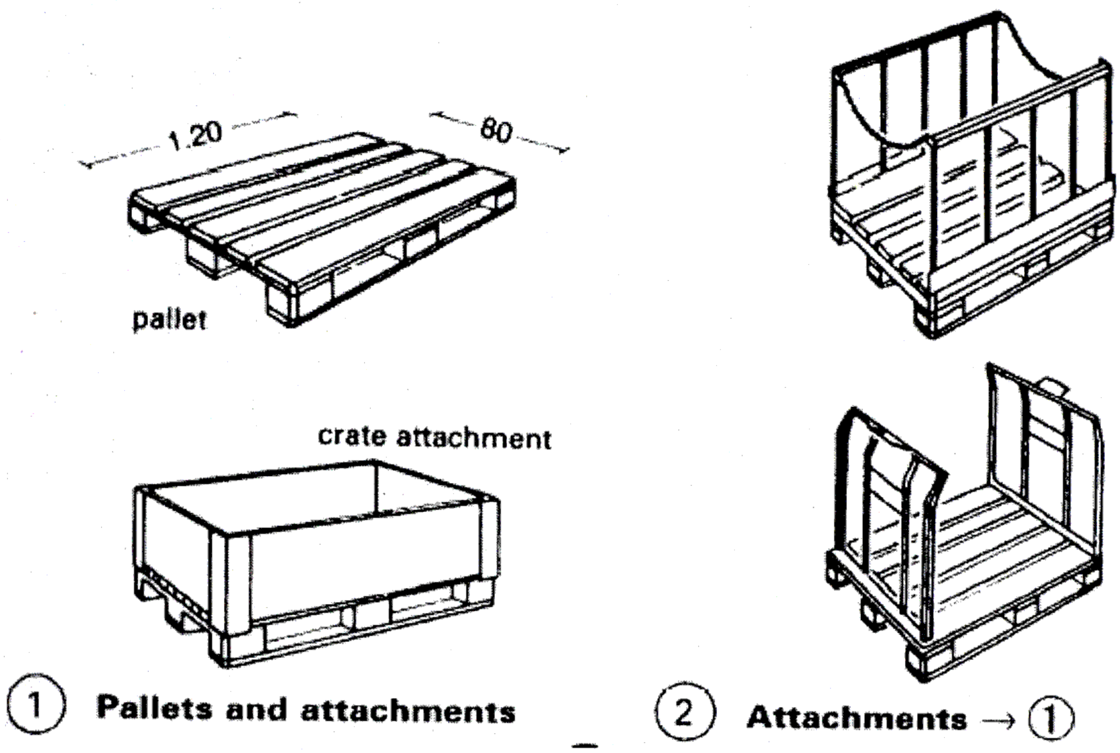


Figure 25: The major tools need for such assembly line

4.13 WHAT IS NEW IN MY COMPUTER ASSEMBLY PLANT?

From the case study and what I have learnt so far, I will like to incorporate

Assemble line for monitors

Keyboard, mouse

And accessories like

Webcam

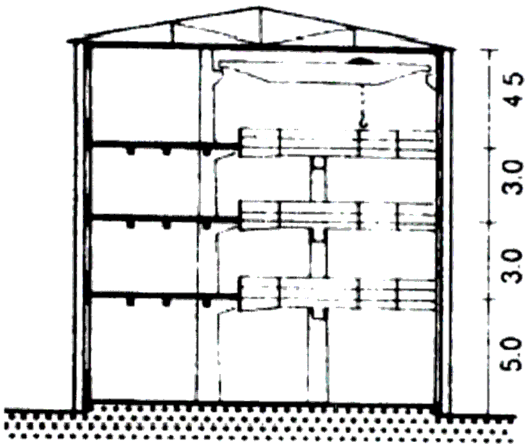
GSM modem, a trademark for an international wireless communications network for cellular phones Global System for Mobile Communications

Liquid-crystal display (LCD) monitors

Production unit will be having robot assembly line

Ware house will use mechanicals system of parking

Electricity will be powered by both solar and the electricity company Ghana.



Multistorey crane shed; work items moved between balconies via crane shaft

Figure 26: Section of a multistory Warehouse

4.14 SPECIAL STUDIES

According to the 2000 national census, Kumasi has a population of 1,170,270 people. It has a growth rate of 5.7% which is far above the national growth rate of 2.7%

Area/year	1948	1960	1970	1984	2000	*2006
Kumasi	81,870	218,172	346,336	487,504	1,170,270	1,625,180
Ashanti	1,109,130	1,481,698	2,090,100	2,948,161	3,612,950	3,899,227
Nation	-	9,726,320	9,632,000	12,296,081	18,912,079	22,225,625

Table1: Population of Kumasi (Source: Population Census Reports, *Projected)

Area/year	1948 – 1960	1960 – 1970	1970 – 1984	1984 – 2000	*2000 – 2006
Kumasi	7.9	4.5	2.5	5.2	5.4
Ashanti	2.0	3.8	3.8	3.4	3.4
Nation	-	2.4	2.6	2.7	2.7

Table 2: Population Growth rate, 1948–2005 (Source: Population Census Reports, *Projected)

4.15 LABOUR

Kumasi has an attractive workforce pool, with labour costs approximately 10 –15 percent cheaper than that of Accra.

Kumasi is home to numerous educational institutions, including the only science and technology university in Ghana, the Kwame Nkrumah University of Science and Technology (KNUST). The university has a student population of nearly 23,000, comprising both undergraduate and postgraduate students.

Literacy in Kumasi is high with more than 15 percent of the population with senior secondary education and about 10 percent with tertiary or technical education.

4.16 BUSINESS OPPORTUNITY IN KUMASI

The city is endowed with an appreciable number of natural resources which serve as a pull factor for investments. They include:

Timber processing Gold mining Agricultural production

- Kumasi is renowned for its local enterprise and artisan skills, particularly in the areas of furniture-making and vehicle engineering. Woodwork, leatherwork and textile production (especially the traditional 'kente' cloth) are established skills amongst the local population although manufacturing methods are typically based on simple technology. Significant non-traditional skills are also present in Kumasi's workforce, for example the broad range of metalworking shops within the 'Suame Magazine'.

4.17 FAVOURABLE INVESTMENT FACTORS

Generally, access to skilled labour and land in Kumasi and the wider Ashanti region are major positive factors that encourage investment in the area. This is enumerated below:

Land availability, tenure and cost

Land prices are at least 15–50 percent lower than those in Accra and Tema. The system of land tenure in the Ashanti region with its close control by the Ashanti king and his subordinate chiefs makes land transactions simpler and more transparent compared to other regions in Ghana.

Lower labour costs and access to skilled labour

4.18.0 SITE SELETION AND ANALYSIS

Site selection has many considerations one has to factor in selecting a site. In selecting a site, i considered the following

1. Source of skilled labour in assembling the computer s.
2. Transportation problem
3. Sources of raw materials
4. Source of market for finished product

4.18. 1 LOCATION

The site is located on the northeastern section of the Ayigya Township on the road to Asokore Mampong adjacent New Calvary Charismatic Church, Ayigya industrial area in the Ashanti region. The immediate surrounding does not have much infrastructure facilities, but there are ongoing infrastructures such as warehouses, pharmacy factories, churches and packaging factory around the vicinity. The area is very god for such assembly plant since it is a quite place and duct free area. The site falls in a light indusial area, which the assembly plant is.

Figure 27: View of Site

4.18.2 SITE DESCRIPTION

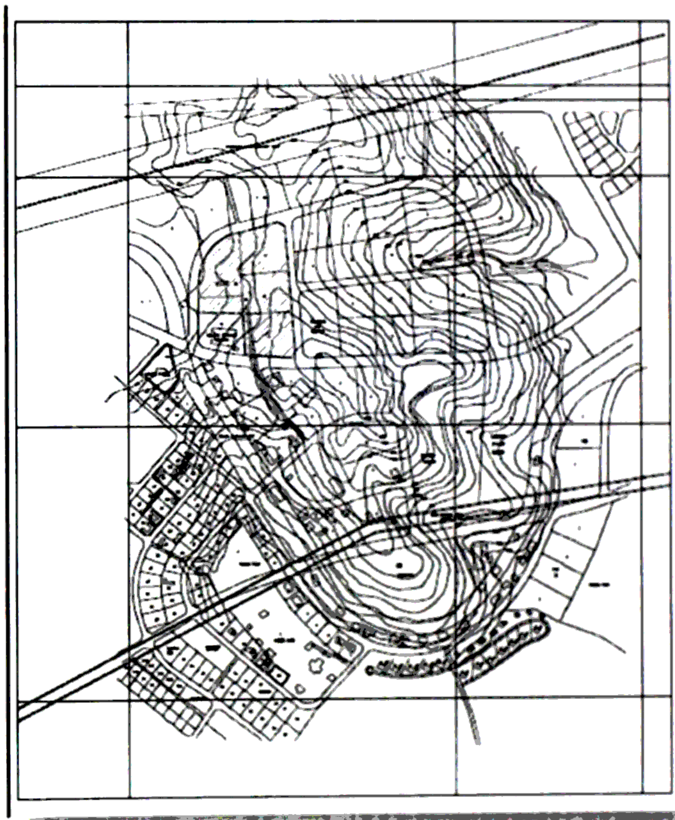
The site has a gentle slope towards the western side and barely flat from the north to the south. It is less than 0.01 degree change in its gradient.

The site is 60784.9899 meter square which is about 15.02acres on interrupted by any activity, thereby, noise free zone. The area is also characterized by light industries which are high in their skyscape. Example is Kojach pharmacy

Figure 28: Map of Ayigya Township

4.18.3 PERIPHERAL STUDY

Currently, the site is bounded by sites which are having ongoing projects. One major project is the Kojach pharmacy with is a five storey factory, soap making factory.



It shares borders with the Ghana railway line, the land has few structures that is constructed by thee Ghana railway line.

The land is also very close from the affordable house and can be seen from the site.

Figure 29: Kojach Pharmacy new block at Ayigya

Figure 30: Christ Charismatic Church- Ayigya

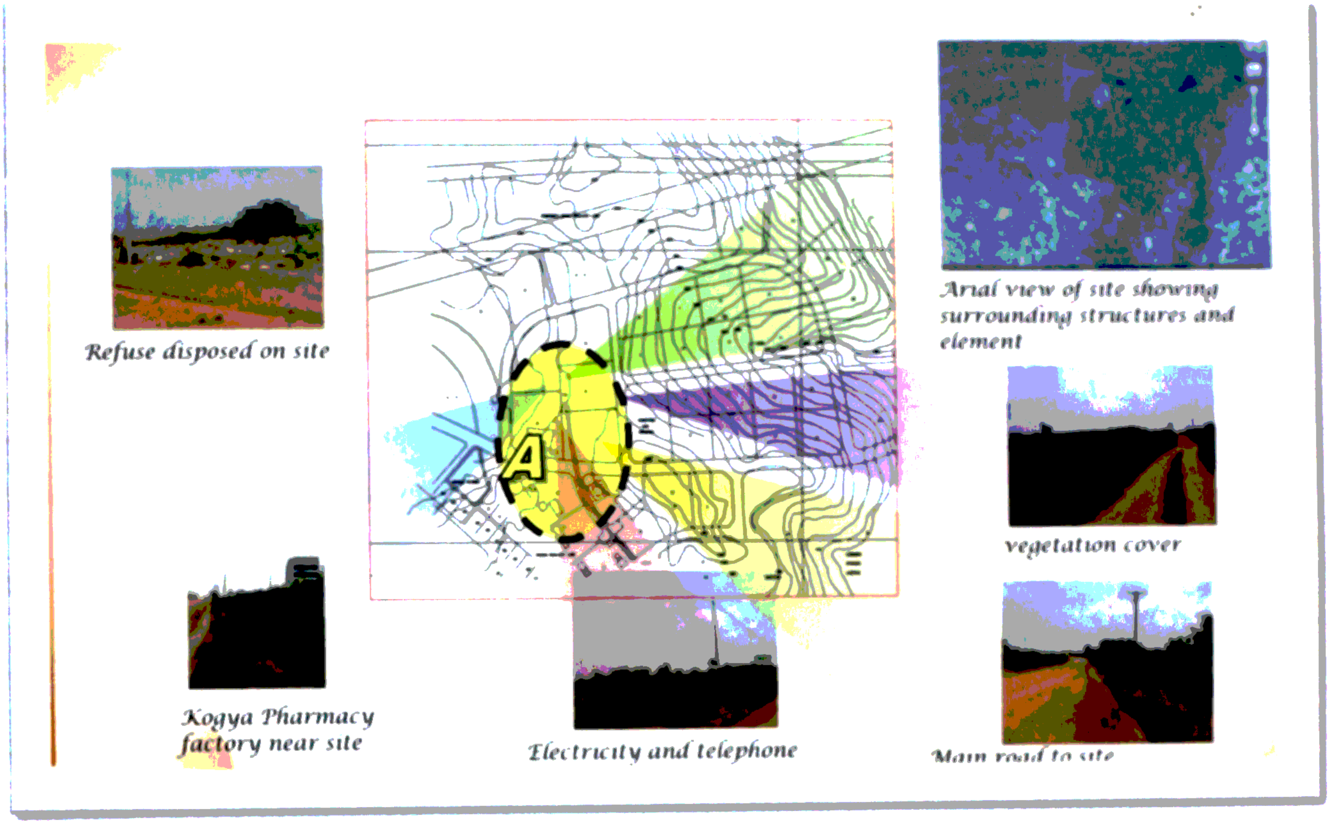


Figure33. : Site Periphery, hatched section showing the site A- Zone and activities around site.

