Automation of health care management system through software

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Abstracts. In these modern times, people prefer convenience over traditional methods. This text describes the benefits of implementing a software system in Polyclinic #5. The system enables patients to make online appointments with doctors, eliminating the need to wait in long queues. Additionally, it eliminates the hassle of managing physical medical cards as all records can be accessed digitally. The software also facilitates communication among employees through a chat room and allows for sending reports to the chief physician. For pharmacists, the system provides the ability to check the availability of medicines. Moreover, the software automates tasks, provides schedules for employees, and enables effective management of the team. The system architecture involves subsystems and user access from different devices. Users include the chief physician, doctors, receptionists, nurses, pharmacists, laboratory technicians, and patients. The system development follows an iterative and incremental approach. It concludes with the implementation of off-the-shelf software that simplifies patient appointments, ensures secure medical records, enhances staff communication, and streamlines management and inventory control.

1 Introduction

In these times of modern technology, few people will want to sit in a live queue to see a doctor at a polyclinic. And also, few people will want to keep a huge medical card at home, which is constantly lost.

The system will help the patient to make an online appointment with a doctor at a time that suits him. The patient will not have to stand in a queue at the reception desk to get their medical records.

The system will help employees to interact with each other on working issues in a special chat room. And also to send reports to the chief physician.

The system will help the pharmacist to see if a certain medicine is available.

The software will automate not only some tasks of staff members, but also provide a schedule for each employee and the ability to manage a team of employees.

Having this software at the clinic will make it easier for the staff to work and for patients to go to the doctor.

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2 Requirements to the system

On "Polyclinic #5" should be implemented using PostgreSQL in the form of seven subsystems. The architecture of the system is presented in Figures 1 - 2.

![System Architecture Diagram](image1)

**Fig. 1 – System Architecture**

This diagram shows the interface architecture of the system. System users can access the system from a computer, laptop or phone. Each user has access only to the appropriate module, they are indicated on the diagram. The modules are located on the server, which retrieves or writes data to the data warehouse through the database.

![Hardware part of the system architecture](image2)

**Fig. 2 – Hardware part of the system architecture**

This diagram shows how exactly the modules interact depending on the device from which the work is done.

The user enters the software through a browser, connects to his interface under his account, then each user can work with his module.

If the user of the system is an employee of the polyclinic, he has two options of interaction with the system:

All computers in the department are connected via switch and connected to the local server. From the local server through the router and firewall goes connection to the global server, which through the database enters data into the data warehouse or retrieves data from it.
The application sends the data to the "firehose"-store, which provides a streaming interface to ingest and process the data. The raw data as well as the final transformed and augmented data are stored in the cloud storage. The transformed and augmented data is uploaded to the data warehouse for analysis.

If the user of the system is a patient, his work will be done through the global server:
He can work with only two modules of the system (work with doctor's appointment, work with patient's treatment):

The patient logs into the system from a computer or laptop or phone logs into the web application through a browser under his account (user interface). They connect directly to a global server, which enters data into or retrieves data from the data warehouse via a database.

The application sends data to firehose storage, which provides a streaming interface for data ingestion and processing. The raw data as well as the final transformed and augmented data are stored in the cloud storage. The transformed and augmented data are uploaded to the data warehouse for analysis.

The users of "Polyclinic #5" are:
- chief physician;
- doctor;
- receptionist;
- nurse;
- pharmacist;
- laboratory technician;
- patient.

Users of "Polyclinic #5" should:
- Have PC skills as a user;
- know the principles of working with Linux, Windows 7 and above;
- have skills in working with smartphones based on Android 6.0 and above. iOS 8.0 and above;
- to be trained to work with "Polyclinic #5" at your workplace in the scope of the user manual.

A prototype of the project layout was presented, according to which the appearance of the future automation system will be developed.

