

A Conceptual Model For An Integrated Medical Examination Information System For Public And Private Sector Employees

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Abstract

This article presents a conceptual model of an information system based on mobile technologies, developed to monitor the health of employees in the public and private sectors and to digitalize medical examination processes. The proposed system features a user-centered architecture and includes functionalities such as planning medical check-ups, recording results digitally, delivering doctor's recommendations, and archiving. The study analyzes the system's functional modules, architecture, security approaches, and practical implementation prospects. The analysis shows that this model plays a vital role in enhancing the efficiency of medical services, simplifying workplace health monitoring, and strengthening digital health infrastructure.

Keywords: mobile technologies, medical examination, information system, conceptual model, health monitoring, public and private sector, electronic health, digital health.

Introduction

In recent years, the processes of digitalization have been extensively developing in the healthcare sector as well. In particular, the regular monitoring of the health of employees in the public and private sectors, the prevention of diseases, and the improvement of the effectiveness of preventive medical examinations have become pressing issues today. However, in the current systems, the medical examination process often becomes complicated due to excessive paperwork, inefficient coordination, and lack of integrated infrastructure.

To address this issue, the development of integrated medical examination information systems based on modern information and communication technologies — particularly mobile technologies — is of particular importance. Such systems simultaneously optimize the exchange of information among employees of public and private organizations, healthcare institutions, and insurance companies. This article proposes a conceptual model of an integrated medical examination information system based on a mobile platform and analyzes its functional capabilities, modules, advantages, and practical implementation prospects. Additionally, it provides details

on the system architecture, technical solutions, and the technological components to be used.

Methodology. In the development process of the integrated medical examination information system, a conceptual approach was applied, involving the following methodological stages:

1. Analysis of System Requirements and Users: The initial stage involved identifying the main users of the system, including employees of public and private organizations (users), medical institutions (doctors, diagnostic centers), organizational managers (HR departments, healthcare units), and insurance companies.

2. Identification of Functional Needs: The specific functional needs of each user group were defined, and information flows, workflows, and data exchange schemes related to medical examinations were developed.

3. System Architecture and Technical Approach: The system architecture was designed based on a three-tier model, consisting of:

-Application Layer: Mobile application (Android/iOS platforms)

-Application Logic Layer: Backend (via RESTful APIs)

-Database Layer: Centralized cloud server (e.g., PostgreSQL or Firebase)

Through mobile devices, users can easily access their medical examination schedules, results, recommendations, and archived data. Doctors, in turn, can review users' historical data and digitally provide health-related recommendations.

4. Modeling and Conceptual Diagrams: To visually and functionally represent the system, UML diagrams were utilized:

- Use Case Diagram: Illustrates user roles and their interactions with the system

- Activity Diagram: Depicts step-by-step actions in the medical examination process

- Entity-Relationship Diagram (ERD): Shows relationships between database entities

5. Information Security and Privacy: Ensuring user data confidentiality and protection was considered a key component in system design. For this purpose, the following mechanisms were implemented:

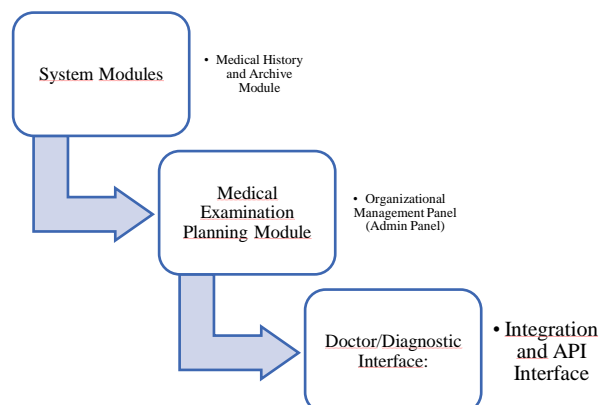
-Authentication and Authorization Mechanisms: (OAuth 2.0)

-Data Encryption: (AES and HTTPS protocols)

- Role-Based Access Control (RBAC): Access rights defined based on user roles

System Model and Functional Capabilities

The proposed integrated medical examination information system is developed based on a conceptual model and includes convenient, secure, and functionally rich features for users. The overall system model comprises the following core components:



System Modules: User Profile Module:

Stores personal data of employees, including passport details, workplace, position, medical examination dates, and medical history. It also supports quick identification via QR code.

