

Integration Between Aqli And Naqli In Development Of Database For Hospital Information System

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Abstract: Database era has been appear during Prophet Muhammad S.A.W. We are using the same concept but only deployed in the medical environment with security features which is related to aqli and naqli. The development of a system not only covered the ability of the system to be functioned and execute very well but a good and efficient system must be able to communicate with the users and become a user friendly system. This research is about developing Hospital Patient Information System developed for Hematology Ward and Hemato-oncology Laboratory at the Hospital Universiti Sains Malaysia (HUSM) based on the aqli and naqli. It lacks of security in term of data integrity of the system. It will be enhanced in its security features which will be implemented with the data integrity feature and also password encryption to overcome the problems. As a result, an automated calculation of blood series and graph production as for data analysis will be implemented in this system. An approach of agile method is the chosen process to be used in realizing this research. This system will come out with the ability of protection in data integrity, password encryption and automatic calculation in order to reduce the fraud and human errors.

Index Terms: Aqli and Naqli, Agile Methodology, Hospital Information System, Database Development

1 INTRODUCTION

Database is a collection of data and makes us easy to retrieve and store. The database already exists during Prophet Muhammad S.A.W time. During Prophet Muhammad S.A.W, database is a collection of the juzuk of Quranic. The 1st Surah was revealed by Gabriel to Prophet Muhammad S.A.W during the 1st surah which is Surah Al 'Alaq in Hira Cave. Throughout his life, Muhammad continued to have revelations of the Quran before his death in 632. As we all know, Prophet Muhammad does not know how to read or write. The compilation of the Al-Quran that used today is by Uthman r.a the third caliph. The surah was delivered to prophet S.A.W based on the event happened for example Surah Al-Haj during Prophet Muhammad S.A.W performing haj. But the database during Prophet Muhammad S.A.W. is manually written but database in the new era is been computerized. In the papers, we also concentrate in security sections which related with amanah. The database is not limited to digitalize Al-Quran but we can use the same concept in developing of Hospital Patient Information System (HPIS). It isa system under Hematology Ward and Hemato-Oncology Laboratory in

HUSM. Both wards have 50 beds and it serves to treat patients diagnosed to have hematological disorders such as leukemia, lymphoma, myelodysplastic syndrome, multiple myeloma etc. Hemato-oncology Unit situated in Kubang Kerian, Kelantan is a referral center for managing patients from East Coast of Malaysia. The management team in the unit consists of clinical hematologist, medical officers and nurses. They are supported by various laboratory services, pharmacy, and record office. One of the laboratory services that provide patients' diagnosis and monitoring is Hematology Laboratory which is placed under the purview of Hematology Department. Since the year 2010, laboratory Hematology supported by IT unit has developed an in-house computer system to convey patients' results to the respective wards aiming towards paperless documentation. The system is developed and organized into patients' registration phase inclusive of patients' personal data and display patients' laboratory results requested. The system is well equipped with some form of security and staff need to use their own identity to have an access to the patients' data. However, there is no traceability when it comes to identification of the user assessing patients' data. Patients information is very confidential and only authorize personel can add and edit. This new system is design specifically for the manage of both departments' patients. It does not only provide patients' personal information, and results but also display the progress of patients and graphs of patients will be display in real-time by depending on request from the user. The target users for this system are the system administrator, medical doctors and nurses. This system involved the extraction of blood data to Excel document. At the same time we can reduce human error by providing automatic calculation in the blood series form such as Mean Cell Volume (MCV), Mean Cell Hameoglobin (MCH), and Mean Cell Haemoglobin Cumulative (MCHC). The enhancement process will take place on the module of the systems based on the previous system and will be implemented with data integrity features and also MD5 password encryption. Each password that is registered or changed will be encrypted from the plaintext to ciphertext then will be saved in the database. In this paper divided into a few section. The next section is Literature review that explain on the agile method that has been used, security and surrah. In

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the section 3, explained on the methodology, problem and scope and followed by analysis. Lastly is the conclusion.

2 LITERATURE REVIEW

In the literature review are divided into introduction which explains the background of the system. In next section will be detailed on the Agile approach method and security features that integrate with Islamic view on Database which exists during Prophet Muhammad S.A.W.

