Introduction:

System Analysis and Design (SAD) is a structured process that includes stages like planning, analysis, design, deployment, and maintenance. To develop a computer-based system, it's essential to go through the system analysis phase. This helps us understand how to implement things and what technologies are needed to achieve specific goals. SAD focuses on two main parts: "Analysis" and "Design." The analysis part specifies what the system should do, while the design part deals with how to achieve those goals.

To analyze the system, we conducted a visit to the CUET Medical Center. Our primary objective was to gain a comprehensive understanding of their overall operations and identify any existing inefficiencies. Based on these findings, we aim to develop an optimized design to address and resolve the identified issues effectively.

Problem Statement:

1. When a student visits the medical center for the first time, they are provided with a medical booklet in which all medical records are manually maintained.
2. The management of the medicine inventory is conducted manually using a register book.
3. Attendance records, ambulance service logs, student service records, and laboratory test records are all tracked manually through register books.
4. Students' feedback regarding the services provided is also recorded manually in a register book.

Our objective is to develop a system that will streamline and automate these manual processes, thereby enhancing efficiency and accuracy.

Purpose:

The CUET Medical Center plays a vital role in providing healthcare services to the campus community, including both students and staff. However, the existing manual system leads to numerous challenges that hinder its efficient operation. This project intends to identify these challenges and investigate automated solutions to enhance the effectiveness of the organization. The purposes of the system analysis are as follows:

- Maintaining records manually results in unreliable patient information, difficulties in quickly accessing medical histories, reduced visibility in tracking treatments and medications, and slow administrative processes, all of which can compromise the quality and speed of healthcare services delivered.

- We chose to concentrate on this medical center due to its importance for the health and well-being of the campus population.
- As healthcare significantly impacts students' academic performance and personal lives, enhancing these services will contribute to a better overall environment for all.
- Furthermore, the lack of digital tools provides an opportunity to create a system that can simplify essential tasks like student registration, medicine inventory management, ambulance service coordination, and maintaining student medical histories.

Scope:

The CUET Medical Center can achieve multiple advantages from the implementation of our proposed system improvements. Some of the primary objectives to be accomplished include:

- Ensure accurate and consistent maintenance of student medical records for better patient care.
- Keep the medicine inventory well-organized and up to date, helping the center avoid both shortages and overstocking.
- Improve emergency response by making ambulance requests quicker and easier to manage through a digital system.
- Provide quick and easy access to comprehensive medical histories for timely diagnosis and treatment.
- Enhance overall administrative efficiency by reducing paperwork and manual errors.
- Increase transparency and accountability in daily operations through digital logging and reporting.
- Improve service quality and patient satisfaction by enabling better data management and communication.

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Overview of Organization:

The CUET Medical Center, located within the campus of the Chittagong University of Engineering & Technology (CUET), serves as a dedicated healthcare facility for students, faculty, and staff. Despite its modest scale, the center plays a crucial role in ensuring the well-being of the university community.

- Under the supervision of Dr. Md. Saiful Islam, the Medical Center functions with a team of 6 doctors, 2 nurses, 3 medical technologists, 2 pharmacists, 2 compounders, 2 ward boys and 2 office attendants, all working in a 3-shift system across 5 working days. This dedicated team ensures the smooth delivery of essential healthcare services to the CUET community.

- Medical services are completely free for CUET students. Although ambulance usage is documented for administrative purposes, no charges are applied. Faculty members, staff families, and referred local residents also receive treatment, reflecting the center's strong commitment to community care.
- The center currently offers diagnostic tests for typhoid, dengue, creatinine, and more. It is equipped with essential medical devices, including two ECG machines, one ultrasound machine, and both semi and auto analyzers, which enable accurate and timely diagnoses. Additionally, a CBC machine has been ordered and is expected to arrive soon.
- The center provides basic medical procedures such as injections, wound dressing, nebulization, and stitching. For more critical or complex cases, patients are referred to Chittagong Medical College (CMC) for specialized care.
- All operational activities, including patient records, medicine inventory and doctor information are maintained manually.

