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Rapid Application Development of Pharmaceutical Database System

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ABSTRACT

This paper provides insight into the design and implementation of a pharmaceutical management system. The primary aim is to demonstrate the rapid development method in developing the important system with Python development tool mainly for the graphical user interfaces and database management. Today, there exists several kinds of pharmaceutical management system have been reported in the literature, but most contents were highly focused on the system functionality and usability studies. The literature that reports on rapid development tools for the system is found to be very limited. Today, with the critical needs of information technology to support fast and accurate data management, the development of information or management system by inexpert users has been an important issue to many organizations. Therefore, this paper presents the system from the aspects of database and usability design and the easy implementation tool for the case of developing a pharmaceutical management system. Usability testing is also provided to show the users evaluation on the system.

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1. Introduction

Digitalization of information dessimination has been prevalent in everyday practices of human activities, which supported by the Information Technology (IT). Database and Graphical User Interfaces (GUI) have been the fundamental IT elements to allow users to store and manage their data and information through a computerized system so called as information system. To utilize an

information system, the users can either buy a ready system, hire a system developer for their company or asking system development services from other company. All these approaches are sometime not feasible to be deployed as the return benefit is not as much as the cost of procuring[1]. Therefore, as to support simple and basic requirements of the data and information management, many companies especially from the small firms decided to develop their own system although with a minimal programming competency. In this way, Rapid Application Development (RAD) has been the best practise that the inexpert users can follow to develop a simple information system.

RAD focuses on prototyping technique soon after the system has been generally designed[2] and the development normally involves simple programming language such as scripting programming language. Scripting language is easier to be learnt by inexpert system developer and Python is the most popular scripting language nowadays. The underlying Python is a huge numbers of complex programming languages developed in JAVA and C++ by the expert programmers that can be directly used by the inexpert programmers through the library inclusion and scripting commands[3]. There exists simple editors for the inexpert developers to write the Python program such as Jupyter Notebook[4], Thonny[5] and Py-Art[3].

This paper presents the RAD method and Python programming tool to implement a simple Pharmaceutical Database System. The knowledges reported in this paper can be a systematic guideline for the inexpert information system developer.

2. Research Background

2.1 Rapid Application Development (RAD)

RAD was introduced by James Martin in 1991 with the main objective to support quick development time and speed up system delivery and deployment[6]. The fundamental steps in RAD are requirement planning, prototyping, testing and deployment, which these processes run iteratively to allow the developers with flexibility and adaptability to mak adjustment on the prototype system quickly before the deployment stage. Figure 1 presents the basic steps of RAD.

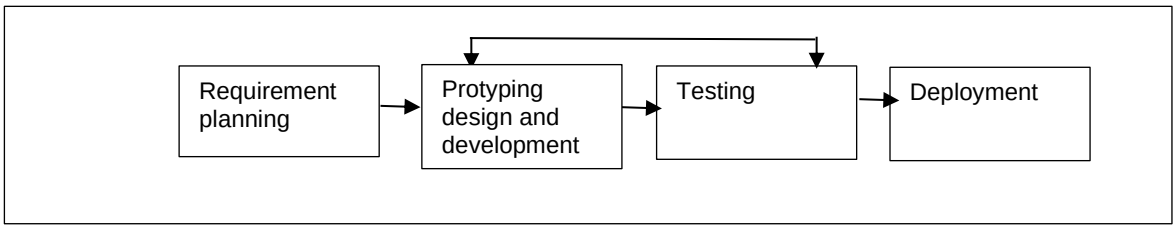

Figure 1. The stages of of RAD

The prototyping design and development are an iterative process that can be flexibly modified based on the end users' evaluation testing. Due to the requirements for flexible modification, the use of simple and rapid system development tool is essential to support the RAD iterative method. Nowaday, Python is the most widely used to facilitate this requirement, which supported with a variety of libraries for different system functions. As for examples, to design, implement and manage a database, there exists easy modules such as mySQLite, PostgreSQL and MySQL. Graphical User Interfaces (GUI) is an important component to allow end users to manage the data in the database. With Python, the Tkinter, PyQT, WxPython, PyGUI and PySide are among the popular modules for developing GUI.