4.18.4 SITE CONDITION AND INVENTORY

With a computer assembly plant critical issues like the safety of the component and the environmental condition of with the computer are exposed to, is a major concern. Two sites were proposed as such.

Site one is located in the Ayigya industrial area in the Ashanti region and Kaasi also in the Ashanti region.

4.18.5SITE A

The site is located along the main street, from tech police station to Asokore Mempong. It is bordered on the north by Kwame Kusi road, the south by Kojach Pharmacy new factory at Ayigya, the east by Presbyterian Church of Ghana (site for Christ congregation) and the west by the main railway line from Nsawamu to Kumasi central. The site is about 7 acres.

4.18.6 ADVANTAGES OF SITE.

Site is accessible by road and near to a railway line.

The site is located away from the noisy and polluted vicinity.

It is located in a light industrial area and as a matter of fact, air pollution is less

The site is having electricity, telecommunication lines and water at the site

The site is having vase land which can accommodate structure in case of future expansion of the facility

4.18.7 DISADVANTAGE

The area is not well developed and might take a longer time before the area become an organize area. Since the road to the site is under construction, it is dusty at the area.

4.18.8 OPPORTUNITIES ON SITE

Proximity to KNUST

Proximity to Schools (example Weweso School) as well as tech police station.

Source of electricity, water and telecommunication line on site

Availability of existing computer market from surrounding schools and information technology dealers and offices around.

4.18.9 THREATS

Glazing cattle are found around site.

The site was chosen base on the following.

The site is undeveloped and flat for a computer assembly plant to be built on it. It is currently with vegetation and an assembly plant can be constructed on.

Proximity to source of market. The site is centered on the north and southern part of Ghana and also a major market for buyers and It specialist.

Residential facilities around will patronize the goods and services as well as the schools around.

4.18.10 SITE B

The site is located at the Kaasi industrial area, a heavy industrial area in Kumasi. It is has so many disadvantage as compared with the site A.

Figure 34: Views of site B

4.19.1 SITE ANALYSIS FOR SITE A

4.19.2 TOPOGRAPHY

The site is virtually flat. It slopes from the east to the west of the site with a gradient of 0.09meter different height in every 1 meter distance covered on ground. The gradient is 1:11

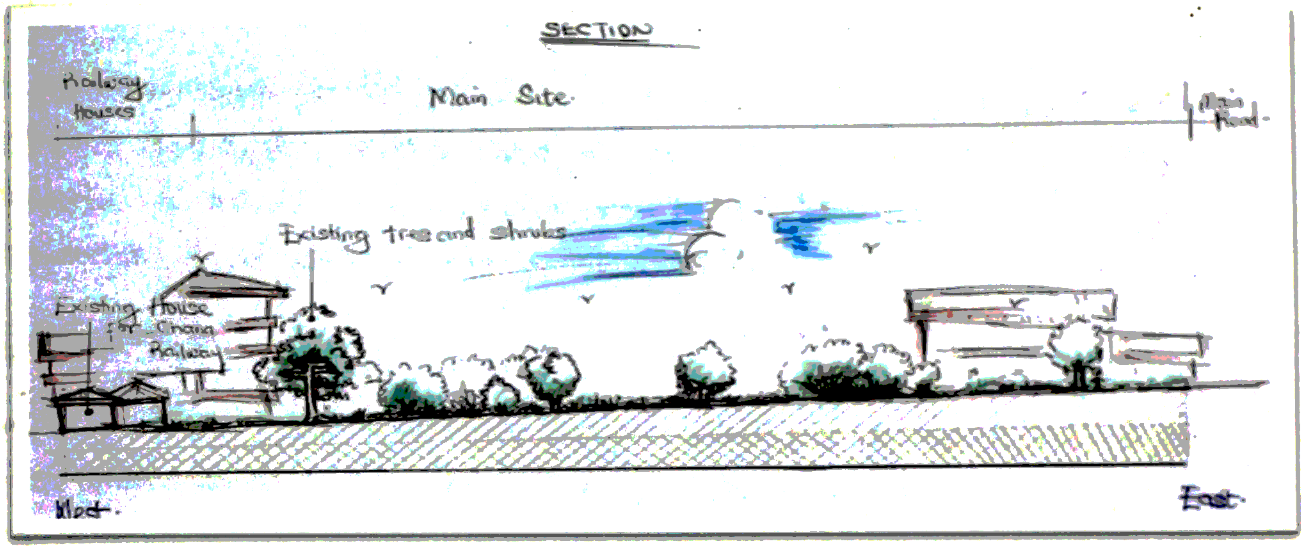


Figure 35: Section showing gradient of slop through the west and east of site

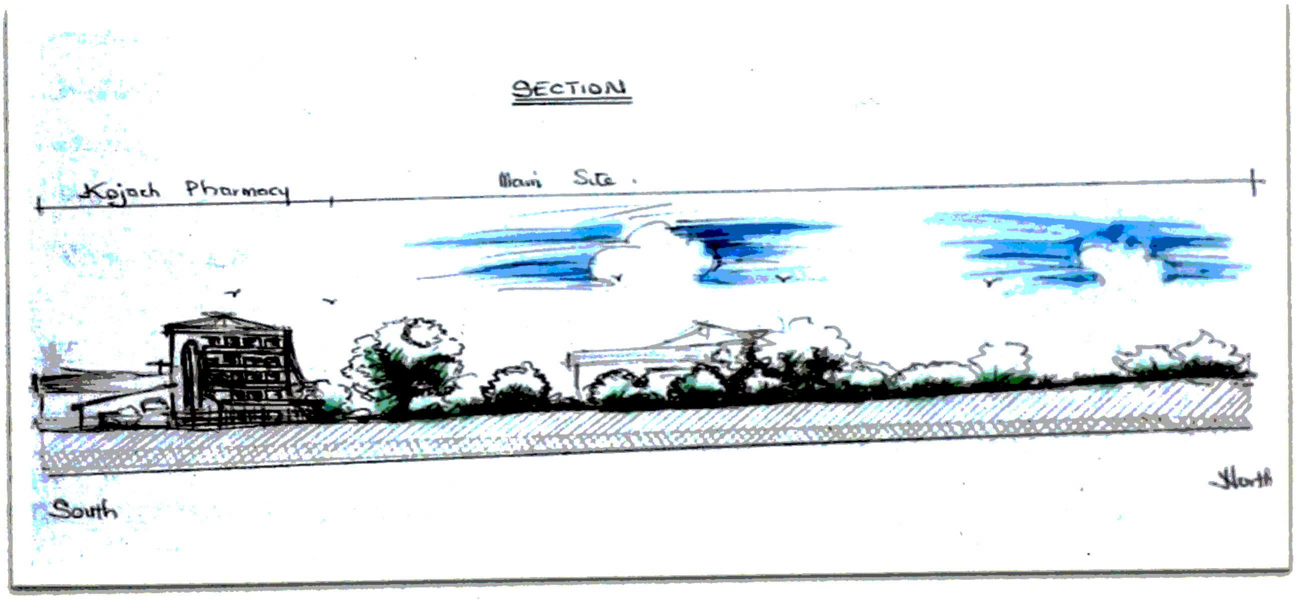


Figure 36: Section showing gradient of slop through the north south of site

4.19.3 ACCESSIBILITY

The site is bounded on the west by existing railway line from Nsawamu to Kumasi, on the north by a major road to Asokore Mampong, east by this same major road to Asokore Mampong. The road to the site is un tad, but road construction is ongoing. It could be concluded that, the site could be accesses by road or railway.

4.19.4 SERVICES

The site gets electricity and water supply from the national grid. Drainage facilities on the site are under construction. As at now the rains has create gullies that uses it as a drainage line.

4.20.0CLIMATE

Climatic conditions on the site are influenced by:

Temperature
Rainfall
Geology
Relative humidity
Wind direction

- **TEMPERATURE**

Maximum mean monthly temperature =32˚c

Minimum mean monthly temperature =21˚c

- **RAINFALL**

The maximum rainfall is around May/June and the minimum is in October. The average rainfall is 1000mm per annum.

- **GEOLOGY**

The land form is made up of loamy soil, sandy, stones and gravel in that sequence

The rich compatible soil makes construction easy on the area.

- **RELATIVE HUMIDITY**

Relative humidity on site is about 80% which make the area cold and refreshing zone

- **WIND DIRECTION**

The wind prevailing winds blows from the south-west. Even though there are time that on might have these winds in all directions but the predominant wind from the south west blows with a velocity of 8.0km-16km ph.

CHAPTER FIVE

5.0THE DESIGN PHILOSOPHY AND CONCEPTUAL

5.1DESIGN PHILOSOPHY

Enhancing productivity through efficiency, mechanizing and bridging the gap between perfection and quality.

Productivity is the outcome of finish product. Productivity which is define as the rate at which a company produces goods or services, in relation to the amount of materials and number of employees needed in relation to time, is the driving force of every company.

In this modern world of our own, we leave in a world that time is a major factor of ever thing that we do. Costumers want results in the nearest possible time, and will opt for one which is of the same quality, efficient and accurate but uses a less time in achieving it.

In view of this the assembly by plant was made of the business minded concept of achieving results with little time. Machines and fast medium of achieving productivity is employed.

The major aim is to narrow distances between facility and make production more efficient as never before.

Design Evolution

5.2 DEVELOPED BRIEF

Administration Block:

- Reception/Waiting area
- Welfare unit (First aid room)
- Offices
- Common Room
- Board room

Training centre

- Hardware training

Software training

Sales Unit

Showroom/Exhibition

Sales Outlet

After sales services

Conference room/ Auditorium

Canteen

Assembly unit/Production Hall

Maintenance unit

Quality Control unit

Packaging Unit

Parking

Security

Waste Management

Services

Storage (incoming)

Storage (outgoing)

Changing room1

Changing room2

Inspection room

Wash room

5.3 ACCOMODATION SCHEDULE

SPACE	Area
Software/ training room	$130m^2$
Training Office	$63m^2$
Hard ware training room	$115m^2$
Changing room	$9m^2$
Store room	$9.3m^2$
Office for Hard ware	$9m^2$
Internet Café	$12m^2$
Exhibition Area	$110m^2$
Reception & Waiting area	$114m^2$
Sales	$167m^2$
Sales Office	$20m^2$
Wash room	$35m^2$
Offices	$280m^2$
Conference Room/Auditorium	$300m^2$
Total	
Canteen	
Eating Area	$120m^2$
Servary	$16m^2$

Kitchen	$40m^2$
Cold/dry store	$18m^2$
Changing area	$25m^2$
Pantry	$15m^2$
Matron's office	$11m^2$
Maintenance Unit	
Control room	$5\ m^2$
A/C room	$30m^2$
Water Plant	$34m^2$
Power House	$34m^2$
Maintenance	$34m^2$
Workshop	$122m^2$
Washroom	$43m^2$
Ware house	
Raw materials & finish product	$2800m^2$
Production Hall	$2500m^2$
Changing/Wash	$120m^2$
Buffer rooms	$180m^2$
Packaging	
Packaging	500m
Laboratory	$18m^2$

Welfare unit (First aid room)	28.4m²
Security Post	25m²
Parking	
Service yard	1500m²
Staff Parking	150m²
Customers Parking	300m²

5.4 CONCEPTUAL SITE PLANNING

When planning such a site, one major thing I considered was access to the site. The site is bounded on it boundaries with propose railway line but currently use as road. It then made it very difficult to access the site from the north and the western side of the site. The eastern road which is now use as a major road to Asokore Mampong but a manor road in the proposal of the town and country people town map was used as the main access route to the site.

