Blood Bank Management System for Hospitals in Malaysia

[1]Kamalakannan Machap, [2] Tusen S. Chandrasegarran

[1], [2] School of Technology, Asia Pacific University of Technology & innovation, Malaysia.

[1]dr.kamalakannan@staffemail.apu.edu.my, [2] tusenchandrasegarran@gmail.com

Abstract

Blood bank in Malaysia needs a systematic and integrated blood bank management system. Currently, the blood banks are either standalone or else they are limited to integrated among their group of hospitals. This paper is focused on web-based Blood Bank Management System (BBSM) which will be integrated throughout the blood banks in nationwide. This solution is aimed to serve the blood bank managements and as well as the donors. Individual blood bank has their own ways and approach of handling the blood pack stocks. This integrated system is to unite all the approach and the requirements. Integrated BBSM is to benefit both the donor and the blood banks. This system strongly follows the requirements of Health Level Seven (HL7) and World Health Organization (WHO). Donors will be able to keep track of their donation details and also their blood test report. As well as the blood bank management will be able to keep track on the inventory of donated bloods, upcoming donation campaigns and blood bank stock management.

Keywords: *Blood Bank , Health and Safety, Integrated management system , Medical information system.*

I. INTRODUCTION

Blood bank is a place where the blood is collected and stored. "Blood bank" is a term, referring to a division of a hospital laboratory. This is where the blood is officially tested and resulted, to reduce the risk when blood transfusion takes place. Is believed that after each unit of blood is collected and few small vials is collected together for the blood test. Upon the blood donation, the blood and donor's details are labeled and transported to respective laboratory. For each test, the whole blood packs are separated into two essential components, red cells and plasma. The blood is tested and the results will be automated into the system. The blood packs will be rejected for transfusion is due to negative report upon the test. After all possibilities test are taken and the results are positive, the blood packs are ready to serve the needs. But will be stored in a huge freezer at CBC, until there is a need. A study says that daily average medical services consume nearly 2,000 blood packs for benefiting 925 patients throughout Malaysia [8].The more the blood packs in need, the demand of the blood packs will be exponential. At these present moments, this world population is heading towards the future. Everything we do have enhanced into integration and automation. And whatever we do, became much easier and faster with the favor of internet connectivity. Gadget regardless all smart devices and PC is capable to connect to internet to browse at anywhere. In this integration of the systems has one's advantage and get hocked up daily. To boot, human error is very common in any era, an automation of recording data from one place to another, Automation is a process of reducing loads of human responsibility. To provide a better future to overcome the existing problems, an integrated web-based solution will be used. The data will be synchronized nation widely in seconds. In addition, believed that quantitative methodology of questionnaires will be used to gain data for better understanding and to make a wiser decision.

II. LITERATURE REVIEW

A. *Development of a Blood Bank Management System (BBMS)*

According to [14] there are several solutions from various solution providers, which have improvised as a benchmark for the enhancement of Blood Bank Management System (BBSM) in India. Blood Bank India (BBI), Lions Blood Bank & Research Foundation (LBBRF) and BBSM as an outdated standalone as a version. These systems have their own functionalities, limitations and requirements. BBI owns a website, have the privilege of creating their own membership account as an official blood donor. This solution has limited according to the requirements of the government and the blood bank. This solution has a privilege, where an individual person or hospitals are open to request for the blood packs from the Blood Bank of India. This standalone system, contains a fundamental function of any blood bank management could perform. This particular system is not integrated with other blood banks management system

B. *Benefits of Cloud Storage*

According to [11] cloud storage is exponential for benefits of the consumers. Cloud storage is in the trend due to the storage cold be allocate in dynamically, which means it increase the storage volume according to the data and traffic use. This is an advantage for the blood banks site, since they will be using the storage as per required. This prevents them to spend excessive. From another point of view, cloud is flexible because it has the advantage of self-service provisioning and automatic deprovisioning the storage according to the requirements and needs. To boot, this cloud storage will carry and integrate the data. Cloud server performs leads to a quick interactive among the system. Similarly, [1] claimed that cloud server is flexible and prompt to save cost. And is understood that it is using less power consumption.

The major advantages are sharing the stored data, effectively manage the file from various location and synchronization.

C. *Security of Cloud Servers*

To add on to the idea, [16] found that information in cloud secured. Data stored on the end user device, such as physical servers is limited from excessing by any other users from various location. This researcher agreed that, rather than purchasing bulks of physical hardware by an estimation. It is advisable to pay for what you use and needed. Investment on cloud storage, could lower the risk of vulnerability to lose data, physical damage, theft and also maintenance issue.