2.2 Pharmaceutical Management System

The immernse importance of pharmaceutical industry as a global sector is inarguable. Every year, research and business in pharmaceutical products maintained their reputable places as a global top ranked product based on revenue. Pharmacy shops are widely available everywhere and it is essential for the pharmacy shop owners to have an information system to manage the items inventory. Based on literature, many kinds of information system have been patented[6],[8] but limited report on the the technical implementation is difficult to be found. To name some of the

information system for phramceutical products are [9]–[13] but these are all a complex information system that might not be feasible to be utilized by small pharmacy shops. Some system supports supply chain management on cloud database [9][14], QRCodes [9] and RFID [14] technologies. Most of the findings highlight that information system is very significant to the pharmaceutical and healthcare industries.

3. Methodology

RAD is the main method used for this system development. During the requirement analysis, a system usability study has been conducted. Figure 2 is the Use Case diagram that shows the system usability in general. The information on these functionality requirements was given by a few pharmacists in the area small city centre in Perak, namely Tapah.

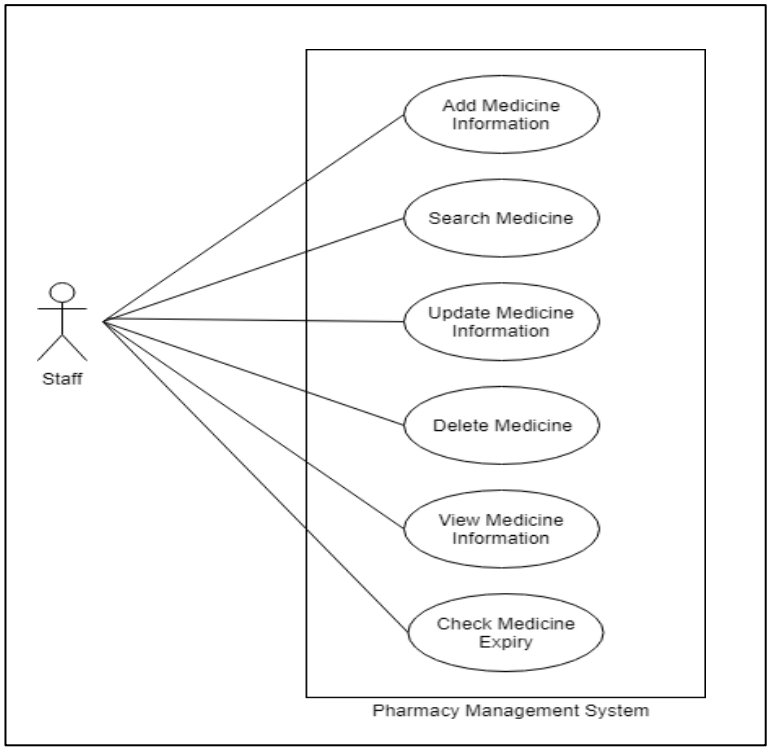

Figure 2. The Use Case Diagram

The main purpose of the information system is store inventory of the pharmacy products and one important aspect is the expiry date. To make it simple, in this case, only one group of users so called as admin that will use the system such as the owner or the inventory manager. The users from customers group could not use the system.

3.1 The System Functional Flowchart

In RAD, it is also essential to design the functional flowchart as presented in Figure 3. The flowchart has been used a tool for analysing the processes and designing the programs modules. The main module of the system is login page to allow only an authorized user managing the inventory in the database so called as admin of the system. The searching process is supported with text query that allow them to enter the medicine name.