Fig. 3 - Registration page layout
Main flow: The user logs in to the system through the corresponding account of the chief physician. Then he can choose the functionality of adding an employee to the database. To do this, he needs to fill in the data about the employee: full name, position, date of birth, contact information, salary. At the end he needs to generate login and password for the employee. Then can edit work schedule and edit medical records of any patient.

Alternate flow: user logs in to the system. He can then choose to edit the work schedule. To do this, he finds the desired employee in his account and selects him. He is shown information about his schedule. He can edit it. He can save this data in pdf format.

System development should be based on an architecture-centric approach. The selected life cycle model should allow for iterative and incremental system development. The main list of site development activities, their content and results are summarized in Table 1. Here is a list of works corresponding to one iteration of the life cycle. It is assumed that all the
listed works will be repeated at each iteration during realization of subsystem or separate variants of use.

To prepare the software for commissioning it is necessary to:

- appoint an official in the customer's organization responsible for the acceptance of the system;
- install a set of technical means, meeting the requirements of the relevant ToR, on the workplaces of the employees of the customer's organization, who should participate in the operation of the system;
- together with the contractor to install the system software in accordance with the administrator's manual;
- to carry out data entry of reference information and system configuration in accordance with the installation manual of the system;
- to draw up the document "test program" together with the contractor;
- conduct tests in accordance with the document "test program";
- if the result of tests is satisfactory - sign the act of technical readiness of the system for pilot operation. if there are any remarks, issue the document "list of suggestions and remarks for finalization of the system";
- if necessary, train potential users in the basics of computer literacy;
- to train potential users to work with the system in the scope of the user manual.

To ensure the functioning of the system it is necessary to develop operating regulations, providing for the work of users and support services.

<table>
<thead>
<tr>
<th>№</th>
<th>System actions and system functions to be tested</th>
<th>Scope of control tests</th>
<th>Performers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Database installation</td>
<td>Initial and updates as modifications are made</td>
<td>Chief physician</td>
</tr>
<tr>
<td>2</td>
<td>Entering initial data, creating accounts for all users of the system</td>
<td>1 for each user</td>
<td>Chief physician</td>
</tr>
<tr>
<td>3</td>
<td>Patient record processing</td>
<td>All patients</td>
<td>Front desk clerk</td>
</tr>
<tr>
<td>4</td>
<td>Doctor's appointment by patient</td>
<td>1 entry</td>
<td>Patient</td>
</tr>
<tr>
<td>5</td>
<td>Entering information about drugs in stock</td>
<td>All products</td>
<td>Pharmacist</td>
</tr>
<tr>
<td>6</td>
<td>Report management</td>
<td>All reports must go through a life cycle from &quot;new&quot; to &quot;approved&quot;.</td>
<td>Chief physician</td>
</tr>
<tr>
<td>7</td>
<td>Filling out the patient's medical records</td>
<td>1 medical card</td>
<td>Doctor</td>
</tr>
<tr>
<td>8</td>
<td>Entering information on laboratory preparations stored in the warehouse</td>
<td>All drugs</td>
<td>Laboratory technician</td>
</tr>
<tr>
<td>9</td>
<td>Entering information in the patient's medical record about tests taken</td>
<td>1 medical card</td>
<td>Nurse</td>
</tr>
</tbody>
</table>

To ensure the functioning of the system it is necessary to develop operating regulations, providing for the work of users and support services.

Table 1 - Order of implementation of priority functions of the system
3 Conclusion

The fulfillment of this specification leads to an off-the-shelf software that can facilitate patient appointments by making online appointments and viewing free and convenient appointment times.

The off-the-shelf software reduces the likelihood of losing a patient's medical records. The ability to view the electronic view of the medical record makes it easier to read.

Automation of staff chat interaction speeds up the work of the polyclinic.

Off-the-shelf software provides the ability to manage staff. The chief physician will no longer need to store information about employees on paper, which will increase the organization of their work. Will allow to get rid of searching for employees among papers, and replace for little time entering their full name in the search bar on the website.

The application system will allow you to view the availability of a drug or lab product using the website search bar.

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