**Communication and Networks**

**CA3 Individual Assignment**

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**Name: Jeslyn Ho Ka Yan:**

**ID: 10241485**

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# Introduction

Technology is become an integral component of our daily life. Technology has a far bigger effect on our daily lives than we think. It is rapidly expanding and changing. It has altered how we access resources.. As a consequence of technology improvements, several platforms, such as the healthcare industry, have grown more efficient.

GDM aims to use HealthTech to expand their medical business and shift it to a larger facility. I am here to demonstrate a broad understanding of networking and how you would go about establishing the IT network for GDM in order to be qualified as an IT Project Manager. I will make recommendations on the sort of healthTech solution, network infrastructure architecture, and telemedicine system that should be adopted by GDM.Part A (i)

Many revolutionary advances in health technology have happened throughout history, but few have had the broad reach or impact that digital technology has. Significant advancements in networking and computer technology have not only extended medical treatment choices, but have also changed how physicians execute their tasks.

**An example of the digital Technology that impact the HealthCare sector is GPConnect and SmartCMS.**

**GPConnect:**

* It is a service that makes clinical information and data available to all relevant professionals at all times and locations.
* It allows GPs to be more effective in their everyday job and allows them to spend more time with their patients.

**SmartCMS:**

* IHiS's SmartCMS technology enables smooth information exchange between clinics and public healthcare institutions.
* SmartCMS can handle registration/approval operations of any complexity

**IHiS has launched a number of HealthTech initiatives in Singapore.**

1. **Electronic Health Intelligence System (eHints)**

It is an Organization Analytic Platform designed by SingHealth that supports the analytical and reporting requirement of Business, Finance, and Clinical users. Healthcare professionals can simply access over a secure network.

1. **Nursing Home IT Enablement Program (NHELP)**

It assists nursing homes in improving patient care and increasing operational efficiency by utilizing suitable IT solutions. It offers nursing homes a suite of IT Systems based on Software-as-a-Service (SaaS), with an emphasis on Patient Management and Electronic Medical Records (EMR).

To summarize, HealthTech, which was founded by IHiS in Singapore, assists healthcare industries in becoming more efficient and productive. The advantages of health technology (IT) include the fact that data input into a computerized system takes significantly less time than paper-based approaches and decreases the possibility of mistakes in patient data and financial details. According to a research conducted by the University of Michigan, switching from paper to electronic health records lowered the cost of outpatient treatment by 3%. These researchers calculated a monthly savings of $5.14 per patient. That sum is unimaginable in a major city hospital network. ( AIMS education 2021)

# Part A (ii)

The Covid Pandemic has highlighted the evolution of healthcare solutions. Nowadays, patients must have everything at their disposal. They want to remain consistent with their healthcare facilities, including the ability to contact medical practitioners for rapid and expert advice on health concerns and receive health reports via mobile apps.

Healthcare, like any other business, has seen significant changes as technology has advanced. People are increasingly depending on smartphones, mobile applications, and other devices for medical treatments and overall health and well-being.

**There are several sorts of healthTech solutions that GDM should consider.**

1. **Online Consultation:**

It’s a consultation conducted over the phone or through video conferencing. These modes of online communication save the customer a trip to the practice while still providing with the assistance they require to improve. This can assist medical clinics in gaining new consumers.

1. **Remote patient monitoring (RPM):**

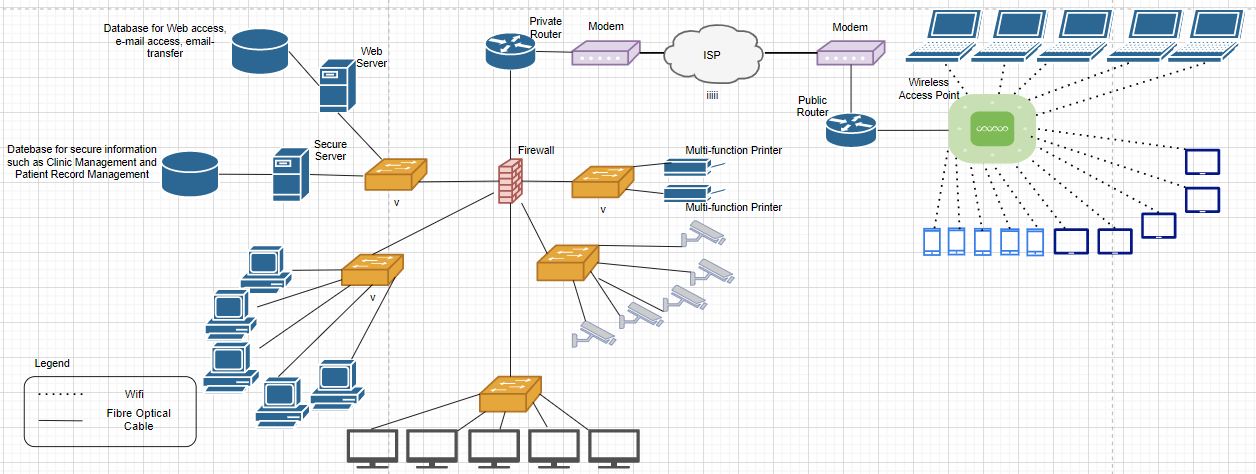
It’s a technology that enable doctors to monitor, report, and evaluate their patients' acute or chronic diseases while they are away from the hospital or clinic. They allow providers to make proactive clinical decisions by providing real-time information of a patient's illness status.