Alternatively, [5] argued that trust is being a major issue. The specific location of the data storage is not aware. In cases, uploading contents of personal data and company's crucial information. Nevertheless, where the data, it is prompt to have attacks from anywhere to the severs. To boot, cloud environments are prompt to have loopholes which is risking the cloud infrastructure. It is not to be surprised to face spammer, could be harmful threads to the cloud environment.

D. *Limitations on the Cloud Servers*

Conversely [9] argued on that is prompt to face hiccups due to the change in IT infrastructure from the physical server to the cloud based. The duration required to adopt to the change, especially in a large organization will consume longer time. In term of privacy and security, these are the major concerns towards the change of cloud computing. When a huge file of data is been transferred, even it's from the previous server to the cloud the vulnerability of threads is still taking into consideration. It is found that cloud providers can easily manipulate the data in the storage. Practically, it is not advisable to keep very sensitive files into the storage. Especially, when it comes to a big organization which consumes huge amount of data. It is also argued behalf of performance instability. Due to high load of data stored and high amount of trafficking, the performance and the behavior will not be as per expected. Every user experience different rate of performance. This is due to various number of scalabilities in users.

E. *Advantages on Social Networking*

Totally this into suggestions [2], the advantages of

non-verbal communication, social networking. It is efficient to brainstorm, to share an information of an event. Besides that, it is faster to communicate and send files, used as a bridge to communicate. Helps to market out an information very quickly in short time, could be also used as a source to send and information or announcement.

In addition to this, [13] claims that social networking helps people around the world to stay connected. This is effective to share knowledges around. Which could be also an awareness of an event. It is a good method to reach out and network even in a short time, is believed that information spreads faster through social networking.

III. PROBLEM STATEMENT

Is believed that in Malaysia, blood banks regularly face blood supply shortage. Nationwide's daily average medical services consume nearly 2,000 blood packs for benefiting 925 patients [8]. There was an incident where National Blood Centre urges public to donate more blood due to insufficient supply [3].
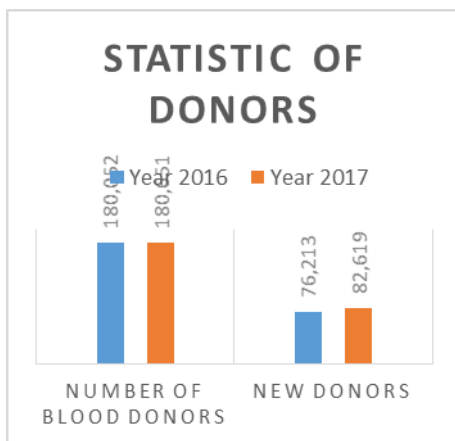
Graph : Statistic of donors

Based on the above graph 3.1, the total number of donors in the year of 2017 should have been 180,052 (donors from year 2016) add with newly registered donors 82,619 (new donors from year 2017), which is 262,671. However, the turnout of donors for 2017 is only 180,651.

Clear evidence of the following here, previously registered donors did not donate in the year 2017, was it due to lack of information sent to the donors about the campaign. Anyhow, the above figure clearly indicates registered donors may not

donate the following years.

By right, there should be 262,671 donors in the year of 2017 according to the data. Unfortunately, only 180,651 donors actively came to donate blood. There is no clue of what happened to 82,020 donors from the year of 2016 to 2017. Although there was an increment of 6,406 new donors in the year of 2016 to 2017, the highest possibility of losing donors could be lack of information about the campaign near their location or last-minute awareness about the campaign the donors preferred location. It is believed that hospital meets shortage of blood packs during festive seasons and school holidays this is because of many accidents occurs during such period of time. An average of 3,000 blood packs runs low from the safe limits in the blood banks. Is believed the needs of blood packs increasing exponentially by years due to increment in the population count [3].

Blood bank of hospitals in Malaysia, have no evidence of any integrated inventory system to monitor or to keep track of donated blood packs nationwide. For example, Net ripples is a solution provider, who actually integrated the blood bank management system and limited among KPJ Hospital Group which consist 21 Hospitals [4]. Commonly faced issue by blood banks are the depletion of blood packs on particular peak seasons. For an example, during long holidays like Hari Raya, Chinese New Year, Deepavali, Christmas, year-end holidays or school holidays. It is commonly known accidents are prompt during long holidays. Therefore, the demand for blood packs increases exponentially in both government and private hospitals [7]. So, as a step to restrain this particular issue, National Blood Centre of Malaysia initiated a mobile application called "My Blood". This mobile application which is only available in Google Play merely encourages Malaysian citizens to donate blood. This is because the application only provides alert on self-blood donation eligibility and also provides information on mobile blood donation camps. There are no any attempts to enhance the application trough regular updates to increase functionality of the application till date. The remainder is manually set by the user for the next donation. The blood bank still uses a manual

recording for all the blood donation [10].