Management Structure:

Management hierarchy, also known as organizational hierarchy or chain of command, is the system of authority within an organization. It describes the many layers of management as well as the flow of information and decision-making from top executives to frontline personnel. Each level of management has its own responsibilities, authority, and scope of decision-making. It is commonly represented as a pyramid or triangle, with top-level management at the peak and frontline workers at the base.

The CUET Medical Center follows a hierarchical management structure that defines authority and responsibilities across three levels. It is represented as a triangle, with the Director of CUET Medical at the top level, the Medical Officer at the mid level, and the Chief Nurse at the low level.

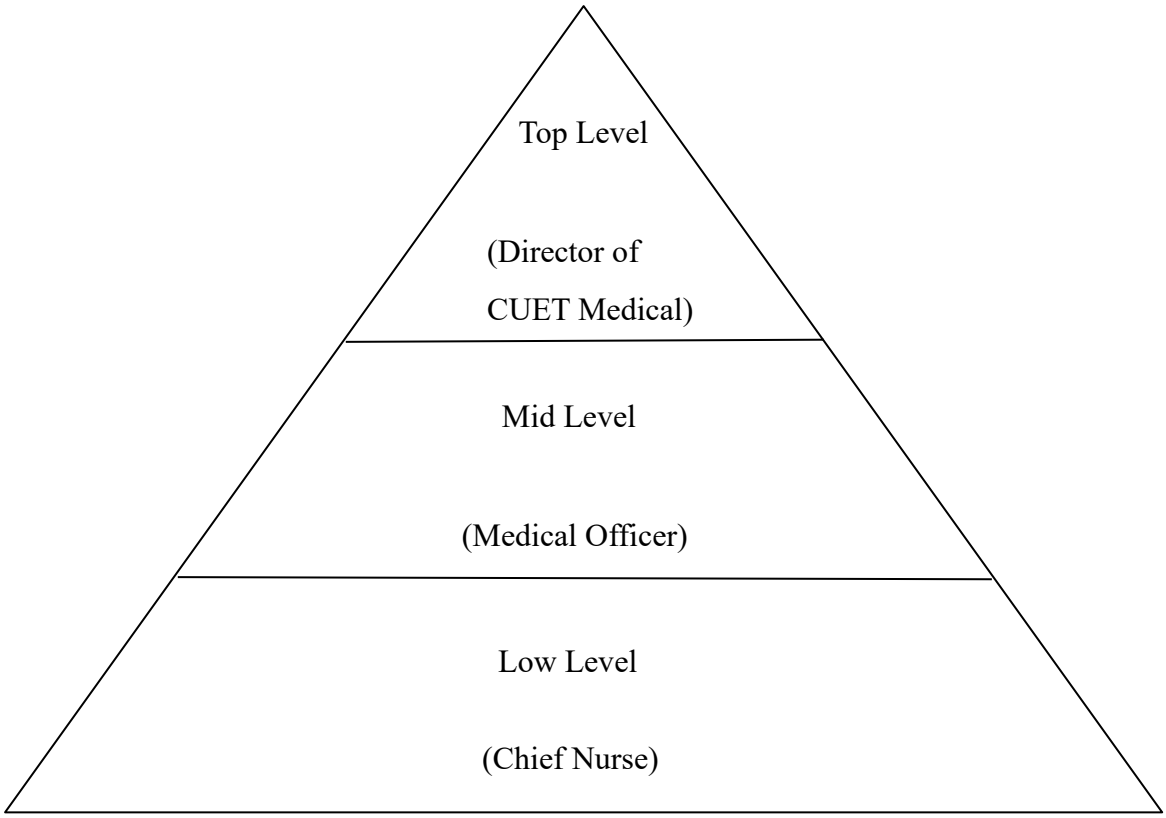

Figure 1: Management Hierarchy

Types of Information:

Operational Information:

- Maintaining patient entry records.
- Managing student medical booklets.
- Managing shift rosters for doctors, nurses, and other medical personnel.
- Monitoring medicine usage and stock levels for timely replenishment.
- Documenting ambulance service usage.
- Performing diagnostic tests and administering primary treatments such as saline, injections, and nebulizers.
- Carrying out regular maintenance of laboratory equipment.
- Collecting and reviewing patients' feedback.