1. **Scheduling System:**

Scheduling is essential for a successful practice, but it may also consume a significant amount of your staff's time if not done correctly. By minimizing the time required to arrange appointments, online scheduling software improves the operational efficiency of the clinic.

# Part B

GreedDoc Medical's new clinic has appointed me as IT Project Manager to develop and build their clinic's network architecture. I had to first create a network topology. A network topology diagram enables me to visualize how devices are linked and communicate with one another. As you can see from the image below, I designed a physical network topology.



1. **Type of internet the source**

I recommend using fiber broadband as an internet source. Fibre broadband is a form of high-speed internet access. The data moves at the speed of light down the wires. This means you're more likely to have better download speeds and a more stable internet connection. This normally refers to any connection with a speed of 24Mbps or above. Most prominent providers offer plans with average speeds ranging from 36Mbps to 67Mbps, all of them are quite fast. (Which? 2022

1. **How the above-mentioned gadgets are joined together via interconnection devices**

As u can see from the diagram on pg. 6, the modem are connected to the internet in order to bring the internet to the clinic. The modem receives signals from your ISP and converts them into signals that your local devices can understand, and vice versa.

A router links your devices as well as the modem in hard-wired connection settings. The router connects to your modem, which then connects to your devices. The router oversees all of the information flowing to and from each device and modem, ensuring that it all arrives securely in the correct location.

**There are two router, one is call public router and the other is call private router.**

**Public router** is connected to the wireless access point. Wireless Access points (WAPs) is a networking devices that Wi-Fi devices to wired networks. The wireless access point is connected to by 5 laptops running a combination of Windows and Mac OS, as well as 5 smart phones and 5 tablets.

**Private router** is linked to prevent malware and application-layer cyberattacks,. There are 5 switch that are connected to the fire wall. Switched network devices are used to connect network devices and use packet switching to send, receive, and forward data packets across the network.

1. **The first switch** is connected to the web server and the secure server, a database is then linked to each of the servers The web server enables web access, email transmission, and email access. The secure server ensures the security of information such as clinic administration and patient data management. The two servers will be put in the IT room.
2. **The second switch** is connected to 5 Desktop using the Fiber optical cable. ,Desktop will be place in a consultant room.
3. **The third switch** is then connected to 5 smarts Televisions, each television will be place in a consultant room.
4. **The fourth switch** is linked to five security cameras, which will be placed around the GreenDoc Medical Clinic to ensure security and provide customers with a sense of safety.
5. **The last switch** is connected to 2 printers that will be in the reception area.
6. **What types of wired or wireless media is being implemented**

There are two types of wired or wireless media use in the network infrastructure.

1. **Wi-Fi**

Wi-Fi is a radio transmitter that is delivered from a wireless router to a number of devices, which transform the signal into data. As u can see in the topology network diagram I had created, the hand carry devices are all connected to the wireless access point using Wi-Fi.

**Pros of using Wi-Fi**

1. **Convenience**

It is faster to configure and provide access to several users connected to the same network than a wired network.

1. **Mobility**

It enables users to carry out their everyday operations from any location as long as they are within range of a Wi-Fi access point.

1. **Low-cost**

Wireless networks provide considerable cost and labor savings. It reduce the costs associated with wiring and maintenance, particularly when setting up a new WiFi network.

**Cons of using Wi-Fi**

1. **Slow speed**

Wi-Fi connection are significantly slower than conventional ones. When many devices are linked to the network, the speed decreases significantly.

1. **Lack of security**

Wi-Fi is prone to hacking. Because of its wireless nature, it is vulnerable to hacking, particularly on public Wi-Fi networks.

1. **Limited range**

The range of a Wi-Fi network is restricted. As you walk away from the access point, the power of the Wi-Fi network decreases.

1. **Fiber Optical Cable**

A fiber optical cable carries data as a light signal. Fiber optic cable is widely utilized in long-distance communication and telecommunications networks.

**Pros of using Fiber Optical Cable**

1. **Good Quality of Connection**

It have an extremely low bit error rate and they are also immune to electromagnetic interference, which can hamper the performance of cable connections.

1. **Highly Secure**

Fiber optic connections do not use radiofrequency signals, there is no way for an intruder to intercept your data packets. Furthermore, any breaches are immediately identified.