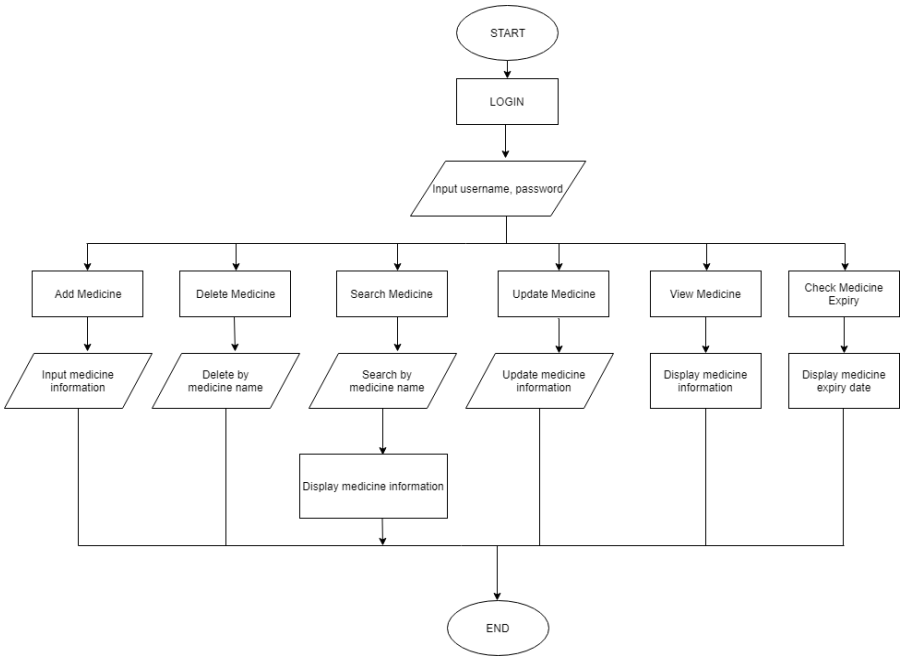

Figure 3. The Flow-Chart

3.2 The Database

The Python library to develop the database is mySQLite Python library, which can be free downloaded from the software developer site at https://www.sqlite.org/download.html. For the pharmaceutical system, two tables have been created, one is table for user and another one is table for medicine. Figure 4 shows the mySQLite interface to create table. Developer must create database and enter the database name before the interface for creating tables is presented.

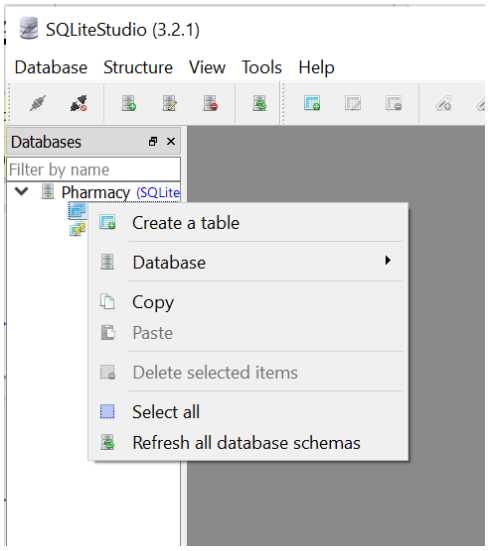

Figure 4. Create table in mySQLite

As depicted in Figure 5 and Figure 6, developers can define the table fields or attribute and other elements of the field such as the data type, optional or compulsory entry, primary key or non

key. Figure 6 is the table configuration for users. The developer can enter the fields name of the table and define the data types. Primary key or PK is the unique field for each user record.