The following is consideration I considered before planning the site.

Access, thus how one can access the site without any conflict with cars and pedestrians

How one comes and leaves the site especially the goods and services

How goods are stored and dispatched to the production hall, through to the packaging section, stored at the finish product ware hose and lastly dispatched to the market.

- The type of production line employed.
- The process involved in a production line.
- How customers come in and leave as well as the staff movement from one place to the other if it is convenient enough.

Lastly security for goods and services people render to the computer assembly plan

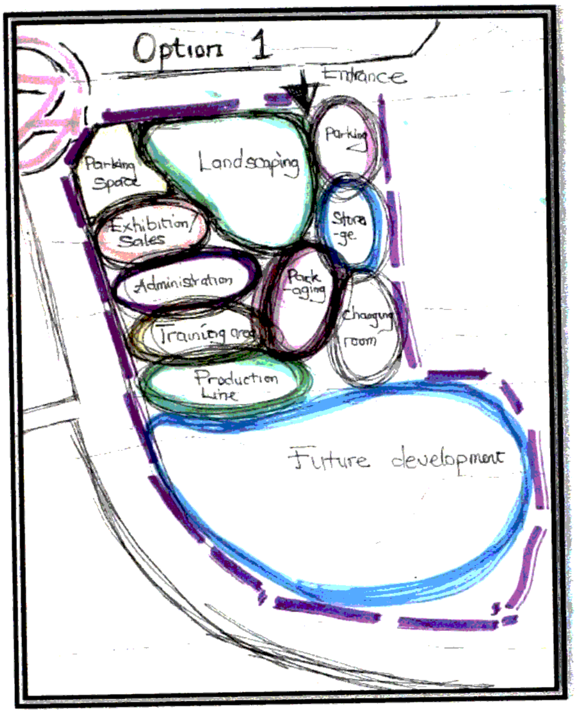


Figure 37: Site planning, option 1

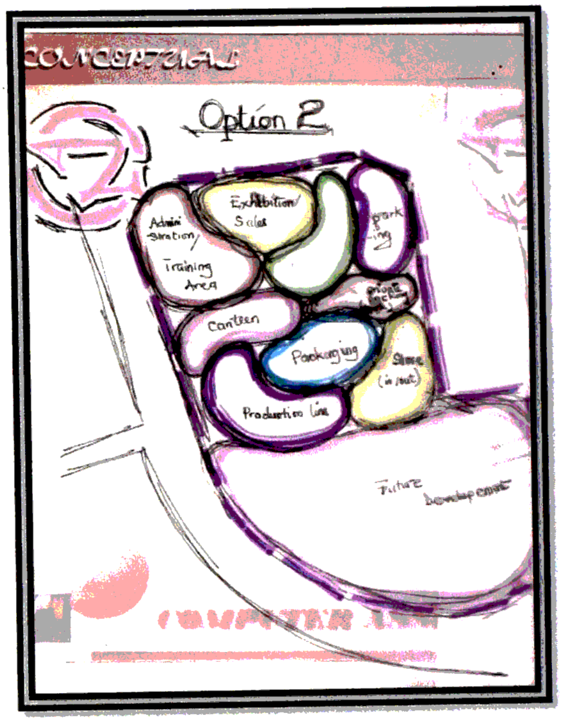


Figure 38: Site planning, option 2

The first two options were about conceptual site planning which considered pocket of structure that has scatter on the site, but which the idea of making it a walking distance as shorter as possible . After a critical analysis and comparing it with my accommodation schedule, I found out that, that could not be achieve unless I go up with my structures.

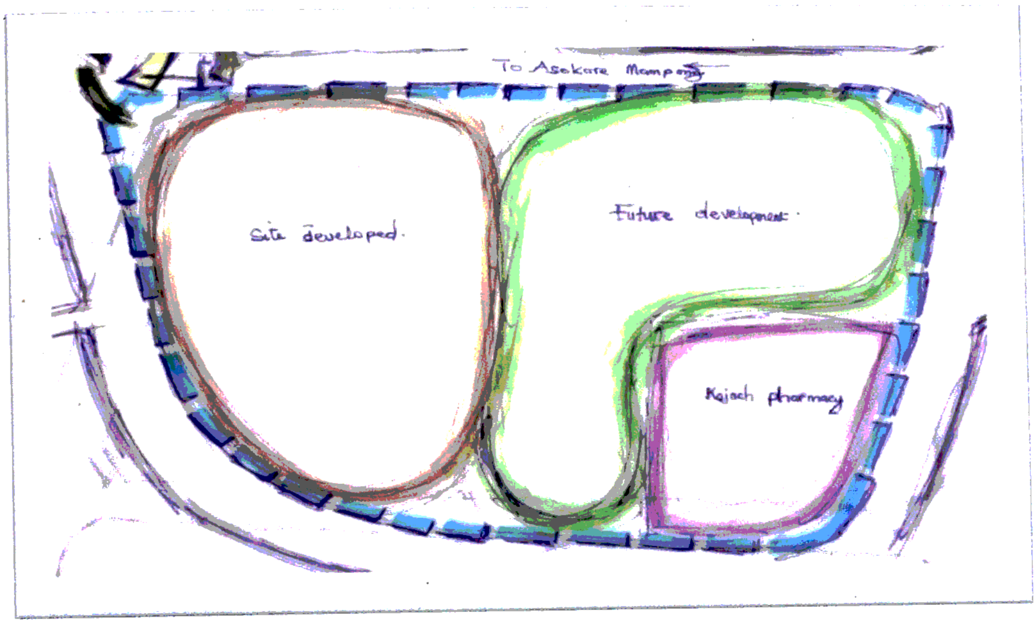
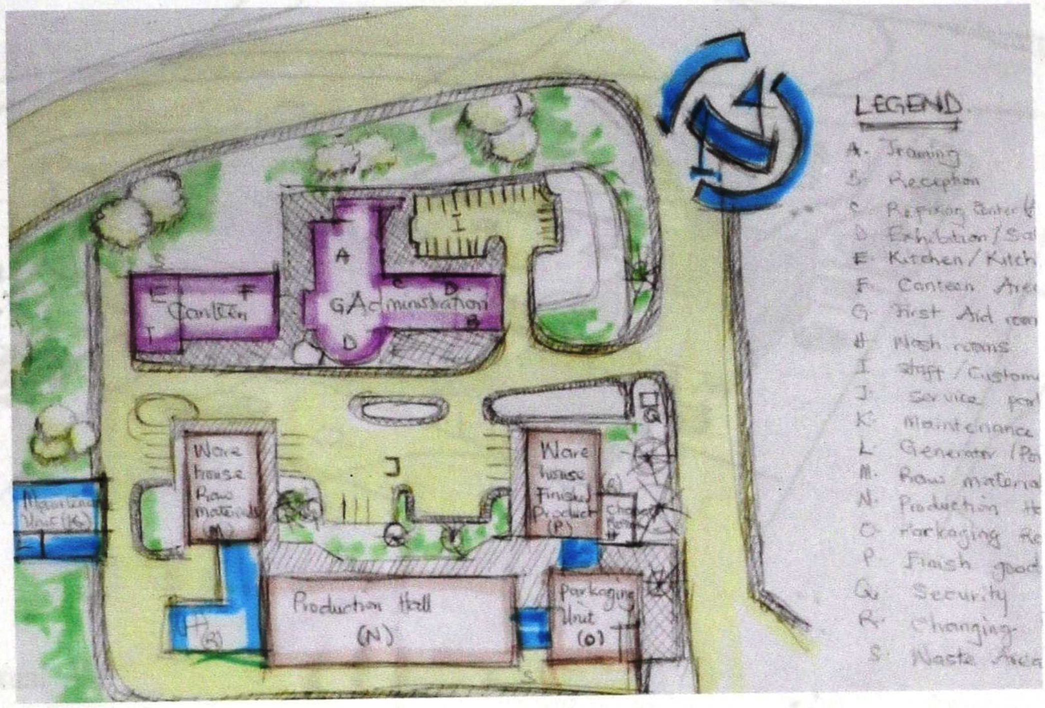


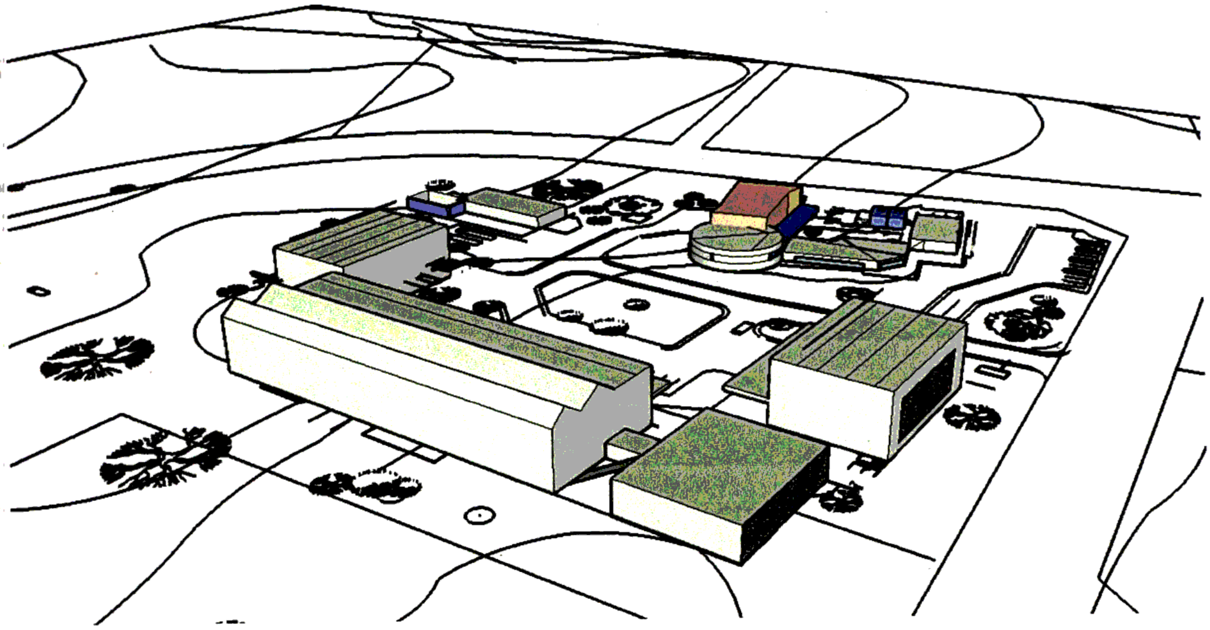
Figure 39: Bubble diagrame showing the site . The orange area is to be developed, the green areais for future developement and the pick area is having a existing structure on it, but is also not part of the site.