2.1 Introduction

The improvement of the technologies nowadays had helped a lot in our daily lives such as in medical, education, business, banking and entrepreneurship. We focused into Hospital Patient Information System (HPIS) since it is the subject of interest for my research. Today, there are many medical software system but there are less secure and the interface design are less suitable for the user. The author [1] concerns on the legal or ethical when developing clinically applied technologies, the data collection and analysis in order to improve the Cardiovascular disease. We can get opportunity from medicine system development of improving different steps in medical practice, from diagnosis to healthcare management and clinical research. In the clinical decision-support system (CDSSs), it is developed by [2] to store and manage the clinical data, tools to alert clinicians of problematic situation or decision making tools to help the clinicians by mapping it with electronic health record (EHR). The author [3] has created an analytics platform for specifying and detecting clinical phenotypes especially on derived variables in EHR data for quality improvement investigations. Currently, our application only store and retrieve the information for patients.

2.2 Agile Approach Method

Nowadays, developers are not looking for waterfall methodology which is traditional software development. Recent studies outcome that traditional teaching strategies like theory presentation and lectures are difference scenario when working in industry environment. A training method was developed called Software Kaizen for high-performance environment. The result shows good outputs in learning, posture change and groupwork including some of the expected characteristics of high-performance teams [4]. User centered design and software engineering are two important components in development process to ensure that an application has good user experience. Based on study by communities of practice (CoPs) who are group of experts that share a common interest and collectively want to improve their knowledge said that large software development organization that used CoPsto support their large scale agile implementation as their transformation from waterfall model to lean and agile was succeed.[5] Chunk [6] is the name of a software development strategies that incorporates many of the Agile methodologies within the classic SDLC with a few removal for the unnecessary step as shown in figure 2.1. Although the methodology is language independent, a fundamental goal of its organization and design was to facilitate development[7] and implementation through the utilization of object-oriented language constructs to develop the identified components. Actually it is a combination of bottom-up approach and top-down approach. [6,7]. From the review, agile approach has improved the high-performance development and it has been used in the software

development of a large-scale.[6]

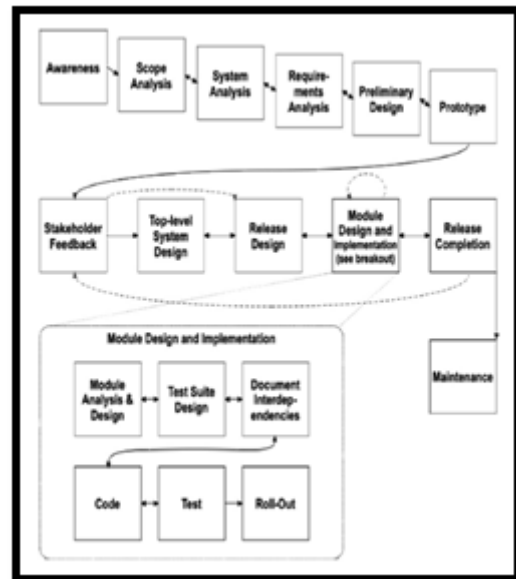


Figure 1 – Phases in Chunk Software Development Strategy[5]

2.3 System Information Security

The implementation of information security in a system requires to address three goals which are the CIA components and they are confidentiality, integrity and availability. [8] These three components are very crucial to protect the data that are kept in the database. They are needed to make the system balance in its functional features and also non functional features. These features define the access right of the system and make the system meets the objectives targeted.[8,9] The various techniques of computerization in application of medical field has helped the medical doctors, researchers, specialists and patients in many ways such as medical images of blood can be analyzed [10]. Many systems nowadays that relate to Medical Information System (MIS) such as e-clinical system. There exist a few software development such as Health, Safety and Environment System (HSES) on the web-based system and registration phase [11], Pet Shop Mangement System (PMS) [12] and Leukimia Information System (LIS) for collection, storage, retrieval and data evaluation [13]. All of them does not focus on security measure. It has been determined that to obtain high level of security quality in Web-based applications system, it is compulsory to include good security practices during the software development life cycle as a whole, and to make use of available security assessment and security monitoring tools that provided to administrators, testers, and developers of valuable information to develop secure applications. The main idea of Software Security is to integrate more level of possible security in software in order to diminish the attack possibilities [14]. A wrong minded such as users are friendly and will not perform an attack, login password can prevent unauthorized users to hack the application, and firewall is enough to protect software from threats. Several approaches are identified often used in software development, which do not provide a valid solution to security issues in the final version of the product [15]. A Security Frame is a tool used in the creation of threat models, when is needed to identify threats and vulnerabilities [16]. It