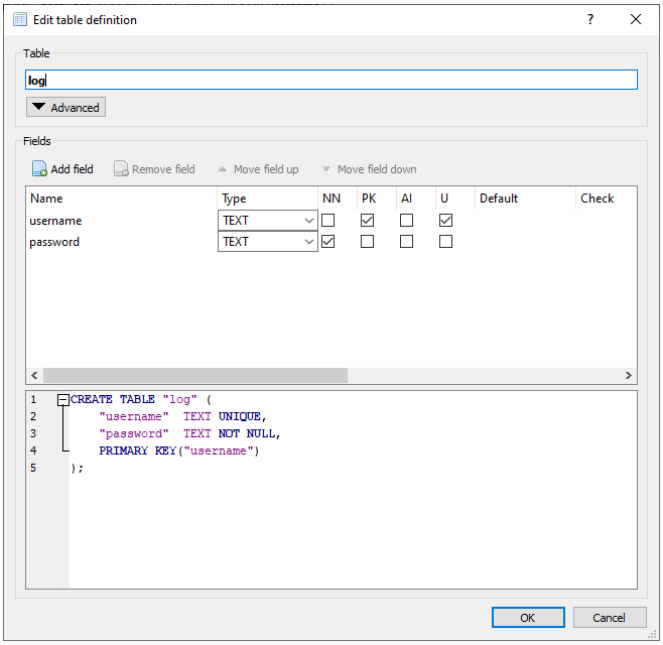

Figure 5. Table definition for User

In this user table, the unique field is username that will be inserted different for each user. Password is another field for additional secure mechanism and set to not NULL (NN) so that it must be an entry for the password. SQL statement for the user table is automatically created by mySQLite. Figure 6 is the configuration for table medicine.

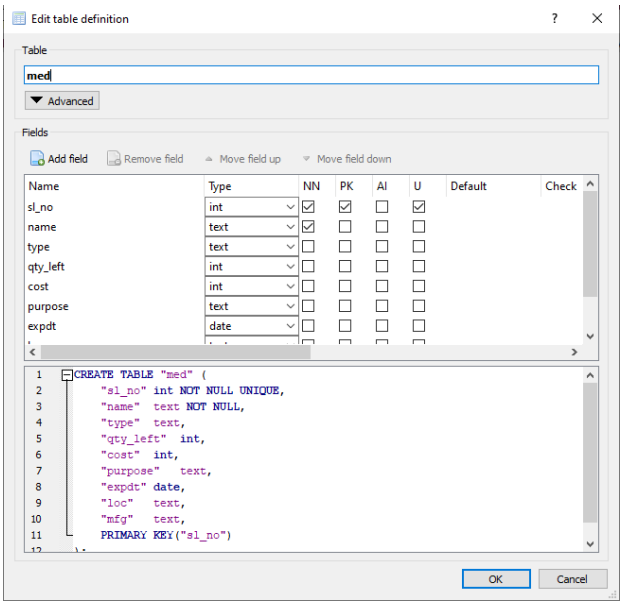

Figure 6. Table definition for Medicine

The primary key for medicine is the serial number and the nonempty fields are primary key and name of medicine.

3.3 The Graphical User Interface (GUI)

By using Tkinter Python library, simple GUI can be developed to connect with the database and tables. Figure 7 is the main login GUI for the system.

Figure 7. Login main page

Once user can enter the system by entering the correct information, the dashboard interface for the system is display as presented in Figure 8.