With this concept, much emphasis was based on zoning. The area was first zoned into area to be used, future development and lastly leaving existing structure around the area to be like that. The site than to be developed was feather grouped into private space and public spaces

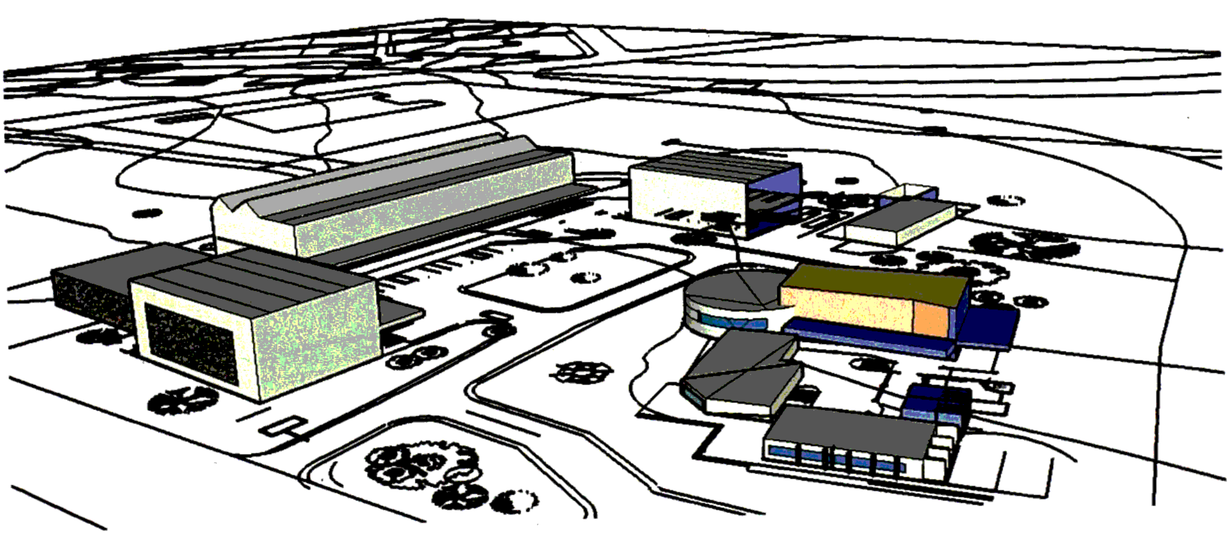
The public spaces include the administration ground floor and the parking space for the costumers' whiles the private space comprises of the whole production hall, the ware houses, buffer rooms, changing rooms, packaging and thee labs and research centers.



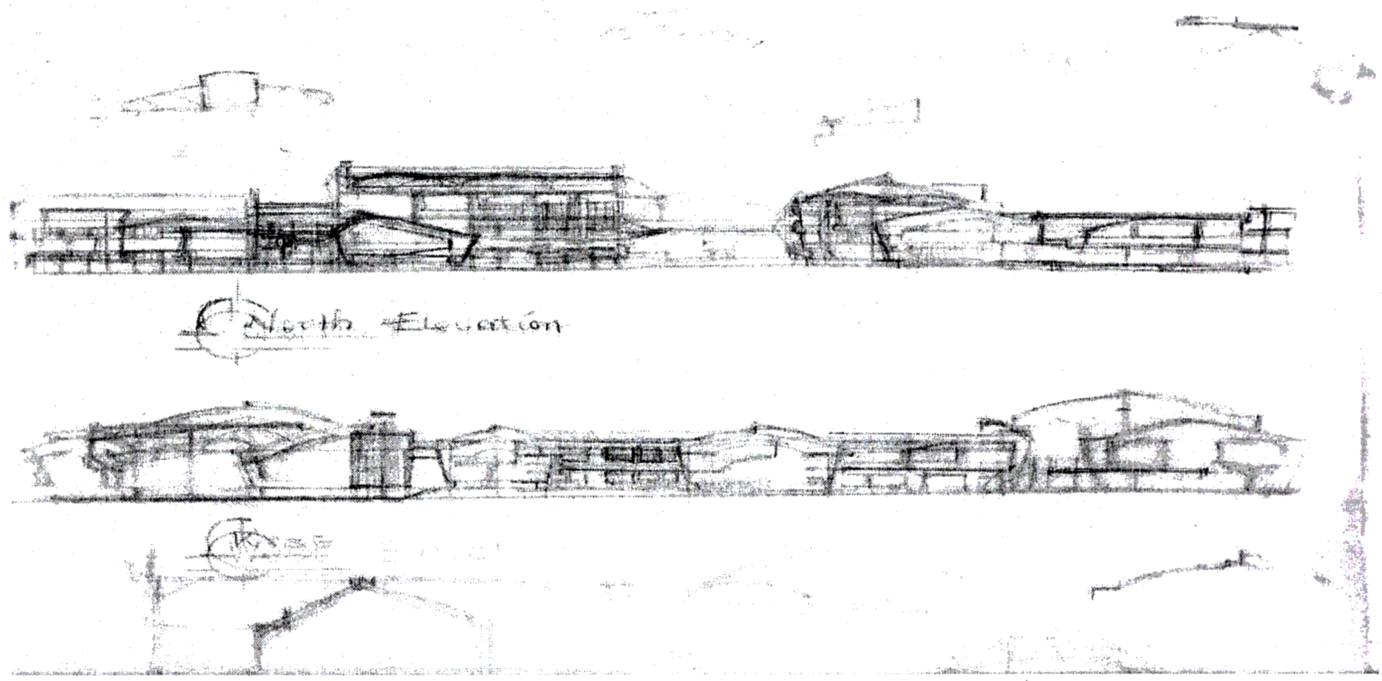
Finally I was able to come out with a final lay out it had area



Conceptual



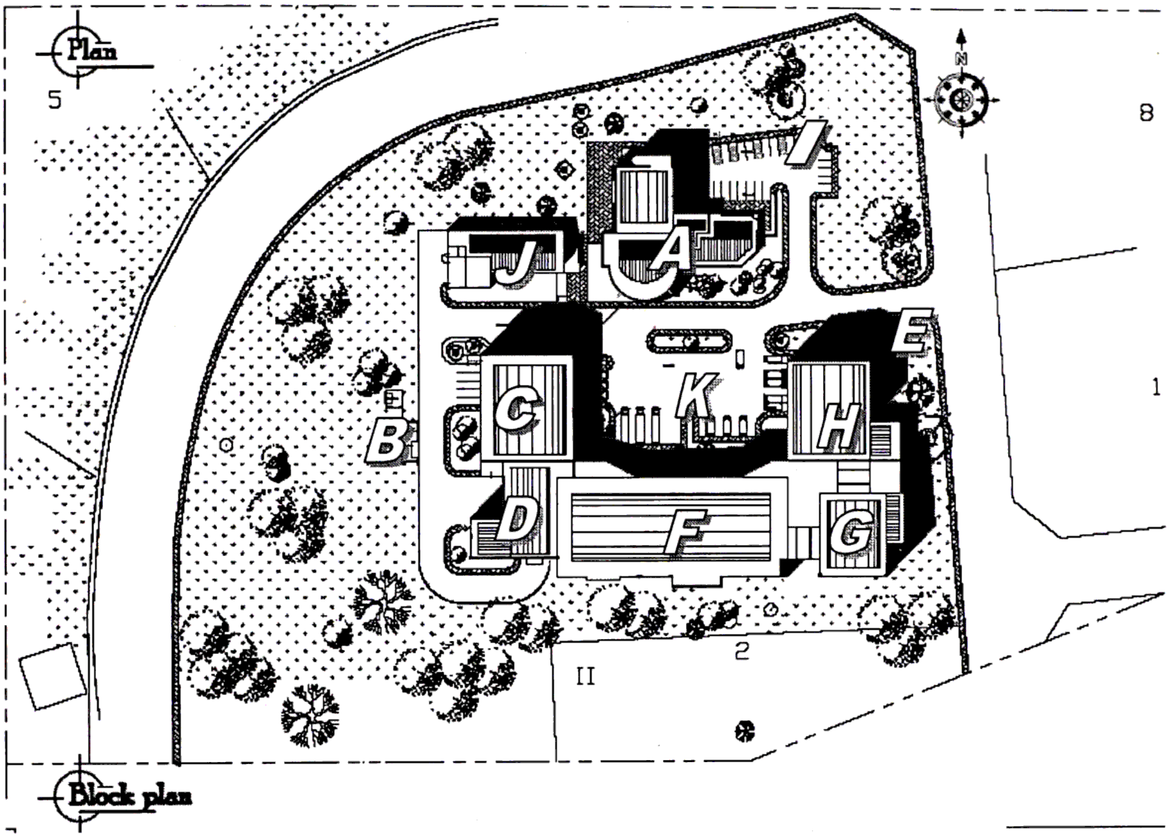
Initially I had a concept like the court yard system, which opens up room for ventilation and services but they were too separated from each other as if it had no links or relations.



Views of how I perceive how the plant will look like

5.5 THE MAIN FACILITY

The main facility has blocks with some of the blocks merging together. This shows that they are not individual facilities but each on has a relation which one another



The block plan

Administration block

Maintenance unit

Ware house (raw materials)

Sorting, changing and clocking room.

Security check point

Production hall

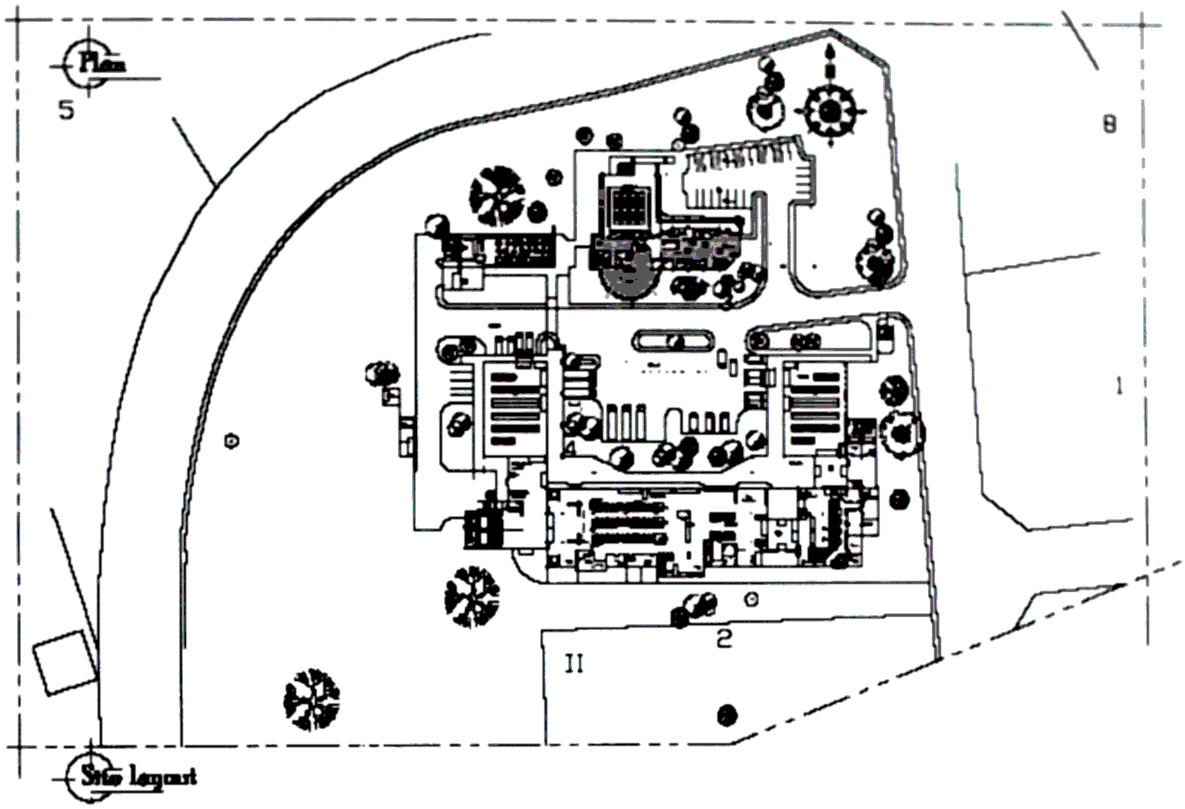
Packaging unit

Ware house (finished product)