IV. SIGINIFICANCE OF RESEARCH

To overcome such situations as mentioned earlier in the problem statement, an integrated blood bank management system in nationwide has proposed. This system is to ensure each and every blood banks in Malaysia is communicating among each other. This could minimize the shortage of blood packs in a particular blood bank because blood banks will be able to donate among the group of blood banks. To boot, notification should be sent to donors to ensure that they are well wise about the upcoming campaign around them. This system will navigate you to the nearest blood donating campaigns with the help of Google Maps. A remainder should be given to the donors to actively donate blood every 4 months once. Citizens are not mentally aware of the benefits of donating blood. Each and every human must be educated by the need of donating blood. This research is also prompt to prevent the opportunity of losing the active donors. The donors can keep track of their blood test results. Into the bargain, cloud servers are used to upload the data of the inventory, the donor's details and blood bank details to ensure the data is able to access throughout this nation.

V. METHODOLOGY

The target blood bank management design are as follows:

a) Focused.

b) Outcome oriented.

Based on the above, the applicable methodology for this particular integrated blood bank management system will be quantitative study.

The purpose of this study is to explain predict, and/or control phenomena through focused collection of measurable data to formulate the facts. The main purpose of this research is targeted for a better understanding of the drawback/improvement required on the existing system.

Various method of data collection strategies shall be applied in case targeting on different participants/non participant, namely as follows:

a) Observation (non-participant).

b) Interview and Focus Groups (semi-structured, formal)

c) Administration of tests and questionnaires (closed ended).

d) Collect data of questionnaires/quiz carried out by relevant organization (PDN) online [12].

A wider scope of understanding and need of the system requires to target the participants wisely, groups as follows:

a) Blood bank managements (User/Non-User)

b) Donors which can be categorized into three, active donors, non-active (possibly via phone call question and answer) and new donors.

All these types of participants should be given an equal opportunity to respond to the respective questionnaire by using a random sampling. Knowledge based on the blood bank management system are not required to answer these questionnaires for non-blood bank management/staff. However, the blood bank managements/staff should have knowledge about the system depending on their role, therefore, two group of participants for blood bank management will be created (user/non-user).A total of 25 participants are in each group. There is a total of five type of participants groups as per mentioned earlier. Therefore, a total of 125 data collected at the end.

Raw data are numbers, performed at end of the study which involves statistics. Microsoft Excel shall be a faster and easier way to analyze the collected data using bar chart. The collected data will be presented into charts would give a better understanding on the current problem/needs. A bar chart shall be used to make the analysis. This bar chart can help to simplify the collected data by differentiating the opinions from different perspective/participants. It is recommended to produce a separate bar chart for each question based on the answers received.

VI. OVERVIEW OF THE PROPOSED SYSTEM

Figure 1: Draft of Donors Website through smartphone

Figure 2: Draft of BBMS through desktop

The above figure 1 and figure 2 are the draft of the blood bank management system will be a web base solution, which consist of two different users. One is from the blood bank management site and another is from donor site. Blood bankmanagement are able to input the daily incoming and outgoing transfers of blood packs. Every blood bank can customize their respective minimum quantity of blood packs. A remainder will be auto generated when the particular blood bank is running below their respective minimum quantity. A blood bank is able to request for blood packs from other blood banks. This is only able to request for donation when the blood pack is below the minimum quantity of blood packs. Furthermore, the management will be able to create an event awareness to all the donors and flash them with a notification. Upon the blood collected from the donors, the test results will be keyed in manually to the system. The information is used to generate the blood results.

The blood report of particular donor will be shared personally. The overall inventory report will be able to generate based on selected date, monthly and also yearly. On the donor site, the donor will be able to create an account for their own. Their own report will be shared in the blood results by that particular date. The donor is a must to create an account before proceeding to donating blood. For the user site, the requirements for the both users are very minimal. A minimum of system which can browse to the respective website should do. Where else on the developer site, domain name, cloud server, and actual data for testing.