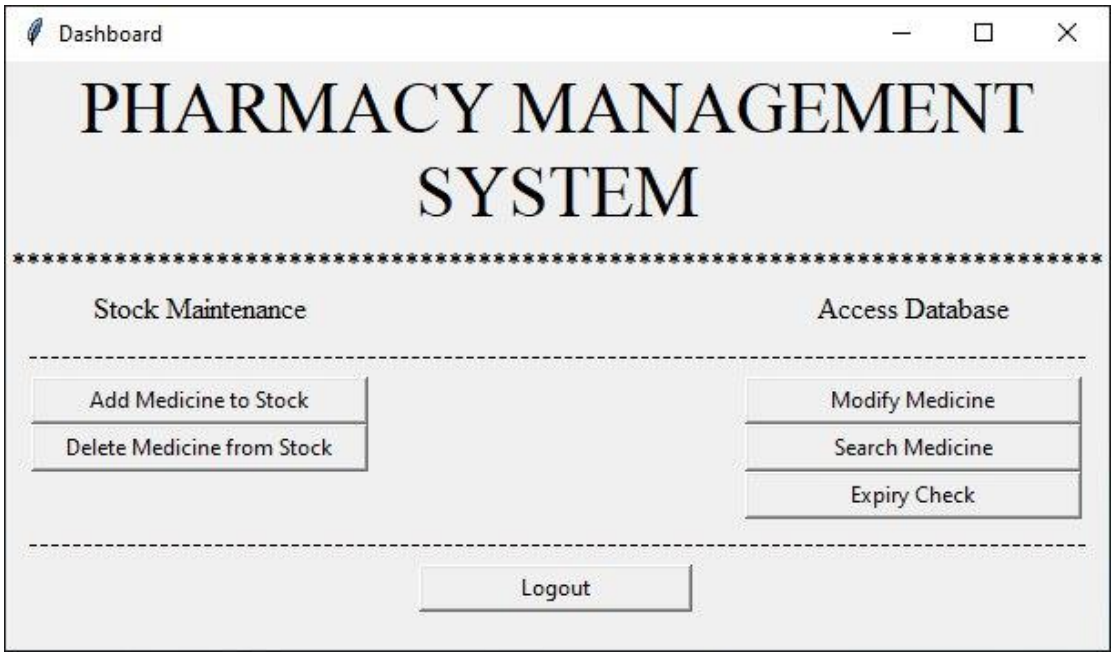

Figure 8. Dashboard page

If user need to delete medicine from the inventory, the following interface in Figure 9 will be appeared.

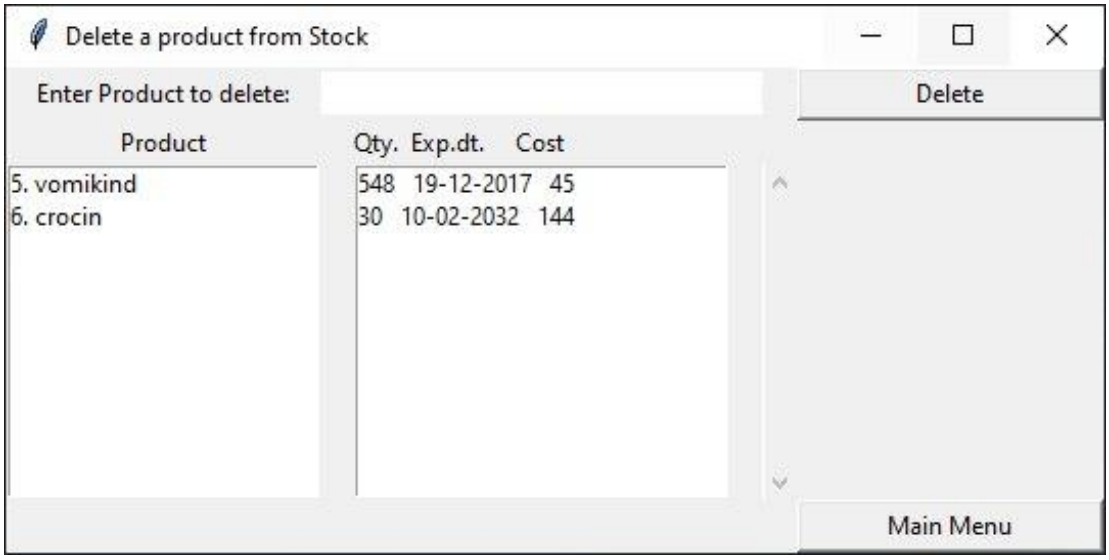

Figure 9. Delete interface

As presented in Figure 10, adding new medicine allows user to insert new item of medicine and Reset stock button can be click. Main menu is to display the dashboard interface.