consists in a set of categories of recurring security vulnerabilities in an organized way that avoids overload of information, and helps to systematically and effectively reveals security threats [17]. In addition also required Authentication, Authorization and Accounting. These are the three basic issues that are encountered frequently in many applications [18]. Objective and measurable of security is playing an important roles in developing the software. One area in which progress is more tangible is software security assessment which can help to improve decision making on enterprise software. The software security assessment called by Vulnerability Distribution Scoring which evaluates as software product based on the characteristics of the vulnerabilities. [19]. Not only the software security but also security policy management is consider as critical to meet organisation needs and reduce potential risks because almost every organisation depends on computer network and the internet for their daily operations. The author [20] has introduced a policy framework called Chameleons-x which is designed to enforce security policies consistently across security-aware system with network services – primarily operating systems, firewalls and intrusion detection systems. The world nowadays cannot avoid the from getting access by the attackers into our system illegally but we can do preventions related to the issues of information security.[21] These six requirement of information security need to be focused on and it is summarized in table below :

Table 1: System Information Security Requirement[21,22]

Requirements	Description
Role-base access control	Access to medical information must be based on the information owners acknowledgement and the owner should know the healthcare professional's role in the patient treatment.
Fine-grained access control	Different roles have different information-access needs. Although clinical information is confidential, it has different levels of sensitivity.
Circle of trust	A need to differentiate authorized users who need immediate access to information in emergency between other authorized role that not use circle of trust. This circle focus to include all CT members treating the patient no matter where they work.
Persistent control	The patients information should have consistant protection although it is archived records.
Dynamic control	Information owners provided with full control over their information by changing level of protection. This will assist in retaining its integrity in case of disastrous error.
Human level policy awareness	Raise the awareness at two levels which are at collaboration level and at human level to inform them of protection level classified by the owner.

2.4 Integration Aqli and Naqli

As a muslim, our base is referencing on two sources which are Al-Quran and As-Sunnah. In the process of doing this research until it come out with the prototype, i can relate a few dalil Naqli and Aqli that can be integrated in this journey. The meaning is there are 3 types of Munafiq people and they are when they talk, they are lying. When they make promise, they break their promise. When they are gave Amanah, they break the Amanah. Indeed, Allah commands you to render trusts to whom they are due and when you judge between people to judge with justice. Excellent is that which Allah instructs you. Indeed, Allah is ever Hearing and Seeing. Here we can see that Al-Quran and As-Sunnah stress on the integrity of work and we can reflect this in the system on the data integrity where the system is like the Amanah to its users. There are also a few histories about the process of collecting the verses of Al-Quran into one book which consists of all the verses and surah that were given to Prophet Muhammad that we can relate with the database. The process of gathering all the verses involving three phases of period. The first period was during the era of prophet Muhammad himself. He asked his pal as the writer of the Al-Quran such as Ali bin Abi Tholib, Muawiyah, 'Ubai bin Ka'ab and Zan bin Tsabit. He will guide them on where to put the verses in the Al-Quran after those verses were witten on palms, pieces of stones and so on. This effort on collecting the verses into one book was not completed and Zaid bin Tsabit was the one last person who read Al-Quran that he memorize in front of Prophet Muhammad. When Rasulullah died, Al-Quran was in the form of verses and surahs that are separated. It was not completed because The Prophet always waited for the next wahyu to be passed to him by Jibril a.s. Here we can see that the process of writing down the verses in one place was like a form of storage during the time which was transformed from a tacit knowledge into an explicit knowledge. The next stage was continued during the period of Abu Bakar As-Siddiq. There was a war during the time and it comes to Umar Al Khattab worries then he met with the caliph Abu Bakar to tell that many Qurri'(Hafiz Quran) were died in the war. In order to protect the genuine and authentic of Al-Quran Umar suggest to make the Quran in one mashaf(book). The idea was rejected by Abu Bakar but he changed his mind and asked Zaid bin Tsabit to write Quranic verses in one mashaf but Zaid also rejected it because the Propet never did that but he also changed his mind. All the verses that had done by Zaid and pals were kept by Abu Bakar until he died and Umar take over the mashaf. He kept that until he died and his daughter Hafsah kept it with her. This time was during the Caliph Usman bin Affan. Usman take the mashaf from Hafsah. That was due to the argues between his people about the 'qiraat'. Usman called his men to copy the original mashaf from the period of Abu Bakar. After codifying the mashaf Usman gave back the original mashaf to Hafsah and he delivered the new copies of mashaf to the cities. Each city will get one. One of it was sent to Madinah named "Mushaf Imam". This was like a centralized database that distributedly arranged so that people will get information and references from same sources. Al-Quran which is completely booked is being used until now and the most important is the content is still genuine and well protected. This is because it is codified by the authorized person with a correct strategy. In database, the way we sort the data are based on few ways and it depends on the information owner or the administrator. It can be based on alphabets,