VII. CONCLUSION

Blood Bank Management System (BBMS) is a precise web-based solution which is developed to manage the blood banks in hospitals in Malaysia. This system is catered as per Health Level Seven (HL7) and World Health Organization (WHO) requirements. This system ensures that the inventory is properly monitored and integrated nationwide. Blood banks are all integrated and will be able to communicate among the blood banks and able to request for blood packs. In addition, able to create awareness of upcoming campaign. The limitation of this system, system uses IC number as a unique user ID to register an account. Where the system will also accept a fake IC number. In future, this integrated system will be enhanced to have mobile application in both android and IOS platform.

REFERENCES

[1] Arpaci, I., Understanding and predicting students' intention to use mobile cloudstorage services. *Computers in Human Behavior*, Pg:8, 2015.

[2] Baruah, T.D., Effectiveness of Social Media as a tool of communication. Pg:10, 2014.

[3] Elankovan.V., Retrieved from WORLD OF BUZZ: https://www.worldofbuzz.com/national blood-centre-urges-public-to-donate-more-blood due-to-insufficient-supply, 20 June 2018.

[4] Group, N. S., Retrieved from Netripples: http://www.netripples.com/ProductDocuments%5C TBBMSR eadMore.pdf. 2019.

[5] Hossain, M. A., CLOUD COMPUTING AND SECURITY ISSUES IN THE CLOUD. International Journal of Network Security & Its Applications ,Pg:12, 2014.

[6] International, H.,Introduction to HL7 Flash Tour. Retrieved from HL7 International : http://www.hl7.org/documentcenter/public_temp_F1E54EEB1C23BA170C0B512269493830/training/IntroToHL7/player. html. 2019.

[7] Kaur, M., Blood bank running low on 'A' group, urges donation. Retrieved from freemalaysiatoday:https://www.freemalaysiatoday.com/catego ry/nation/2017/01/02/blood-bank-running-low-on-a-group-ur ges-donation. 2 Jan 2017.

[8] Lau, B., Malaysia blood supply shortage. Retrieved from MIMS Today: https://today.mims.com/malaysia-blood-supply-shortage--enc ourage-blood-donation-by-educating-youngsters. 28 July 2016.

[9] Mohammad Manzurul Islam, S. M., Cloud Computing: A Survey on its limitations and Potential Solutions. Pg:6, 2017.

[10] MyBlood., Retrieved from Google Play.https://play.google.com/store/apps/details?id=my.gov.pd n.myblood&hl=en. 6 April 2017.

[11] Obrutsky, S.,Cloud Storage: Advantages, Disadvantages and Enterprise Solutions for Business. Pg:10, 2016.

[12] Pusat Darah Negara. , Retrieved from Undian Anda: http://www.pdn.gov.my/. 2018.

[13] Sirous Panahi, J. W. , Social media and physicians: Exploring the benefits and challenges. Health Informatics Journal , Pg:14, 2014.

[14] Sumazly Sulaimana, A. A., Development of a Blood Bank Management System. ScienceDirect, Pg:6, 2015.

[15] The American National Red Cross., Frequently Asked Questions. Retrieved from Blood Donation Process: https://www.redcrossblood.org/faq.html.

[16] Trujillo, S., Security of Cloud Data Storage: An Analysis. Pg:4, 2016.

AUTHORS PROFILE

First Author Kamalakannan Machap from Asia Pacific University, Malaysia. He received his Doctor of Philosophy in Information Technology with specialism in Networking from Bharath University. Master of technology in computer communications from Bharath Institute of Higher Education and Research, India and his bachelor's degree in Computer science and engineering from Bharathidhasan University, India. He also received a professional cisco certificate network associate (CCNA) from cisco in 2003 and rocheston cyber security engineer (level-1) from rocheston in 2019. Kamalakannan Machap is a professional member of the Indian Science Congress Association (ISC), International Association of Computer Science and Information Technology (IACSIT), and International Association of Engineers (IAENG). He is teaching undergraduate students for networking and system security courses. He also has supervised undergraduate and postgraduate students. He is also appointed as an external examiner for PhD students from various university in India. Kamalakannan Machap has presented papers in National and International conferences and also published in high impact factor journals such as Scopus and ISI.

Second Author Tusen A/L S Chandrasegarran, Currently pursuing Bachelor's (HONS) in Computer Science and completed Diploma in Information's and Communications Technology with specialism in Software Engineering Research in Computer Theory for automata, Context-Free Grammar (CFG), Complexity & Decidability. IT director of interact club. Participated various inter competitions and win many prizes. Represented of MSSD participated in games.