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An applicable master plan to develop city's Information Technology Infrastructure

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Abstract

Nowadays, communication devices are widespread exponentially. People use some of these devices in daily life like as using mobile to access for shopping from Internet and pay by credit cards or student email their homework to their teacher. In other words, Internet network plays significant roles in people's life. Therefore, some features such as access to Internet from everywhere, connection bandwidth and minimum necessary devices to connect and use network are important in make better satisfaction of people.

In this article, a master plan of infrastructure is suggested that city which built base on this infrastructure, people in city can connect to Data center from anywhere with simple and usual tools like PDA, Notebook and also cell phones and also superior manager can use the information to make proper decisions and as a result they can offer a fast and appropriate sort of management. In this instruction, people can easily connect to Metropolitan Area Network (MAN) then use IT subsystems like E-commerce, E-learning, E-health and others and enjoy from IT subsystem advantages in city. In this design, there are some important factors that we must attend to them because they affect the result, some of them such as speared of access point to MAN, independent from especial hardware requirement, Network Bandwidth and simple using structure for people. So, in the result, the useful information of people is saved in Data center and people or organization can reach these data easily and use people data in time.

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1. Introduction

As the population of a country and its progresses grows into the modern era, the individual's needs no longer change in a way that they can be respond to through the previous management methods. In other words, nowadays countries are moving toward postmodernism and in these traditional management strategies do not comply with people's expectations. Today, societies need a fast and accurate sort of management which is possible by means of sound decision-making.

In order to make accurate and prompt decisions, exact and comprehensive information needs to be readily accessible, together with the technological infrastructure to store and retrieve it. At the same time, such devices are needed for managers so that they can represent appropriate analyses through using the information given by the instruments. The managers can also use the information to make proper decisions and as a result they can offer a fast

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and appropriate sort of management.

In this study, we propose a data and network infrastructure such that information can be stored in an integrative and up-to-date way, whilst complying with user requirements through a Metropolitan Area Network (MAN)[6]. For the data infrastructure, an appropriate architecture is needed to maintain and update details about an individual ranging from family particulars to his/her financial status. Similarly, the private and government organizations can store the individual's data which can be inserted into the data center. Then, they can have access to that data by sending standard queries to database or data center.

Regards to the MAN the structure should be divided into 3 stages. Individuals, private and government organization each are placed in one of these stages depending on their network capacity. Also, in order to have quick and easy access to the network, a combination of different networks has been used for creating the MAN so that data and data analysis can be accessible throughout the whole city.

This paper is organized as follows. In Section 2 some background information about IT subsystems and their advantages are described. In Section 3, we introduce the advantages of IT infrastructure in a city and why we need this infrastructure. Section 4 derives necessary network and Data center infrastructure and a new model of this infrastructure and Section 5 concludes with a summary and discussions of future research directions.

2. Background

Technology in the 21st century has altered people's life styles in a drastic way; management methods, work-flow of organizations, the way people are entertained and even the general cognitive process of a person have been radically influenced by availability of information.

In this century, the mass of information is increasing exponentially. So, the duplicated information is a major problem for a manager to store data because data is produced in different places and saved on different networks. On the other hand, new technology such as IT helps the people to solve these kinds of problems [8]. At first, IT was introduced as concept but human have expanded upon this concept in different dimensions such that subsystems of IT were created.

In this section we introduce some important IT subsystems such as e-commerce, e-learning, e-government, e-health and e-tourism and the requirement facilities that they need. These are the most important sub-systems of IT that people use for daily life. All of them are used to integrate information in one place and then use then analyse information for user.

2.1. E-Commerce

E-commerce has different meanings and is divided into different parts. But in the e-commerce software, the producer [9], seller and buyer can reach their aims such as buying goods at low prices, selling goods in auctions, getting technical detail about goods etc.

Anyone can use e-commerce especially one based on the web to buy or sell goods anywhere and at any time. It also removes the locality of marketing and Small and Medium Enterprises (SMEs) can sell their products in international markets.[3]

The e-commerce advantages are listed below:

- Decreases in the marketing costs, Online buying and selling, It can happen anywhere and anytime, Remove the middleman role in traditional market, Enter international market, Buy goods of good quality with the lowest cost and Access to technical details of products

But some requirements are needed that e-commerce systems are used by people. If these are not available, requirements change their role to problems [11]. Below are some examples:

- Security of systems especially e-commerce web site
- Good and secure network infrastructure for connection to banks and secure money exchange
- Rate of people access to network and e-commerce web site
- Some specific characteristics that this kind of site should obey such as secure auctions forums, good graphical web site, ability to 3D view of goods.