Medical Examination Planning Module:

Enables automatic scheduling of annual or quarterly check-ups, Sends reminders via SMS or push notifications to employees,

Doctor/Diagnostic Interface: Allows doctors to input examination results, analysis summaries, and recommendations digitally. Supports rapid data processing through automated diagnostic templates

Medical History and Archive Module:

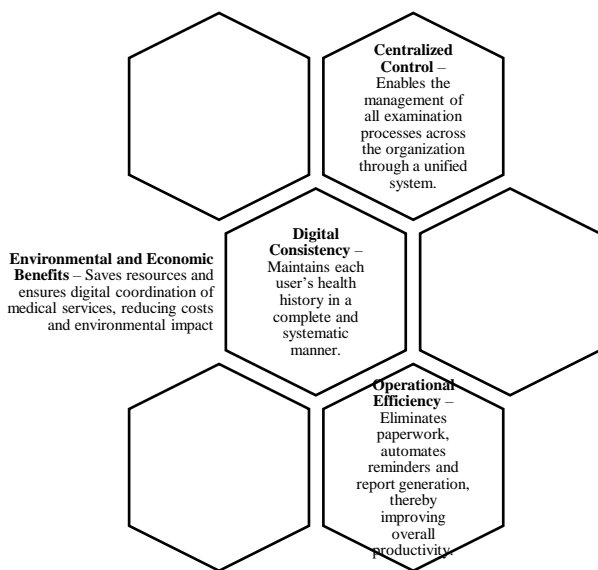
Stores each user's examination results chronologically Provides options to export data in PDF format and generate analytical graphs

Organizational Management Panel (Admin Panel):

Designed for HR personnel or healthcare unit managers to monitor medical examinations, generate statistics, conduct analysis, and prepare reports

Integration and API Interface: Enables data exchange with insurance companies, medical laboratories, and other systems via open APIs

Advantages of the Model



Results and Analysis

The conceptual model of the integrated medical examination information system, developed based on mobile technologies, ensures a digitalized, transparent, and systematic process for monitoring the health of employees in both public and private sectors. The analysis shows that implementing this model in practice will produce the following positive outcomes:

- **Improved Effectiveness of Medical Examinations:** Through the mobile application, employees can track their medical examination schedules, results, and doctor recommendations in real time. This increases participation rates and promotes early health monitoring.
- **Real-Time Monitoring at the Management Level:** Organization managers (HR specialists) can monitor the medical examination process in real time and make targeted decisions regarding workplace health. The system automatically generates a list of employees who missed check-ups and sends reminders.
- **Ensured Data Security and Privacy:** Authentication via OAuth 2.0, encrypted databases, and role-based access control ensure a high level of

information security, which is particularly important for sensitive health data.

- **Enhanced Analytical and Statistical Capabilities:** Based on collected health data, the system automatically generates statistical reports on health dynamics, disease distribution, and health levels by age. This enables HR departments and healthcare providers to take evidence-based preventive actions.

- **Economic Efficiency:** The system helps reduce workplace losses, minimizes repeated illnesses, and contributes to creating a healthy work environment. It also reduces costs associated with paper-based reports, human error, and unnecessary repeat examinations.

Conclusion and Recommendations

This article presents a conceptually developed model of an integrated information system based on mobile technologies aimed at continuously monitoring the health of public and private sector employees and digitizing medical examinations. The proposed model incorporates a user-centered approach, modular structure, security measures, functional richness, and solutions tailored to real sector needs.

The system provides the following key advantages:

- Automation and simplified control of medical examinations;
- Centralized and continuous health monitoring for users;
- Coordinated information exchange among healthcare providers, enterprises, and insurance systems;
- Analytical tools to support strategic decision-making in healthcare management.

Recommendations:

- Pilot implementation of the system prototype in small organizations to test its functionality;
- Integration of AI-based health assessment algorithms to enhance decision-making;

- Incorporation into the national digital health platform using digital health passports and electronic medical history; Development of a cross-platform version compatible with all types of devices.

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