Parking space

Canteen

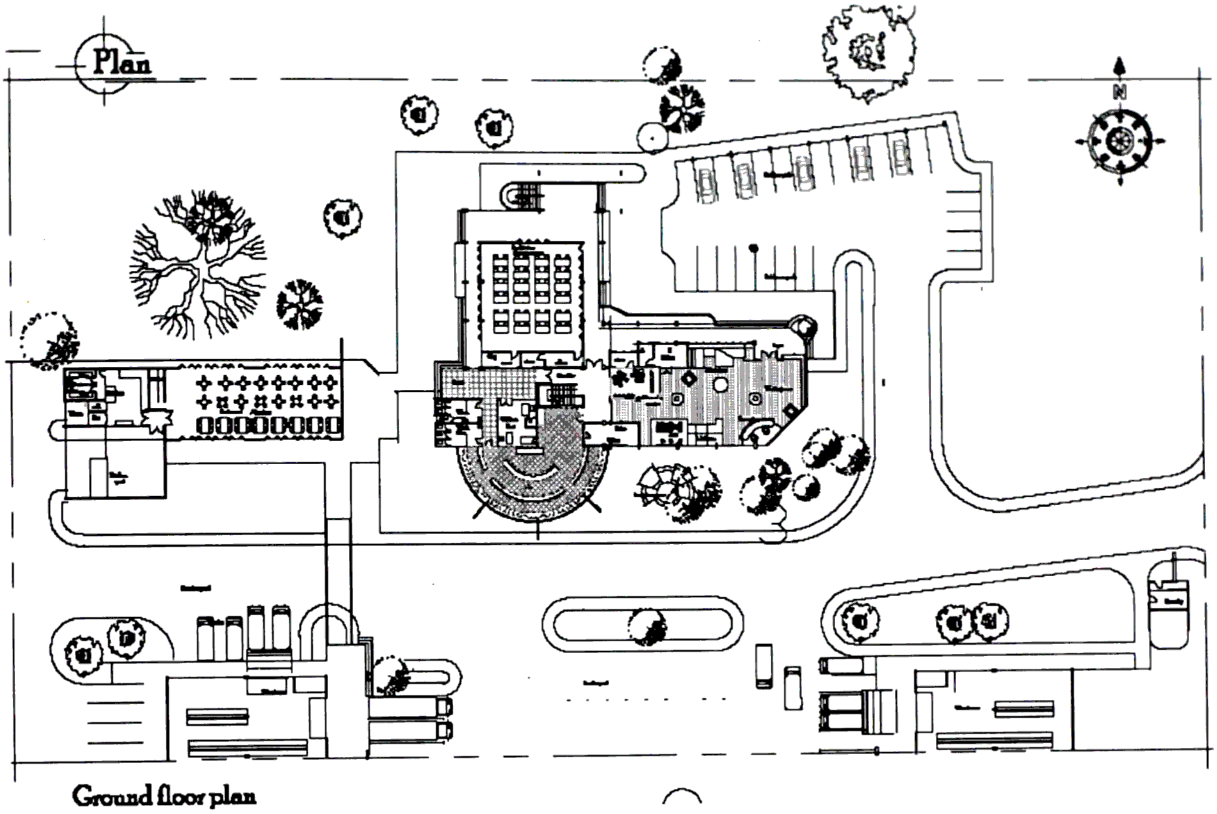
Parking space for service



Administration Block

The administration of the assembly plant houses, the reception, waiting area, after sales service, repair service, internet café, exhibition area welfare unit (first aid room) training section area office for the sales department, CEO's office , conference room, aboard room, auditorium, a general office for the staff, archives and a staff common room.

The administration was group into private and public space with intermediate areas linking them. The ground floor is basically of more public space and the other two floors is a semi-private even though customers can visit.

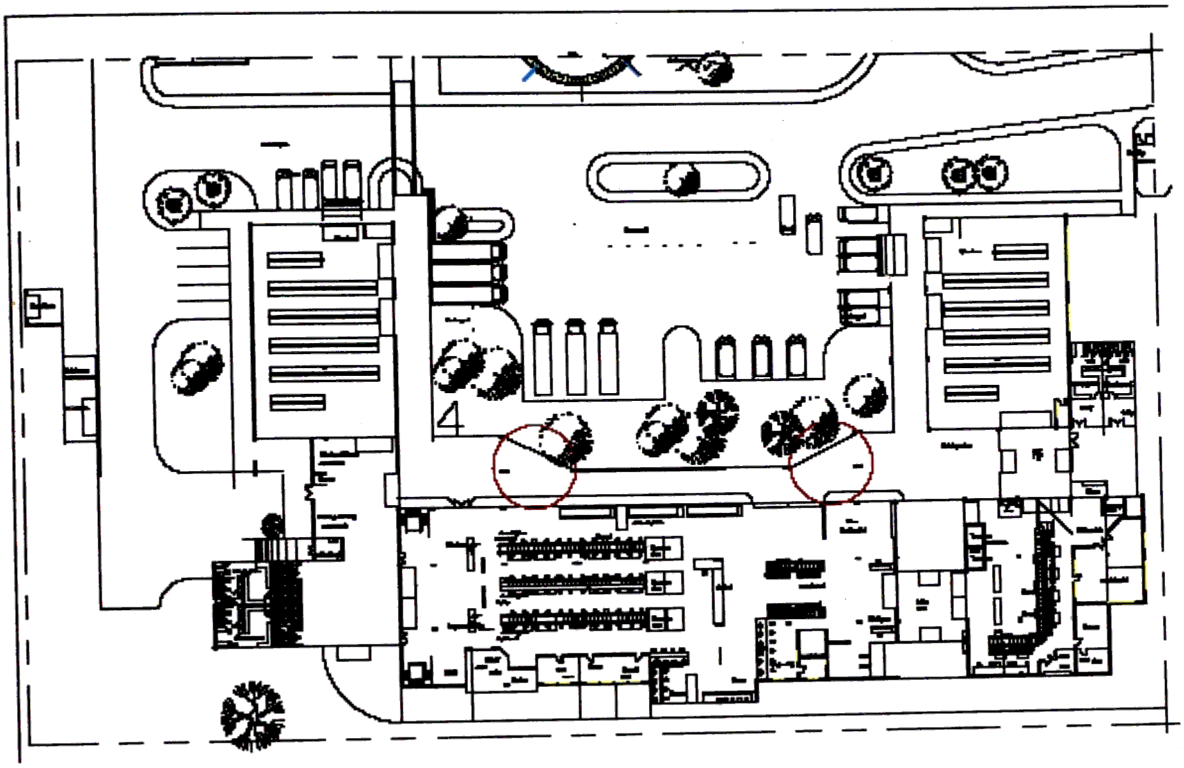


The Welfare unit (the canteen)

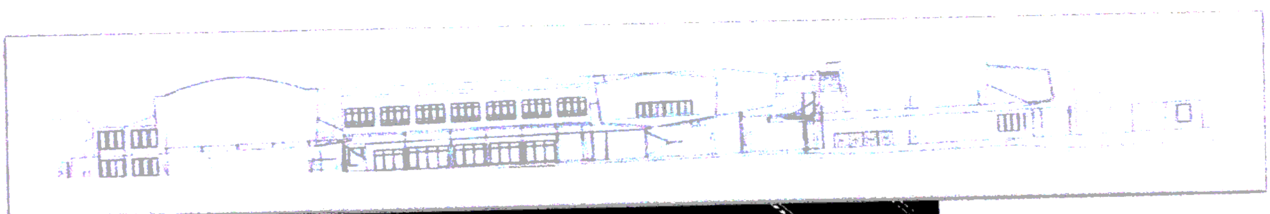
The canteen is part of the walfare of the unit. Basically it is the main facility at that unit. It consist of eating area, serery area, kitchen , changing room, cold store pantary service yard wast desposal unit .

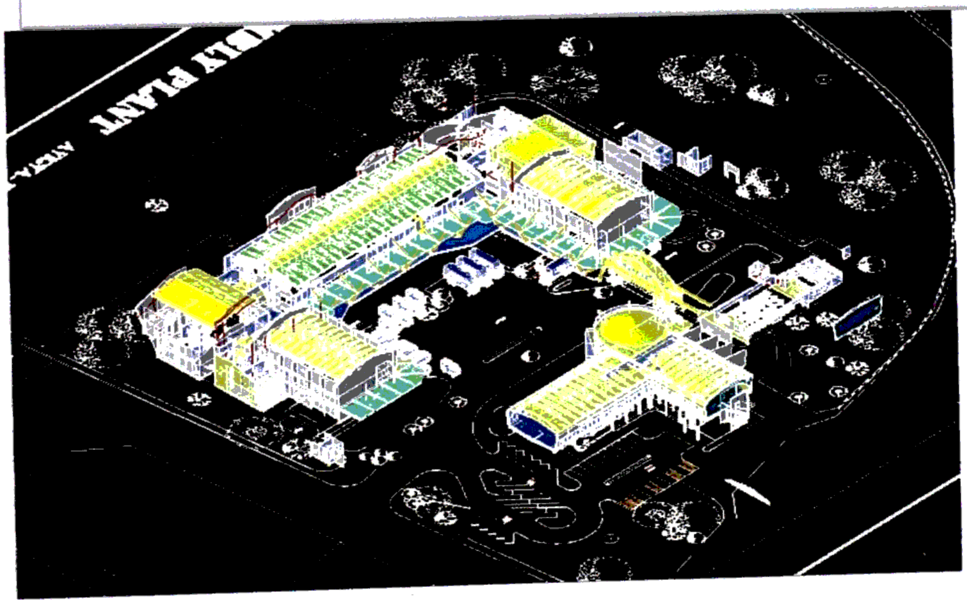
It is o serve the workes with lunch only ,but it is design such that workers can ask servers to heat or warm something for them.

The canteen is linked to the administration with a covered walk way which makes wo



Production Hall.





5.6 DESIGN CONSIDERATION

Control of dust

In a computer assembly plant, dust pollution is a major effect to these computers. Measures were then taken in this design to restrict the in follow of duct into the production hall. A clean room was employed to ensure a safe and secure computer. Lobbies, corridors, buffer rooms and electrostatic chamber were put in place to discharge and clear all unwanted particles before one is allowed into the production cycle room.

5.7 FORM AND LAYOUT

Architectural style

The architectural style that influences the design is Modernism which refers to a loose term applied since the late 19th century to buildings in a variety of styles, in which emphasis is placed on functionalism, rationalism, and current methods of construction, in contrast with architectural styles based on historical precedents and traditional methods of building.
This category often includes Art Deco, Art Moderne, Bauhaus, Contemporary style, International style, Organic architecture, Streamline Moderne This idea influence the structure and the form of the assembly plant. The functions of the facilities that support the production hall also play a rule in the outcome of the total layout which is the courtyard system.

5.8 PHASING

The brief of design shows that the project when undertaken, will require extensive planning and financial management, thus the construction will be put into two phases as follows:

Phase 1

The first phase will begin with the construction of the main administration block, production hall and warehouse.

Phase 2

Phase two will continue with the construction of the canteen blocks and the maintenance unit, water tank, and the general compound.

5.9 COSTING

This section shows the cost per unit area of the various spaces. The cost per unit area is GH'350 and it will be multiplied by the total floor area of the spaces which includes: Administration, production hall and support/service facilities.

Space summary	Area	Cost (GH')
• Administration	7204.26m^2	2,521,491.0
• Production Hall	9,567.89m^2	3,348,761.5
• Total area of support/service facilities	3,589.00m^2	1,256,150.0
• Grand total of spaces	**11,750.00m^2**	**4,112,512.5**

5.10. 1SERVICES

Hazardous wastes are generated by nearly every industry; those industries that themselves generate few hazardous wastes nonetheless use products from hazardous waste generating industries. For example, in the computer assembly industry, writing software generates little hazardous waste, but the manufacture of computers involves many industrial processes. Making a computer circuit board generates spent electroplating baths that contain metal salts, and the production of computer chips uses acids, other caustic chemicals, and solvents. Other hazardous wastes are generated in the manufacture of fiber optics and copper wire used in electronic transmission, as well as magnetic disks, paper for technical manuals, photographs for packaging and publicity, and trucks for transportation of the finished product.

5.10.2 VENTILATION

Ventilation system used in the design is artificial ventilation/air conditioning systems. Two types of air conditioning systems were used: central air condition and split systems. The central air condition is used for the production hall and the ware houses as well as the packing unit and the split for the administration and single spaces.

Computers and their components require conducive temperature (16°c-27°c) to perform. As a matter of fact, hot conditions should be avoided., two types of air conditioning systems were used: central and split systems for the Assembly unit and the other places respectively.

5.10.3 FIRE CONTROL

Fire as it is well known is a very distractive element. In a design like this, much effort is emphasize on fire retarding agents

The materials used for the production hall, warehouse, packaging and the administration have high fire retarding component like CO^2 them

The sprinklers employed at the production hall to the ware house uses foam CO^2 extinguisher in quenching fire since water will destroy the component of a computer

Fire detection; The fire alarm system shall be an automatic and shall be sensitive to smoke and heat and which shall communicate to building control room to raise signal and then furthered on to the fire-fighting units

5.10.4 POWER

Electrical power will be tapped from the mains along the site and stepped down by a step-down transformer to 415V/240V before being sent to a switchboard and then distributed to the panel boards in the electrical room. . Because, the assembling process needs uninterrupted power supply, a standby generator set will be available and will be automatically triggered to supply electricity when the lights are out.