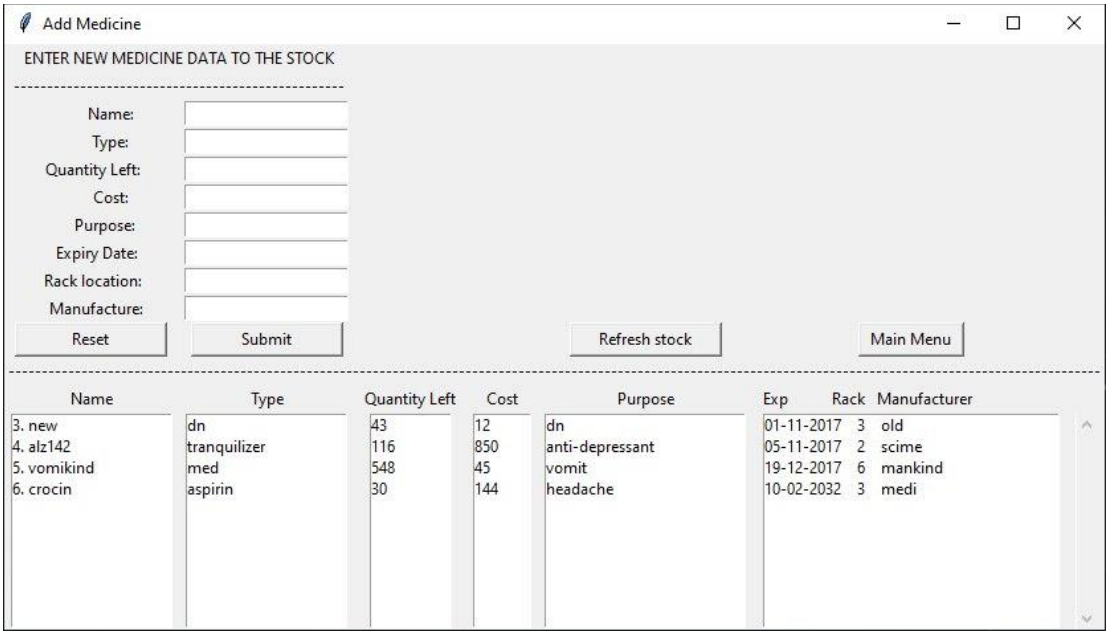

Figure 10. Add interface

It is sometime requiring the users to modify the medicine information such as to change the number price. Figure 11 shows the interface for search the item and Figure 12 to modify the item data.

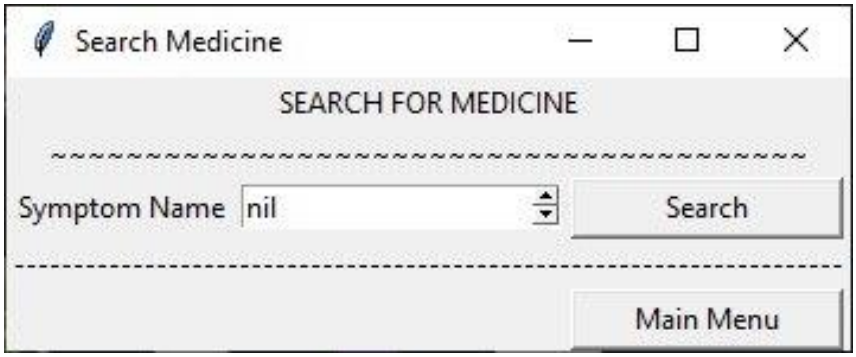

Figure 11. Search interface

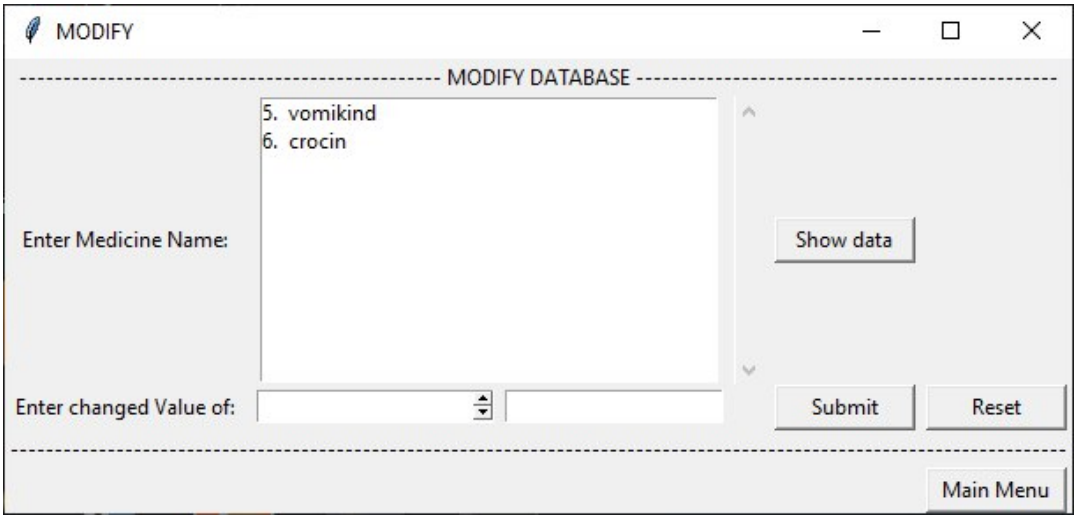

Figure 12. Modify data interface

If specifically, they need to check the expiry date, interface as in Figure 13 will be displayed.