Therefore, E-commerce is plays a very important role in people's lives. Some advantages and its requirements are discussed and we aim to solve these issues in our design.

2.2. E-Learning

E-learning has a lot of advantages and also has a big effect on today's science. There are different definitions for e-learning. The important one is 'E-learning teaches how people can learn new sciences'. [1] In this system, either the resource or the connection type are digital. In some e-learning methods, students can use the resource files that the teacher introduces in his/her web site, on a CD or the teacher teaches from other places to students in other points. In these kinds of classes there is an interactive relation between the teacher and students because the students can use some e-learning software such as Forums and the teacher can use the Internet to teach the new topic to the students or find some samples.

There are a lot of articles or research which shows that e-learning systems can increase the rate of learning more than traditional classes, especially for places that are far from development and technologies or country such as villages or a developing country.

This system also develops the learning process after the class; the teacher can answer student's questions, extends their innovation and gather exercise's answers by group mailing system or in the teacher's web site and forums.

Some advantages of e-learning are listed below:

- It is less expensive to produce, It moves faster, It can work from any location at any time, It can be updated easily and quickly, It can lead to increased retention and a stronger grasp on the subject, It can be easily managed for large groups of students But this system also needs some facilities as requirements, some of these that have been listed as below, The access point to internet or MAN, The low bandwidth of Internet connection and The cost of Internet account charge.

E-learning is the second IT subsystems that play an important role in children and young people's life.

2.3. E-Government

E-Government involves the automation or computerization of existing paper-based procedures that will prompt new styles of leadership,[4] new ways of debating and deciding strategies, new ways of transacting business, new ways of listening to citizens and communities and new ways of organizing and delivering information. Ultimately, e-government aims to enhance access to and delivery of government services to benefit citizens. More importantly, it aims to help strengthen the government's drive towards effective governance and increased transparency to better manage a country's social and economic resources for development. Some advantages are:

- Direct access to Information
- Direct connection to superior manager
- Give service for every day and each time in any place
- Increase the efficiency of government services
- Save in the paper and time
- Analyse the input information

This system also needs some requirements to be implemented. The most important one is the spread network to which people and manager can have access and use e-government software [11].

2.4. E-Health

E-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networking, global thinking to improve health care locally, regionally, and worldwide by using information and communication technology.

As of the main purposes of e-health is the integration of people's health information, then hospitals, pharmacies and who has permission can access to patient information easily. Also the e-health can help the surgeon to perform operations on a patient in another country.

Some important E-health advantages are:

- Enhance the quality of health care
- Learning basic health to people
- Share the patient data
- Analyse the patient data to make some results

These advantages are reachable if the network cover relationship between patient and doctor and information are centred in specific place.

3. Necessity of IT Infrastructure in City

By improving society from a Modern to Post-Modern and increase rate of population in countries, human face the density of information that are being collected from environment needs to use new management methods.

Therefore using new and intensive management methods are needed which can analyse intensity of information to control population and also estimate people's request in time.

So manager should get access to intensive information, then analyse this data to understand patterns or to predict future and use these result in decision. So, this decision is useful for people because is based on information of people's life and will be true because information was collected from environment so countries will be improved.

Today, everybody who has good information and can use them in time is successful man. So, we should create infrastructure that centralize data in specific place and create a network that people, managers and organizations can get access to information.

By the end of 1990's and beginning of 2000, scientists tried to solve above programme by using new technology. So, solutions such as e-commerce, e-learning, e-health and other virtual services have been used. These solutions can solve the people problems [12]. Nowadays, children, parents, scientists and Doctors can use these subsystems. Some difficulties have been occurred; some people can't get access to these subsystems such as developing countries or some people try to fraud the systems and ill-usage of them such as what happen in e-auctions or use other's credit card. These problems can be solved because the source of them are the systems requirements mentioned in section II which two most important are the rate of network generality that people can connect to it easy, from anywhere and anytime and the intensive data that contain people's life log from personal bank account to his/her education history.

Therefore using new and intensive management methods are needed for these kinds of countries which can analyse intensity of information to control population and also estimate people's request in time.

We discuss this infrastructure in to 2 parts, first is necessary to intensive data to Data center and save new data in this place and add authentication system that people can to get access to data depends on their jobs and needs. Second, create a network that use various protocols or network types to cover the city and assign a high bandwidth backbone to support data transaction between people and data center.

All at all, in city that have IT infrastructure, people can easily get access to network then use IT subsystem, data have been saved as intensive and manager can access to intensive data and can analyze it and use the result in decision.