identification numbers, account numbers, registration number and etc. This make us easier to search and fine the data that we desired t know and it saves our time. The system becomes more efficient and the storage can be used effectively. Same goes to Al Quran, Rasulullah made us easier to learn and memorize the Al-Quran. Furthermore, it is sorted based on topic discussed in that particular surah. (Dalil from Al Quran which is related to the guarding or keeping of the Al Quran. Allah said that) *Indeed, it is We who sent down the Qur'an and indeed, We will be its guardian.*(A few of the members of tafsir said that : The things that guarded is referred to Prophet Muhammad and not Al Quran?)

Dalil which are "Warid" (from Allah to Prophet) in the Al Quran which showing the guarding of it from being changed or added or less are :

Allah said : (*Indeed, it is We who sent down the Qur'an and indeed, We will be its guardian.*(Al-Hijr, 9))

Imam At-Tabari said that : ("*Indeed, it is We who sent down the Qur'an*" (means Al Quran) *We will be its guardian*(Al Quran is protected from being added in it wrongs which are not from it, or being cut or less from it which are include of laws, limitations and fardhu, the letter in the verse) (from what was told in Al Quran and from members of Takwil))

From Qatadah : (Allah guards Al Quran from being added in it syaitan which is misguided, or being remove from it the truths) and he said the letter in the verse (what was from Prophet Muhammad, means he is the Guardian from who wants evils in it))

The first meaning is true from appropriate context, then Allah delivers verse that before this verse Allah said : (*And they say,"O you upon whom the message has been sent down, indeed you are mad. Why do you not bring us the angels, if you should be among the truthful?" We do not send down the angels except with truth; and the disbelievers would not then be reprieved.*(Al-Hijr, 6-8)) Az-zikr in verse is referred to Prophet Muhammad , and this is Al-Quran. And because of that Ibnu Kasir said: " The first meaning is prioritize which back to Al Quran".

(*Indeed, those who disbelieve in the message after it has come to them... And indeed, it is a mighty Book. Falsehood cannot approach it from before it or from behind it; [it is] a revelation from a [Lord who is] Wise and Praiseworthy.* Fussilat, 41-42)

Imam At-Tabari said : (Al Quran is the greatest book which is greated by Allah, and guard it from each who wants to replace it or change it, from human, jinn and demon." (Meaning: The misguidance not able to change with what it does, and replace things from their meanings, and this is from hands, and not in it the truth, and not the successor)

Qatadah said : Misguidance : Demon, not able to cut the truth from Al Quran, and cant add truth in it.

Allah said : (*And recite, [O Muhammad], what has been revealed to you of the Book of your Lord. There is no changer of His words, and never will you find in other than Him a*

refuge.)

Hafiz Ibnu Kasir said:

"Allah asked Prophet Muhammad to recite the Quran and delivers the Quran to all humans.

Not being changed to it, not being manipulated, not being interpreted."

A'lamatu Assaidi said : Do obey what is Allah delivered to you by knowing the meanings and understand it, believe the contents, and follow the orders and leave the donts, indeed Al Quran is the greatest book which is not changed in its words, ie: It doesn't change and does not change for truth and fair, and it delivers goodness more than each all. (and finally your Creator's words are true and fair (then it can be perfectly understand that Quran is impossible to be changed and replaced.)

Allah said :(*And you did not recite before it any scripture, nor did you inscribe one with your right hand. Otherwise the falsifiers would have had [cause for] doubt. Rather, the Qur'an is distinct verses [preserved] within the breasts of those who have been given knowledge. And none reject Our verses except the wrongdoers.* (Al Ankabut. 48-49))

The second proof that show Al Quran is guarded in Ulamak souls, and delivered by Allah, and the delivered are not possible to be wrong at anytime and anywhere.