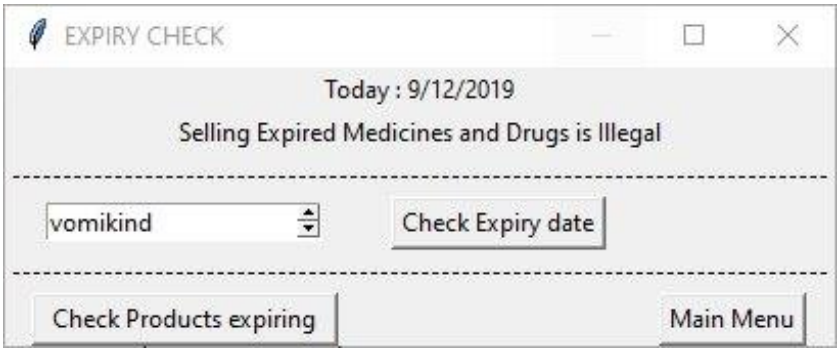

Figure 13. Checking the expiry date

3.4 Connecting GUI to database

As the GUI Tkinter is a separate library with mySQLite in Python, connecting them is essential. The simple codes to connect these two libraries are presented in Figure 14.

```
login=sqlite3.connect("admin")
l=login.cursor()
dashboard=sqlite3.connect("medicine")
cur=c.dashboard()
```

Figure 14. Connecting database table in mySQLite with Tkinter GUI elements

The login and dashboard are the name assigned to the GUI of the main menu for login and inventory, respectively. The codes for dashboard menu can be written as in Figure 15.

```
def open_win(): #OPENS MAIN MENU----------------------------------------------------------------------------MAIN MENU
    global apt, flag
    flag='apt'
    apt=Tk()
    apt.title("Dashboard")
    Label(apt, text="PHARMACY MANAGEMENT\nSYSTEM", font=("Times", 30)).grid(row=0,column=0,columnspan=3)
    Label(apt, text='*'*75, font=("Times", 12)).grid(row=1,column=0,columnspan=3)
    Label(apt, text='-'*97, font=("Times", 12)).grid(row=3,column=0,columnspan=3)

    Label(apt, text="Stock Maintenance", font=("Times", 12)).grid(row=2,column=0)
    Button(apt,text='Add Medicine to Stock', width=25,command=stock).grid(row=4,column=0)
    Button(apt,text='Delete Medicine from Stock', width=25,command=delete_stock).grid(row=5,column=0)
    Label(apt, text="Access Database", font=("Times", 12)).grid(row=2,column=2)
    Button(apt,text='Modify Medicine',width=25, command=modify).grid(row=4,column=2)
    Button(apt,text='Search Medicine', width=25, command=search).grid(row=5,column=2)
    Button(apt,text='Expiry Check', width=25, command=exp_date).grid(row=6,column=2)

    Label(apt, text='-'*97, font=("Times", 12)).grid(row=12,column=0,columnspan=3)
    Button(apt,text='Logout', width=20,command=again).grid(row=13, column=1)
    Label(apt, text='').grid(row=14,column=0,columnspan=3)
    apt.mainloop()
```

Figure 15. Python codes for dashboard main menu

3.5 The Hardware and Software Requirements

Table 1 and Table 2 show the hardware and software requirements for developing and using the system.

Table 1. Hardware Minimum Requirement

Hardware	**Specification**
Computer RAM	2.00 GB
Computer Processor	Intel(R) Core (TM) i3-4005U CPU @ 1.70GHz 1.70 GHz

Table 2. List of Software Requirement

Software	**Specification**
Thonny Software	Development Platform
SQLite	Database Management System

3.6 The Testing

In this section, the results evaluation are presented from the system testing conducted to 20 users (five users are farmasists and others are general staffs). Respondents have to chooce the measurement scale for each survey question as 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree.