4. Network and data center infrastructure

After discussing about IT advantages and requirements and analyzing the requirement in the previous sections, in this section we drives a optimum that can reach our aims that all of the people can access to network from anywhere in any time can use intensive data in daily life. This infrastructure is divided into two parts, data infrastructure and the MAN design.

4.1. Data Infrastructure

In this part, the major aim is collecting data in specific place and save them centralized.

Today, the process of collecting, classifying and analyzing of information is known as integration of data. This process causes to delete waste data and duplicate data from source data. So we have just pure and comprehensive data from people.

In this part, our strategy is that we want to save every one’s data from his birthday in to data center and all of the data is save as relevancy data. So you can access each data from one point and vice versa and also a small changes in data can affect all of them automatically. For everybody that has borne assign a code that all of his/her data save based on this code. This code can be a unique string of character or smart card that this code is hidden and he/she must use smart card in everywhere. Therefore we can access to people’s data in different category by searching his/her unique code.

In designing data infrastructure we should:

- Change the miscellaneous data to integrated data
- Define the access level to data

The solution for saving data in integrate style is using data center. We can save people’s related data in data center and also can use standard query to extract necessary information. In data center, data can save in different dimensions. By using Data Marts each organization can record customer data as part of his/her general in specific dimension. Organization can reach their need by sending a query to data center and if it has correct access data center return the part of his/her data or return the result of process on multi dimension of the data. You can see the process of receive, save and output of data center in the follow Fig.1.

As in the Fig.1 can understand, each organization can use Data marts to save part of information locally based on Meta data that is exist on data center. Also the results which data center can produce are shown in this view. The cube in the figure is the instance of dimension data in data center. We give a sample to make deep and efficient understanding of our design, about the role of data integration in people’s life.

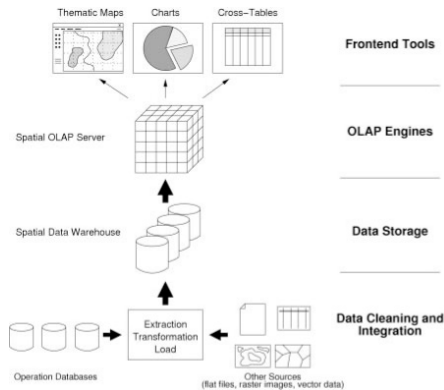


Fig. 1. Data centre's schema



Fig. 2. Sample of MAN in a city

Sample one:

”suppose the patient information -such as doctor’s assessment of ill or the result of radiography- is recorded in a same place in city. If the patient isn’t gain his/her health or the patient change his/her doctor, his/her ill’s background has been recorded in the data center and other doctor can study more on the ill or based on his/her health background medicate better medicines. Also this process can happen in drugstore, the drugstore man can give the correct medicine.

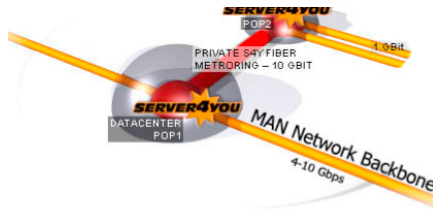


Fig. 3. the schema of MAN 's backbone

This process can happen in high level, the superior manager of people can detect contagious illness in society and also understanding the rate of its growth”.

As we discussed in above section, in this century, people information should save in data center. But we just research about the advantages of it. But base on the growth of technology indubitable it can implemented.

4.2. Network Infrastructure

In this part we design a network that covers all area of the city, and people can get access to it from everywhere. For this aim I should joint different protocols to spread network because some places in city have especial geography and we can just use wireless LAN but some other we can use fibre optics or E1 line [7]. We can add this types to basic MAN that show in Fig.2.

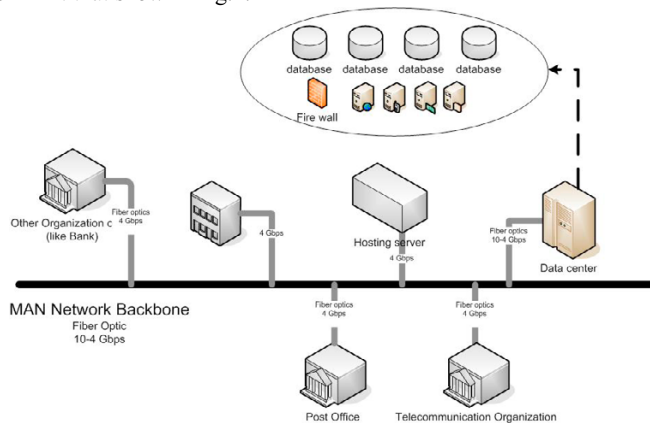


Fig. 4. The schema of MAN backbone structure

Whereas this network should support people's transactions, so this network needs a wide bandwidth backbone. We use fiber optics as backbone because can support 4 to10 Gbs bandwidth [5]. So this backbone is the high way of connection to other networks. The data centre also connects to this backbone. You can see this structure in above (Fig.3). After the backbone design we should design the upper level, in this level most of the organization that need high bandwidth such as ICPs, education institutes and the major governmental organization such as banks, post office and police office are connected to this level of network. The structure of this level is shown in Fig.4.