Allah said : (*And if Muhammad had made up about Us some [false] sayings, We would have seized him by the right hand; Then We would have cut from him the aorta. And there is no one of you who could prevent [Us] from him.* Al-Haqqah. 44-47)

Nafi' said :

Khatib Al Hujjaj said: Ibnu Zubair had changed the Al Quran. Ibnu Umar said : Al Hujjaj lied. Ibnu Zubair did not changed it and impossible to do it.

Allah characterize Al Quran as a greatest to Him, and the elevation of its stats, And great stature , and these descriptions are all descriptions of right and truth, it can be inferred that keeping Al Quran from changes and manipulated, it is not perfect without guardian and survival as the strengthening value.

Allah said that : (*Ha, Meem. By the clear Book, Indeed, We have made it an Arabic Qur'an that you might understand.*(Az-Zukhruf. 1-3))

18)

Al Hafiz Ibnu Kasir:

Allah said : (Between the top honor in public , to honor and obey him and whom he admires people of the earth, then Allah said (Al Quran)(Luh Mahfuz, said Ibnu Abbas and Mujahid) Allah side said Qatadah and others) (greatest position, the best and the most honorable, said Qatada (Arbitrator innocent of confusion and aberration. And all of this alert in his honor and virtues) like Allah said: (*Indeed, it is a noble Qur'an. In a Register well-protected; None touch it except the purified. [It is] a revelation from the Lord of the worlds.*)

Allah said : (*This is the Book about which there is no doubt, a guidance for those conscious of Allah*) Al Quran deny every

doubt, and change, and distortion of the greatest insecurities exile who deserves exile.

Basically, all the sorting process was guided by Rasulullah S.A.W. It does not only covered which come first and then but all the place to stop(waqaf) in every verse where there are signs of Hizib or 'Ain. There also signs for a surah and a juzuk respectively. This was done until the 30th juzuk and if there were verses came after it, Jibril will guide Muhammad S.A.W on where to put the verses. The last verses is from Surah al-Ma'idah verse 3.

4 METHODOLOGY

This part explains about the methodology used in developing the system. Firstly, the previous system should be analysed to get all the requirements such as the modules in the system and how it is functioning. Discussion with the users will help the researcher to gather data needed and also any extra requirement from the clients in enhancing the system performance. Agile methodology will be used in this research since this approach helps businesses respond to unpredictability. It helps in reducing the development cost and time then reducing the mistakes happen in satisfying the user requirements. This is because agile methodology is iterative.

Table 2 : Description on the phases in Agile development

Phases	Descriptions
Requirement and analysis	Identify the problems faced and come out with the user requirements and objectives so that we will get the strategy that is going to use and scope of the system.
Design	The design phase consist of logical design and physical design. The goals in this phase are to design and model the system design using UML diagram and produce a detail design and model for the system. Design the prototype model and the system interface using graphic software tools.
Code	Convert the user requirements into a coding as the modules of the system using PHP, HTML, CSS and MySQL then integrate with security elements.
Test	Test the developed modules with the right input to see the output and also control the validation. This can be done with the user so that they can give feedback and if any, the developer will fix that before proceed to next stage since it is iterative.
Deployment	Implementing the full version of the system that meets the objectives and user requirements at the right environment which is the user's computer.

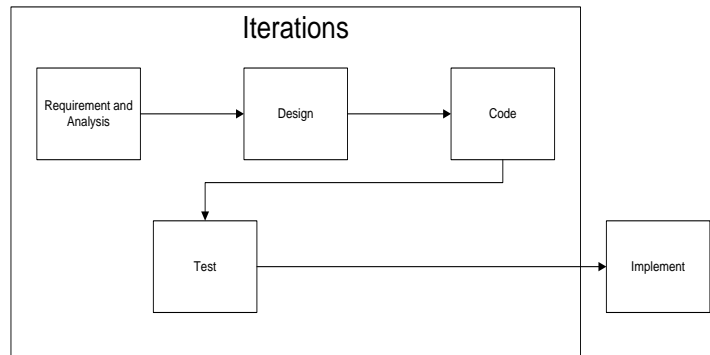


Figure 2 : Agile development life cycle

4.1 Problem Statements

The idea to enhance this system is because of a few problems regarding the previous system. It can run smoothly and effectively but it lacks in security features and its productivity. Firstly, the system was less in data integrity since it was not able to auto calculates the data in the system and this leads to human errors. It also does not have the authentication of the user access level. The functions accessed by the management team are similar to the below team. Moreover, it has limited traceability to those accessing the data because there is no accounting such as activity log recorded. Then, it has no graph or summative results showing the trends of the investigation such as blood series. It is crucial so that the medical doctor can analyze the behavior of the disease and decide further treatment.