Tactical Information:

- Prescribing medicines and performing diagnostic tests such as ultrasonograms.
- Reporting Medicine Requirements.
- Identifying and Reporting Equipment Shortages.
- Coordinating patient referrals to specialized medical facilities.

Strategic Information:

- Overseeing manpower resource gaps.
- Appointing doctors, nurses, and other medical personnel.
- Supervising salary processing and promotion approvals.
- Managing tenders for advanced medical equipment procurement.
- Infrastructure Development.
- Digital Transformation Initiatives.

Statutory Information:

- Reporting Total Expenditure.
- Verifying certifications of doctors, nurses, and medical personnel.
- Ensuring proper licensing of medical equipment and ambulance services.

Information Gathering:

Questionnaires:

- What tasks are handled by the senior staff nurse?
- How is ambulance service recorded?
- Who handles the medicine stock on a daily basis?
- How is the medicine stock planned and procured?
- What types of tests are currently performed in the health center?
- What medical equipment is available?
- Who performs the tests using this equipment?
- What challenges are faced regarding technical personnel for rare procedures like X-rays?
- Is the work process digitalized or manual?
- Who is responsible for overseeing the overall operations of the Medical Center?
- Who currently makes the administrative decisions in the absence of the CMO and DCMO?
- Who manages promotions and salary-related issues?
- Are patients admitted to the center?
- What medical procedures are performed?
- What is the purpose of the booklet?
- How is the staff structured?
- Is there a shortage of skilled manpower?

- Is there any medical machine currently expected to arrive at the facility?
- Who is responsible for the recruitment of medical personnel?
- How are salaries and promotions for medical staff managed?
- Who handles the tendering and approval process for new medical equipment?

Requirement Specification

The CUET Medical Center serves the students, faculty members, administrative staffs, and also their families. Based on comprehensive interviews conducted with personnel across various roles within the medical center and an in-depth analysis of the current operational framework, several areas for improvement have been identified. These proposed improvements aim to simplify operations, improve accessibility, and ensure efficient management of resources and patient data. The key requirements are outlined below:

1. **Digital Platform and Medical Record System:** The CUET MEDICAL CENTER currently lacks a dedicated online platform, which poses significant challenges in terms of accessibility and responsiveness. At present, patients must physically visit the center to determine whether which doctor is currently available, what types of diagnostic tests are offered along with their respective costs, or to acquire contact information for ambulance services. To address these issues, the development of a comprehensive digital solution is proposed, which includes both a dedicated website and a digital medical record system. This platform will:
    - Provide real-time updates on the medical center's operational hours and doctor availability.
    - Publish a complete list of available diagnostic tests along with their associated costs.
    - Display up-to-date information on ambulance availability and the contact details of on-duty drivers.
    - Offer students a digital version of their medical booklet, allowing them to access and present their medical history anytime from any device.
    - Enable medical personnel to efficiently access patient records, improving the quality of care and diagnostic accuracy.
    - Minimize the risks associated with lost or damaged physical records, thereby ensuring greater data integrity and continuity of care.
2. **Desktop app and well-structured database:** All operational data at the medical center — including medicine inventory, ambulance usage logs, patient records, and medical

equipment — are currently maintained manually in physical documents. This results in inefficiencies, and difficulties in tracking and reporting. The implementation of a desktop application with an integrated and structured database will:

- Enable systematic digital record-keeping and easy retrieval of information.
- Facilitate real-time updates on medicine stock, equipment status, and patient treatment history.
- Improve resource management and operational transparency.

Conclusion

We have chosen to analysis the existing system of the CUET MEDICAL CENTER to identify its current challenges and limitations. As students of CUET, we have personally recognized the need for improvements that would benefit the university community — including students, faculty members, and administrative staff.

In this digital world, we have identified an opportunity to modernize and simplify the operations of the medical center through digital transformation. To gain a comprehensive understanding of the center's functionality and management structure, we conducted a series of interviews with personnel across various roles within the CUET Medical Center.

Based on the insights gathered, we conducted a thorough analysis of the center’s operational framework. This analysis enabled us to pinpoint key areas of inefficiency and propose a set of improvements aimed at enhancing accessibility, record-keeping, and overall management within the medical center.