The backbone that you see in Fig.3 is like circle but we show as line to better understanding. In the next level the bandwidth is decrease to 1 Gbs but the number of organization or ISPs that cover is very high. The wireless antennas also connect to MAN in this stage. I these stage we just mention general information. Because every of these points have a complexity and we just adequate to say as general but for implementation, each Hardware and software should be known. So in sage3 we spread bandwidth with SMEs, ISP, antenna and educational centers.

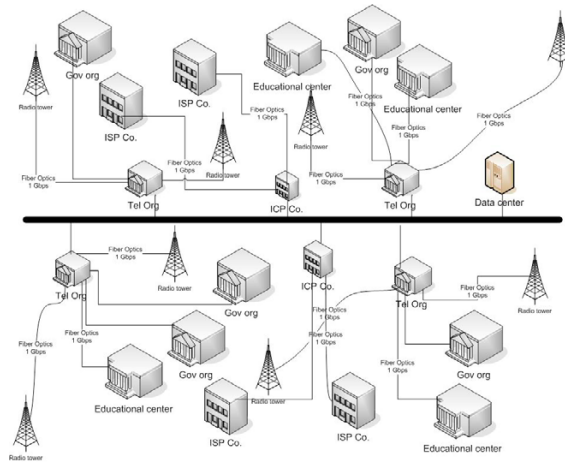


Fig. 5. The two upper levels from backbone

The view of this stage design is shown in Fig.5. After this stage the ISPs that connect in above stage, give DSL service to home, stores and schools and other places such as cabins that use to help people and diffuse in city . In this stage Internet share between homes and stores, so everybody can access to internet from that places, also people can connect to network by using wireless LAN and get access by using mobile and PDA. The general view of the design is illustrated in the Fig.6. So, by this design we can manage MAN bandwidth based on their needs and every organization can access the suitable internet bandwidth.

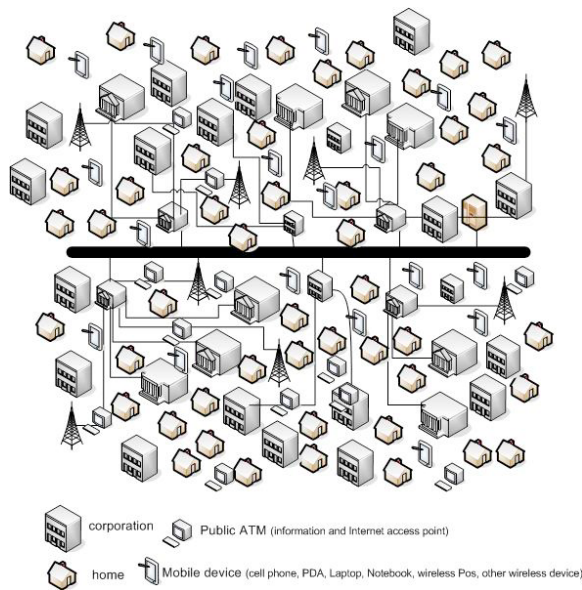


Fig. 6. The last level of MAN

5. Conclusion

Information Technology in the 21st century has altered people's life styles in a drastic way; management methods, work-flow of organizations, the way people are entertained and even the general cognitive process of a person have been radically influenced by availability of information. It also helps the manager to access and analyze the density of information and use this analyze in decision making.

In this study, we propose a data and network infrastructure such that information can be stored in an integrative and up-to-date way. So, manager can access this integrated information to decision and people can use it in daily life in stores, hospitals, pharmacy, school and other places. The data structure, we save people's related data in data center then everybody can use standard query to retrieve necessary information base on his/her permission. Also everybody can access to data center. We propose a network infrastructure and design a network that covers all area of the city, and people can get access to it from everywhere. For this aim, we should joint different protocols to spread network because some places in city have especial geography and we can just use wireless LAN but in some others one can use fibre optics or E1 line.

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