5.10.5 WATER SUPPLY

Ghana Water Company is the main source of water supply. Reserve tanks has also been provided to store water for drinking but the underground water system that is the bore hole is also adopted to ensure that water is always available to be used.

5.11.0 CONCLUSION AND RECOMMENDATIONS

5.11.1 RECOMMENDATIONS

The following measures have been recommended for effective running of the project.

Waste Management**:** Scrap from computer parts should be recycle and reuse. Waste from the factory should be well disposed off with much precaution

.

'Configure to order' approach to manufacturing: This refers to the manufacturing and delivery of computers configured to customer specifications. To manufacture affordable computers for our schools, it is recommended that; software and hardware installations should not be sophisticated, since this makes the computers underutilized. The implication of this is that, computers that are configured to the specification of our students and therefore have lesser gadgets as well as lower software and hardware installations should be produced for them and not necessarily sophisticated or general systems. This automatically cuts down on the product cost.

5.12 CONCLUSION

With the rapid growth and increasing demand for computers in Ghana and beyond, it has become apparent that undertaking such a project would go a long way to boost the Ghanaian economy as well as improve upon the low computer literacy in the country.

With the growth of computer usage and demand increasing, such assembly plant will go a long way to boost the economy and create more jobs for the youth and the old as well. Computer education will also increase since people will have computers at their disposal to use and learnt

The government of Ghana is committed to increasing computer literacy since it has been realized that, it is the key to developing a thriving and competitive economy. In line with this the government is pursuing a programme known as the Government Assisted PC Program (GAPP). It offers incentives that make it easier for Ghanaian citizens and businesses to purchase or lease PC's for home use. Therefore, establishing a local computer manufacturing plant would help in this direction. In other words, affordable computers produced from the factory could assist in the GAPP.

Appendices

Definition

Assembly plant:

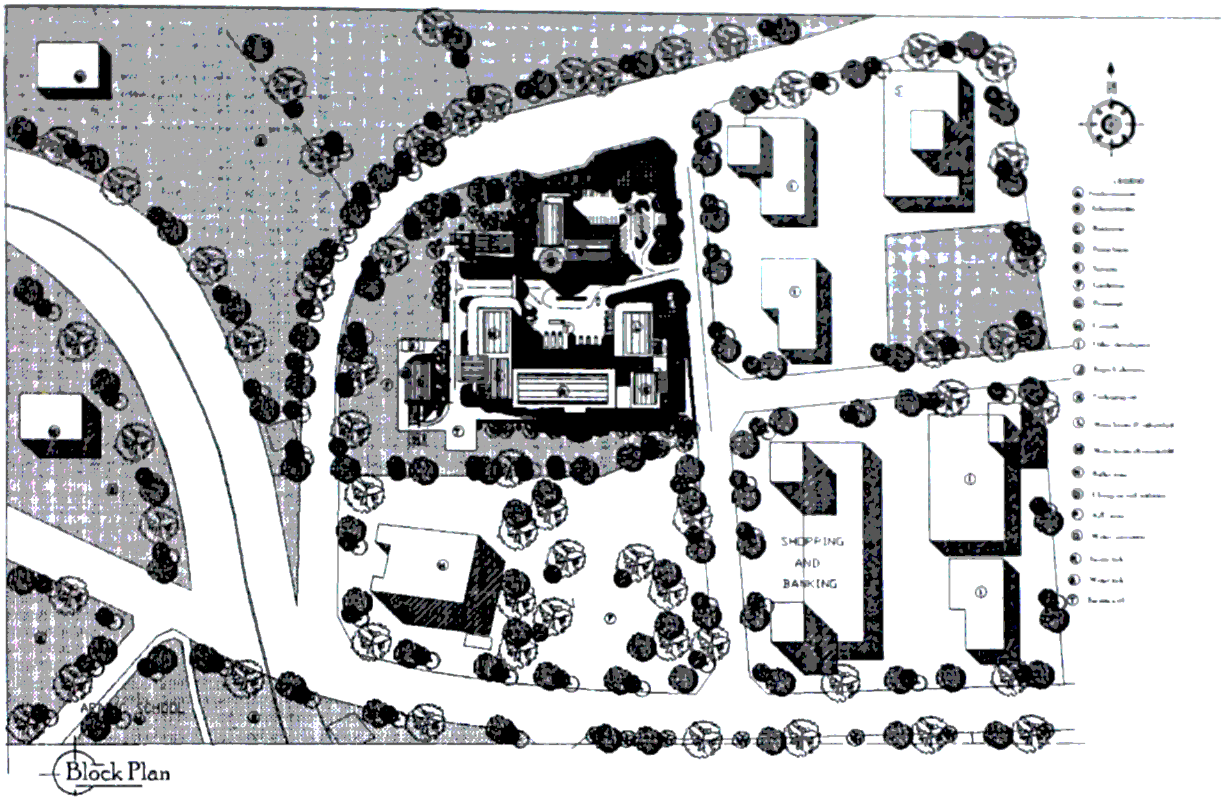
An assembly plant is a factory where manufactured parts arc assembled into a finished product. In other words, it is a building in which an assembly line is housed. This is just one out of many forms of an industrial building or a factory.

Assembly line

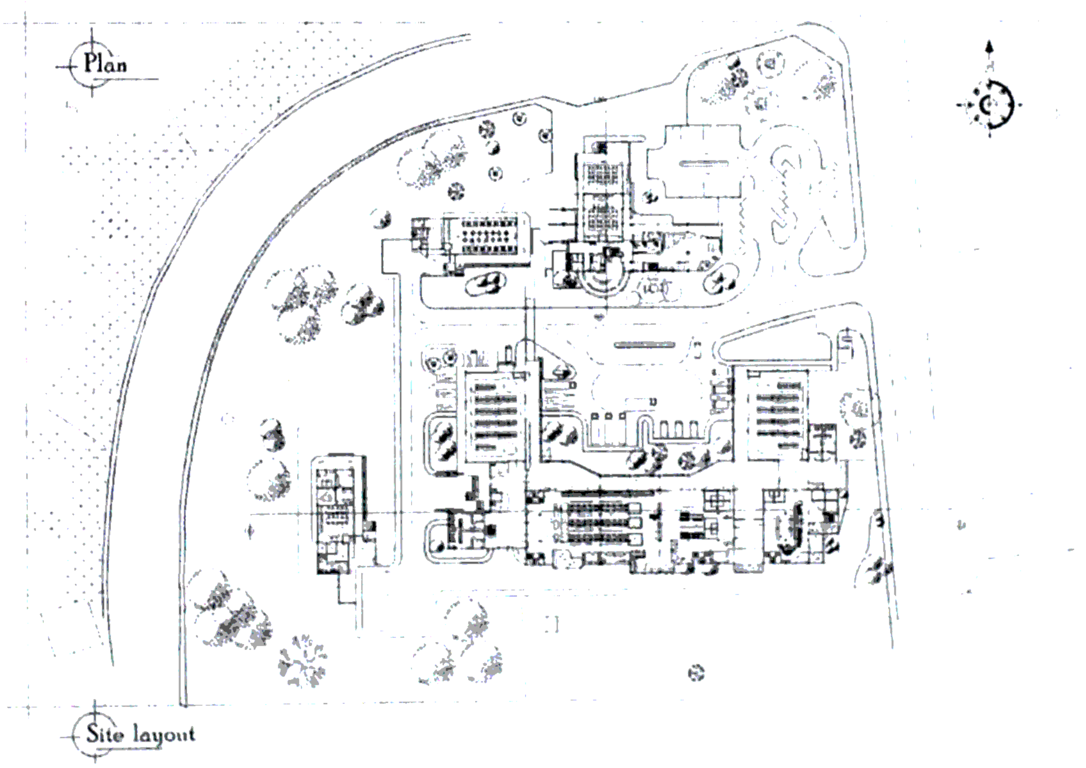
This is a factory arrangement whereby the work in process passes progressively from one operation to the next until the product is assembled.

Computer

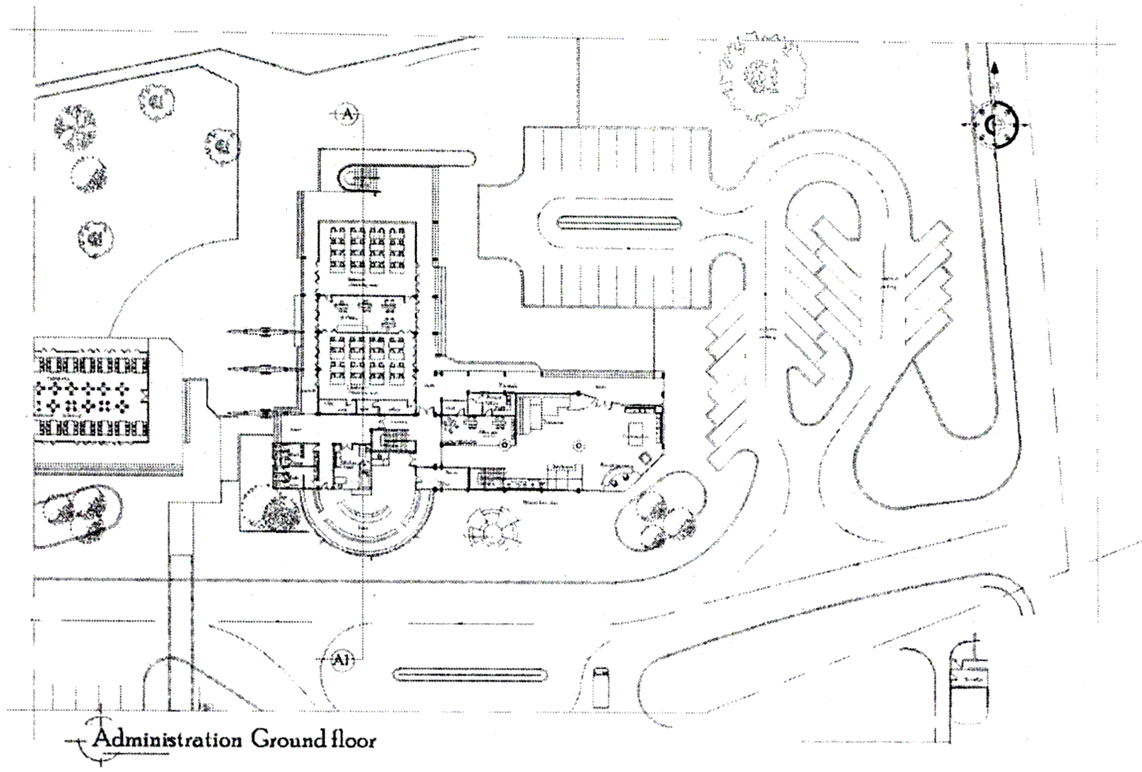
An electronic data processor electronic device that accepts, processes, stores, and outputs data at high speeds according to programmed instructions