The first element is the GUI of system that is the level of easiness percept by them. Figure 16 presents the graph.

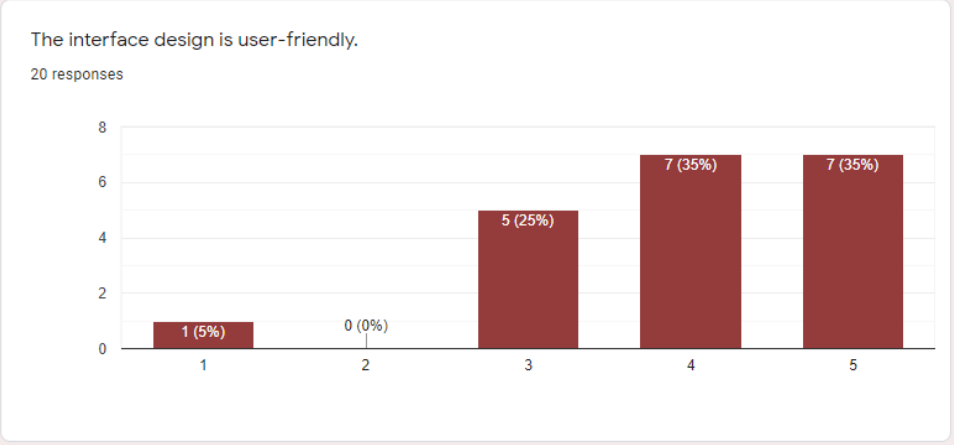

Figure 16. Easiness of the GUI

There were 35% of the respondents strongly agree with the easiness aspect of the GUI provided by the system while 25% respondents are neutral, and 5% and 1 respondent strongly disagree. Figure 17 presents the respondents' feedback on their perception towards system functionality that can help them in managing the pharmacy records.

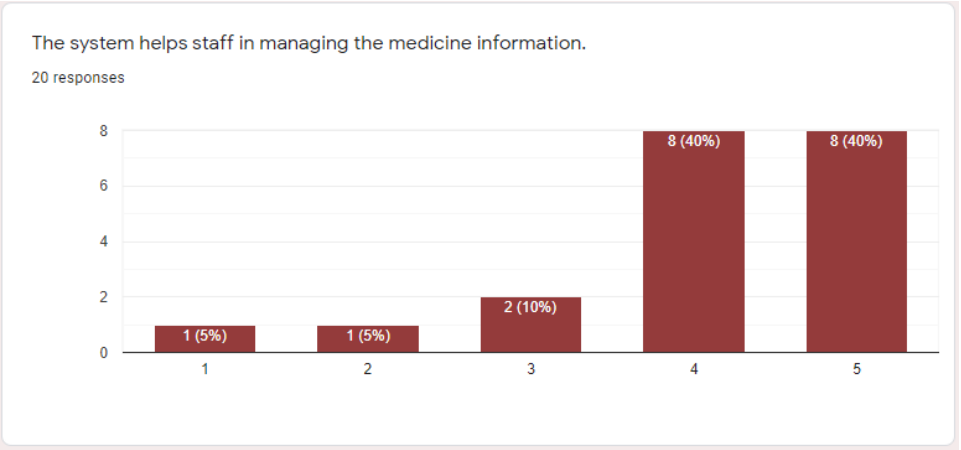

Figure 17. Users perception on the system functionality in assisting their inventory tasks.

Major of the respondents strongly felts that using the system was helping them in managing the inventory tasks of medicine records. When they were asked about their readiness to use the system, majority of them also give positive respond as presented in Table 3.

Table 3. Number of respondent's who are ready to use the system

	Yes	**No**
Number of Respondents	17	3

4. Conclusion

Today, in-house information system development by the inexpert system developer from the none IT internal staffs has been a critical need. Therefore, this paper demonstrates the easy steps for developing a simple Pharmaceutical Information System by using Rapid Application Development method. The development tool is Python scripting language that supported with database and GUI modules or libraries that are easy to be learnt by the inexpert developers. The system has been tested by several users who involved in the pharmacy shops and the positive returns have been achieved.

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