1. **Scalability**

Fiber optic internet is scalable and adaptable in terms of expansion. It is quite simple to put new equipment over previously laid-out fiber.

**Cons of using Fiber Optical Cable**

1. **Easily damage**

Although fiber is lighter and thinner than typical metal wire, it is vulnerable to physical damage. It can be easily cut by mistakes during the building renovations.

1. **High Upfront Costs**

A specialized piece of equipment is required to ensure that everything is functioning properly, and you must also have the suitable technician on hand to set up the fiber optics equipment.

# Part C (i)

Almost all treatments and activities conducted by healthcare professionals are influenced by technology. Healthcare landscape has dramatically change due to the use of the telemedicine. Telemedicine uses telecommunication technology to diagnose and treat patients, so the patient does not need to visit a clinic to receive medical advice.

**There are three types of Telemedicine**

1. **Store and Forward telemedicine**

According to the developers of store-and-forward technology, the platform is excellent for evidence-based treatment, in which doctors may gather all of a patient's information, evaluate it to allow physicians utilize to offer successful care.

1. **Hospital Based Real Time telemedicine**

It enables doctors and patients to communicate at any time and from any location. Any two-way communication method, such as video conferencing, allows doctors and patients to speak in real time.

1. **Home Based telemedicine**

The doctor will monitor the patient with an electronic or medical equipment, and the data obtained will be transferred to a monitoring system. It is often used in chronic illness management to detect medical concerns early. Telemonitoring telemedicine is similar to home-based telemedicine.

**The Benefits of Telemedicine delivery**

It can help reduced clinic wait times, access to subspecialist views, prevention of contagious illnesses, home monitoring of multiple medical indicators, and increased online learning. The general quality of healthcare and medical education has improved, while total healthcare expenses have reduced.

# Part C (ii)

GDM should explore implementing a Telemedicine system to help the clinic function more efficiently, especially because GDM's services are in great demand. Telemedicine technologies, which offer remote consultation, diagnosis, and treatment, are becoming an increasingly important tool for healthcare practitioners. Telemedicine is the process of connecting healthcare doctors to their patients and over long distances utilizing communications technology. Telemedicine manifests itself in several ways, all of which revolve around data transmission and communication.

**The GDM should employ all three basic types of telemedicine modalities**

1. **Store and Forward telemedicine**

* **Increased efficiency and comfort**
* The patients and the doctor do not have to be present at the same time. Both patients and physicians benefit from increased efficiency and convenience. Participation can take place anywhere; they are not required to travel vast distances merely to attend the clinic. Once the patient files are transferred, healthcare providers can review them at their leisure. Clinics may now serve a larger number of patients because patients are no longer need to attend the clinic, freeing up time for both doctors and patients. Outpatient visits are made available to people who require them the most.
* **Patient Satisfaction**

Several research on patient experience with telemedicine have been conducted, and the overall conclusion is that patients are pleased with telemedicine. Most patients are just as happy with telemedicine visits as they are with in-person visits. In fact, some patients prefer virtual appointments over in-person visits.

1. **Hospital Based Real Time telemedicine**

* **It improves GDM service quality by**

It allows doctors to communicate with their patients more frequently and efficiently from anywhere. If the doctor has a critically sick patient, they can use video conferencing to check on them, this could dramatically increase the level of services you provide, which your patients will appreciate.

* **Increase Clinic Revenue**

Because of the clinic's great production and efficiency, it can serve more patients. The use of telemedicine video conferencing results in increased productivity and efficiency. As a result, the clinic may see significantly more patients than usual.

University of California Davis Children's Hospital researches had discovered that the average yearly hospital income for the hospitals studied increased from $2.4 million prior to telemedicine implementation to $4 million thereafter. (Fierce Healthcare 2013)

1. **Home Based telemedicine.**

* **Increases patient engagement**

it provides patients with tools to help them understand their health. When a patient knows their disease, their individual care plan, and their role in improving their health, they are more likely to have favorable health outcomes. Convenient access to health education resources enhances their involvement even further.

* **Improves clinical staff efficiency while addressing clinical staff shortages**

It helps doctors prioritize care delivery by allowing them to evaluate each patient and case based on near real-time patient status. In the face of acute staffing shortages, home based telemedicine can assist minimize the stress of over-scheduled in-person visits by allowing doctors to offer some of that treatment electronically. It employs a team-based care strategy that provides for provider flexibility.

# Conclusion

In conclusion, GPConnect, SmartCMS, and telemedicine provide a variety of benefits to clinics, including enhanced patient care, increased efficiency, and cost savings. It enables clinics to deliver more convenient and accessible care to patients, especially in rural and distant places where access to healthcare is restricted. This enable GreenDoc Medical (GDM) to deliver high-quality treatment to their patients while also improving their operations and financial line by embracing these technologies.

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