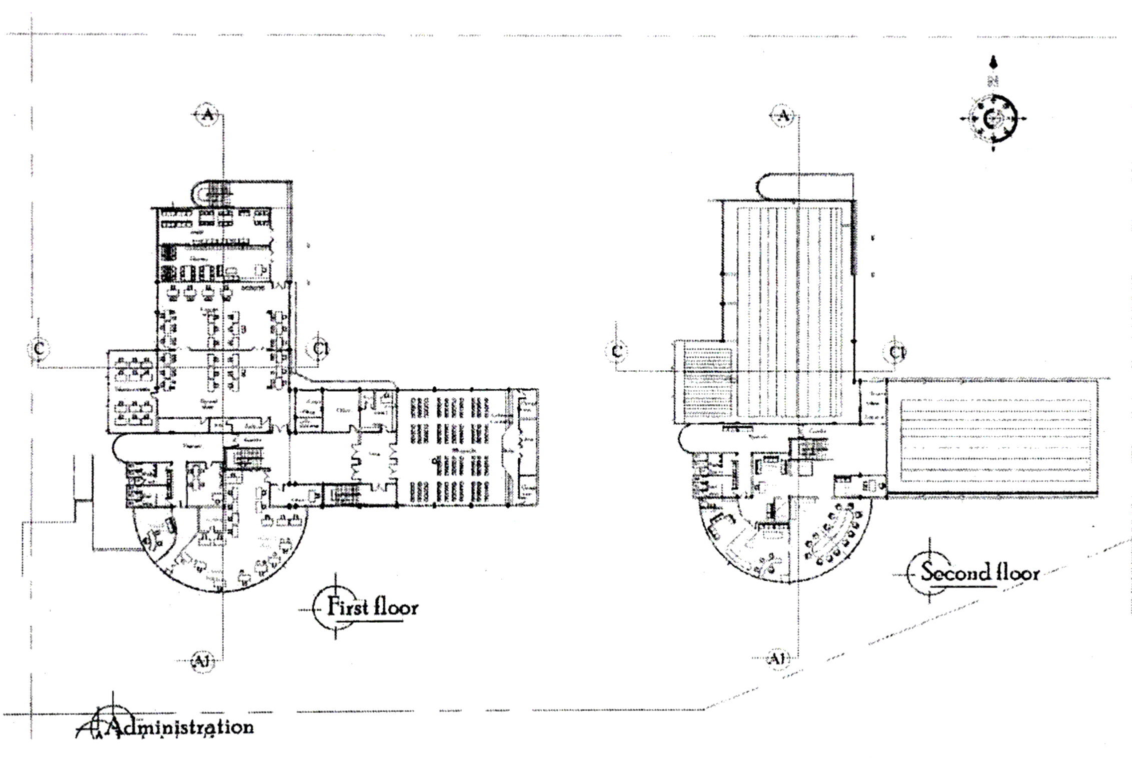


Block plan

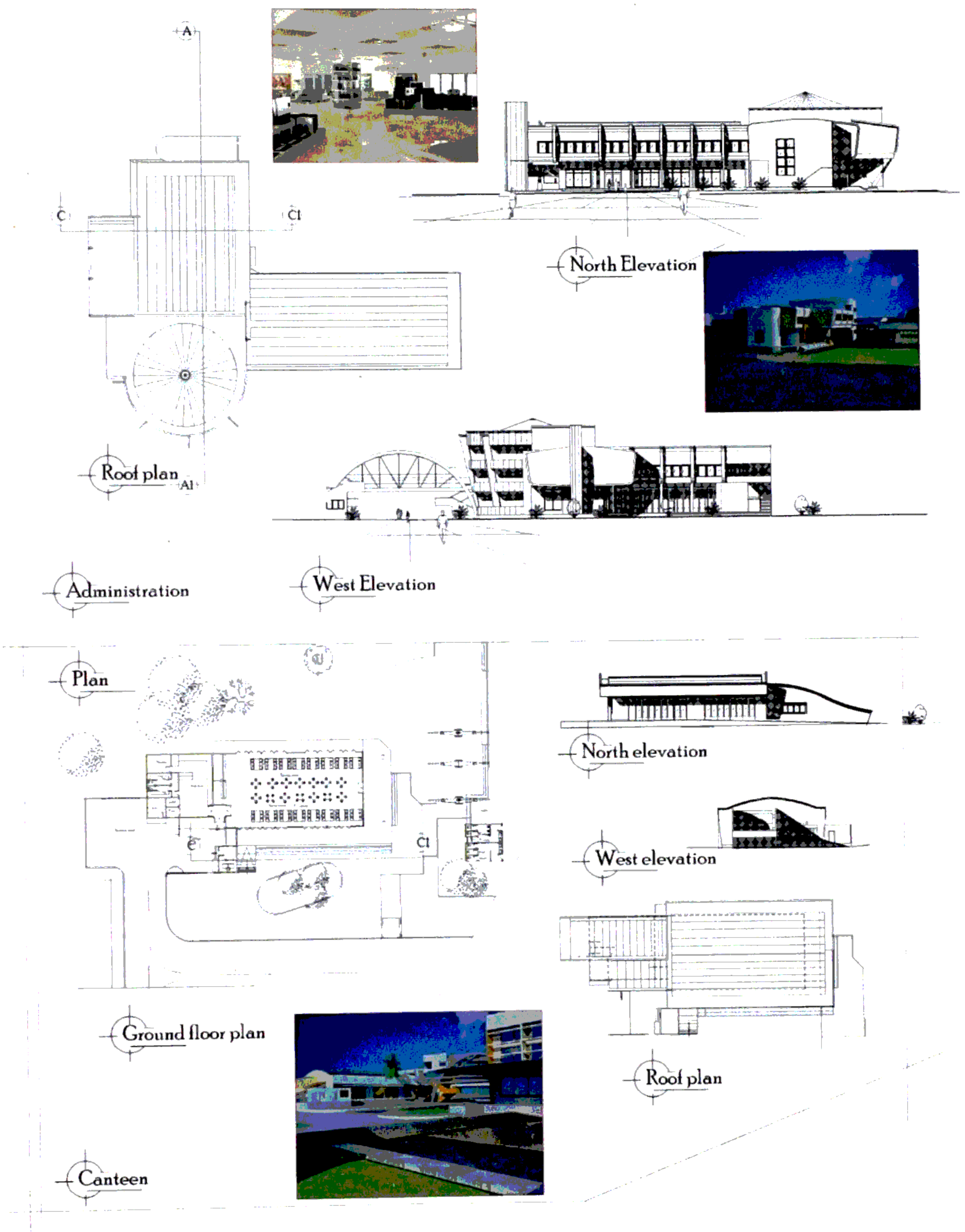


Appendix 1

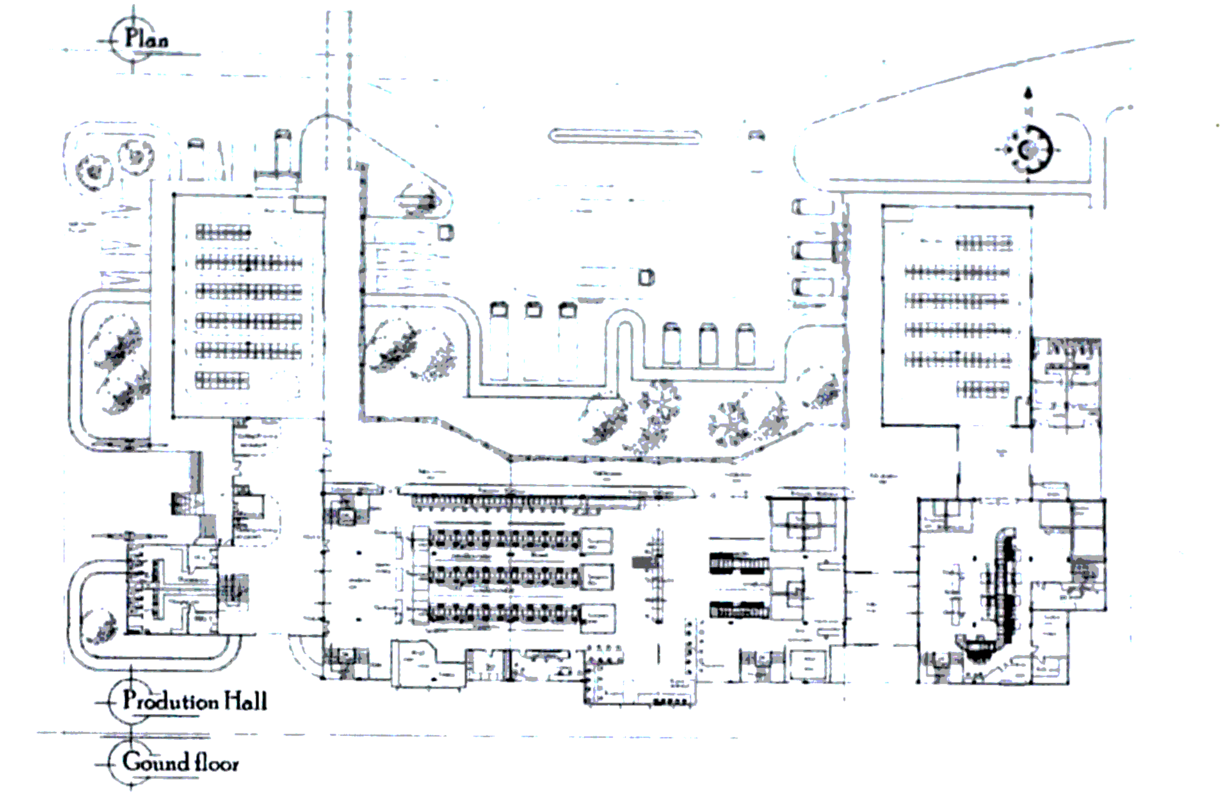

Administration Ground floor

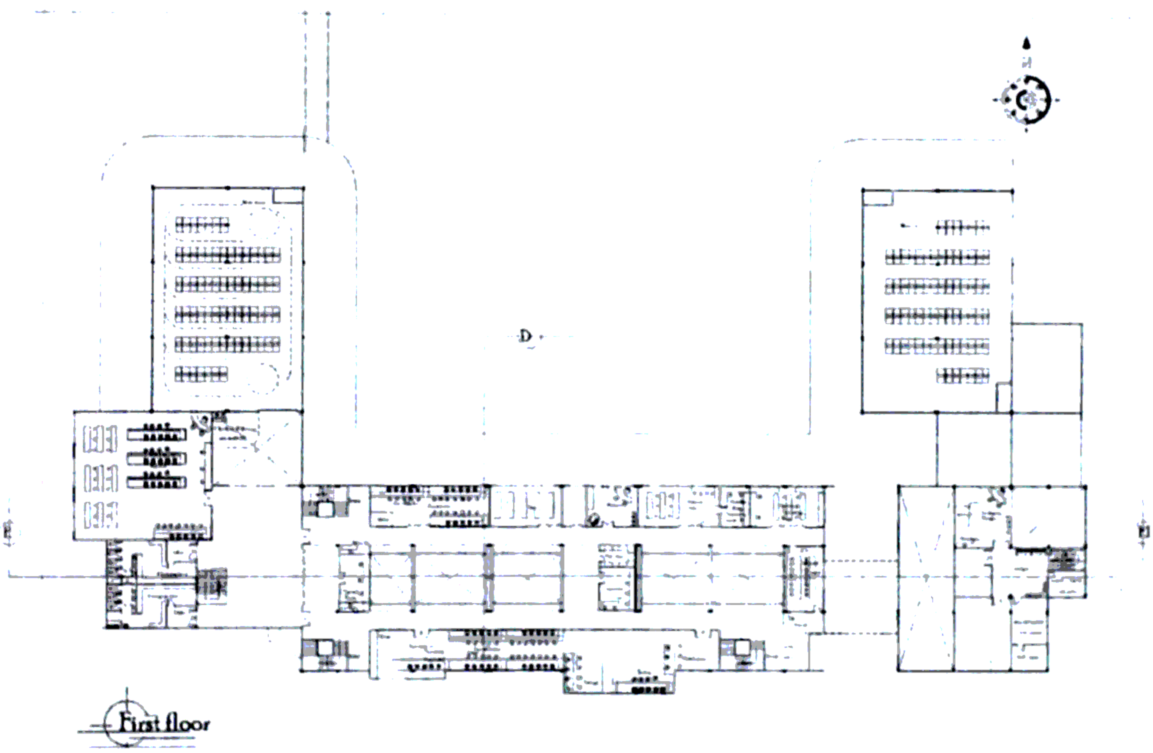

First floor
Second floor
Administration

Appendix 2

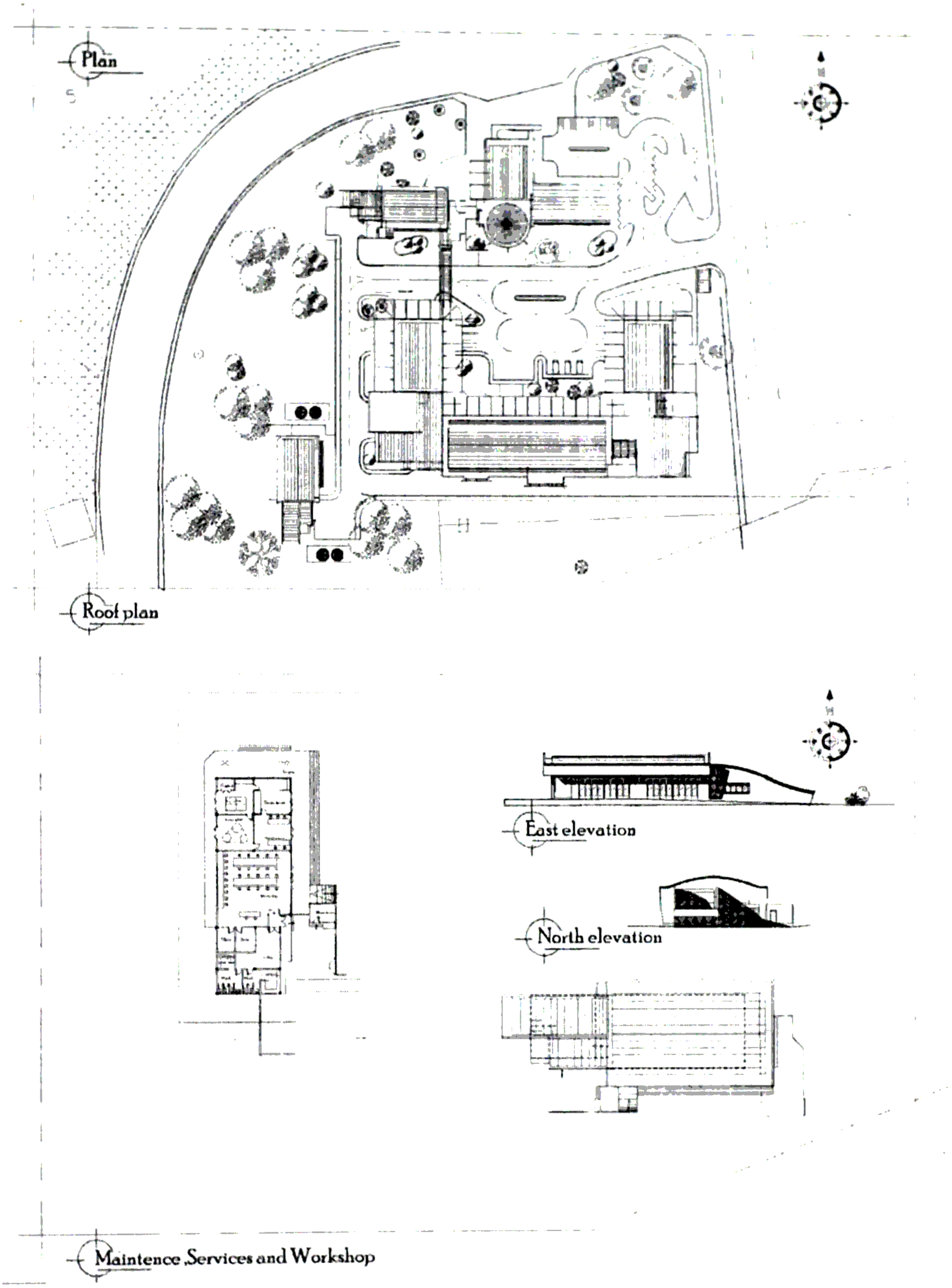

North Elevation
Roof plan
West Elevation
Administration
Plan
North elevation
West elevation
Ground floor plan
Roof plan
Canteen

Appendix 3



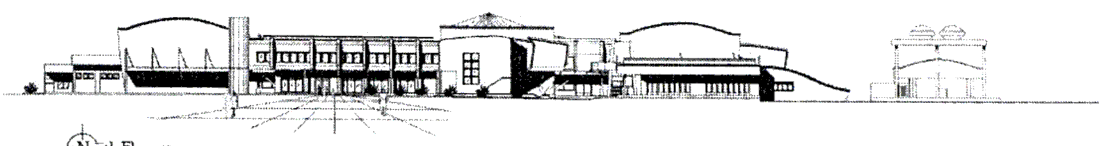


Appendix 4


Plan
Roof plan
East elevation
North elevation
Maintence ,Services and Workshop

Appendix 5

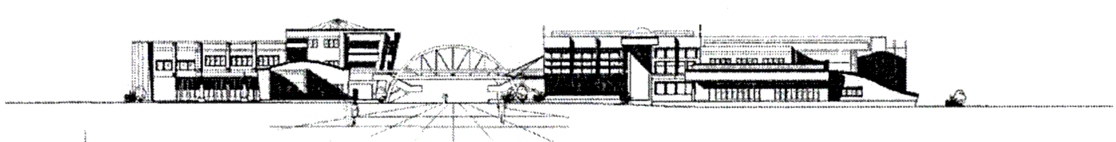
Elevations



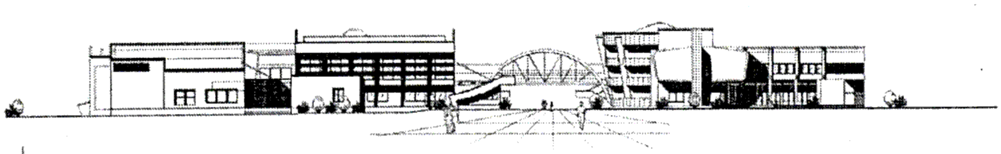
North Elevation

South Elevation

Elevations



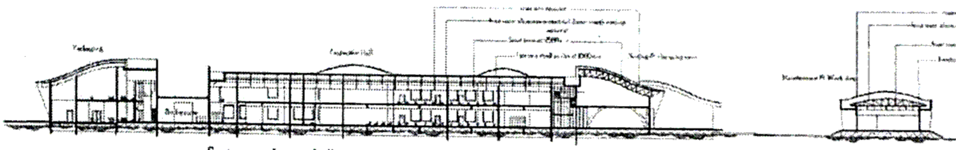
West Elevation



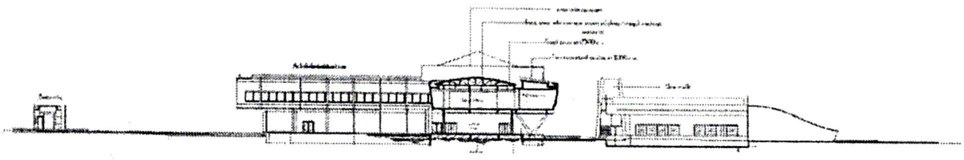
East Elevation

Appendix 6

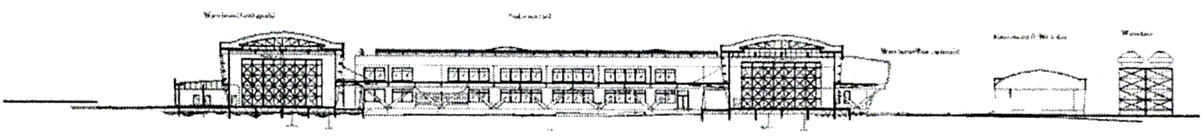
Sections



Section production hall



Section administration

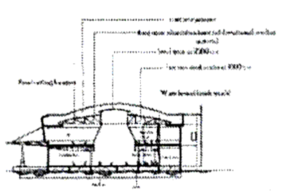


Section ware house

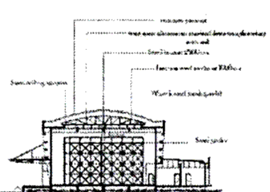
Sections

Section canteen

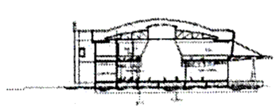
Section ware house



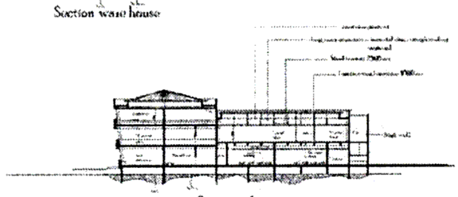
Section production hall



Section ware house

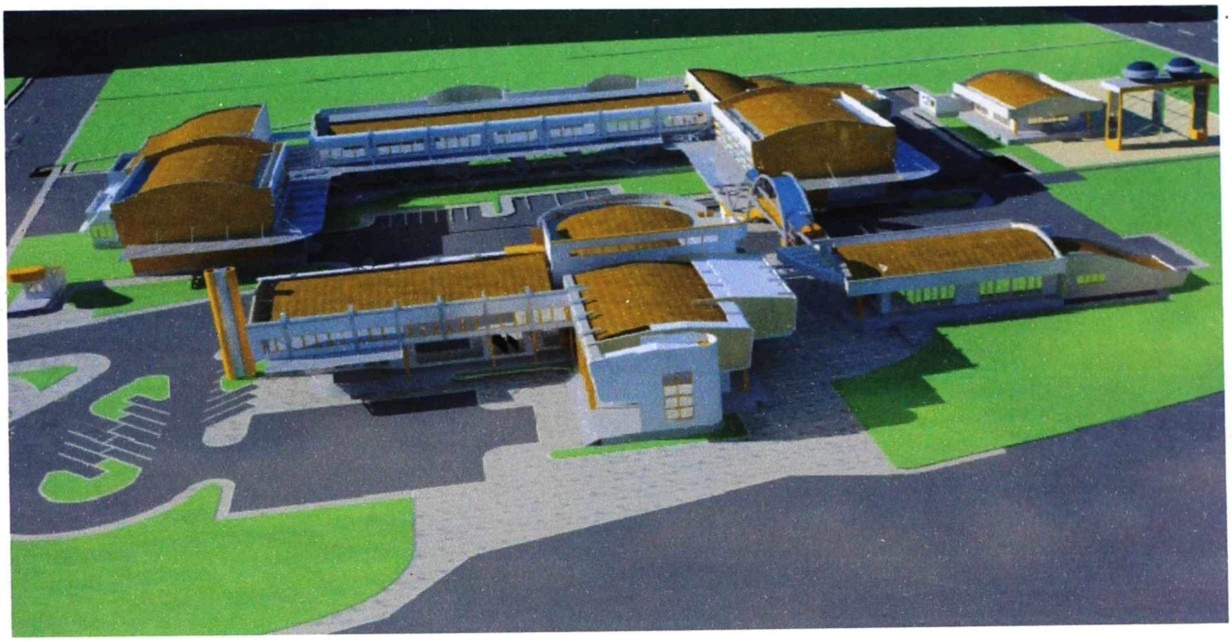


Section production hall

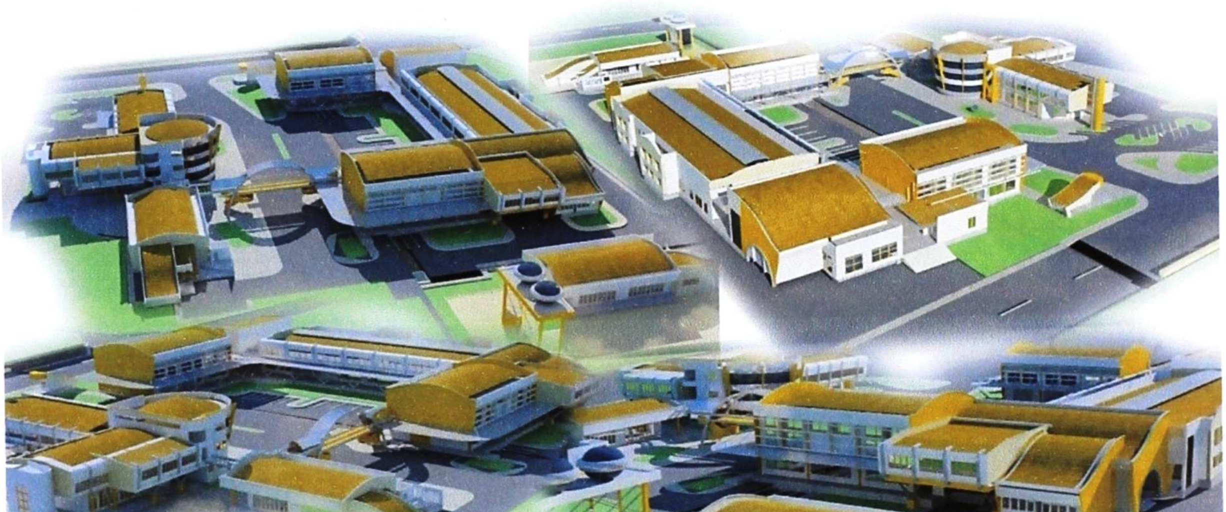


Section administration

Appendix 7



Aerial view of the computer assembly plant



Isometic view in diffent views

Appendix 8

Perspective View

Appendix 9

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