4.2 Scope

The scope of this system development is only for the use of two departments in HUSM which are Hematology Ward and Oncology Clinical Laboratory. The access that will be used is intranet because it only can be used in that organization. This system is extended from previous system [26] some enhancement in term of user requirement such as graph of progress of the patients and security features on data integrity and user log then completing all the module of the system. The enhancement of this system will be done based on the objectives of this proposal which focusing on the data integrity, user log, and data analysis. For the data integrity, an automated calculation will be implement in the coding so that the part of calculation will be automatically done by system after the user key in the required fields. Then, the user activity with the system will log in the system log as one of the integrity data control. Moreover, a graph analysis based on patient information recorded in the system will be one part of the module so that it can help the medical doctors clearly analyze the data and come with right decision. The design part is administrative style and also responsive since the growing technology of smartphone. The ability o responsive interface helps much when using smartphone.

4 ANALYSIS

In this section discussed on the analysis that have been performed in developing the hematology information system where show a few screen capture on the system. All the patient data been kept in the database with security features on the application. This show that in our daily life all of works has been done during Prophet Muhammad S.A.W. which are collection of surah and hadith then practising amanah. Figure

3 show the screen capture on the user profile that only authorised user can login into the system. This system have three layer of user which are administrator, doctor and nurse. In the security, we defined as role-based each of the user has their own roles that related with Amanah.

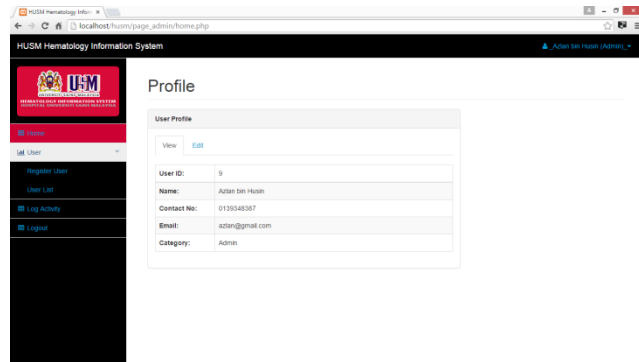


Figure 3 : Screen capture on the User Profile

Figure 4 show the user activity login where detailed of date and time login and what activity that they performed.

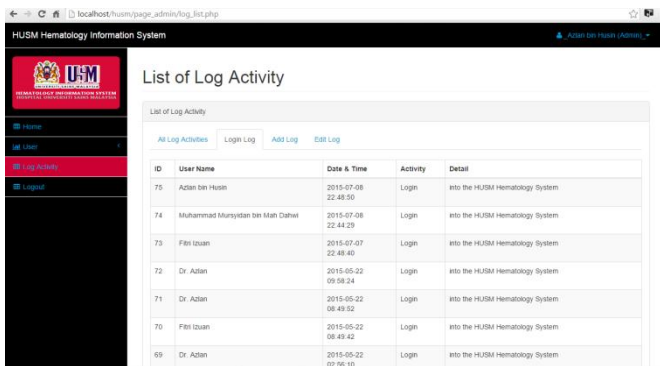


Figure 4 : Activity Login

Figure 5 show the example of the list of patients where the medical doctor can view the patients. All the patients information is been kept in the database to show the data can be organized.

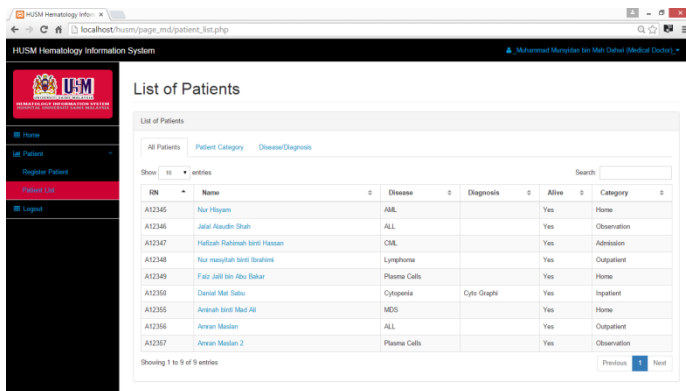


Figure 5 : List of patient

In the Figure 6, show the statistical of patients progress in a week. By using the database, it can also analyst the data not only kept and view. This will help the medical doctor in

knowing the progress of the patients

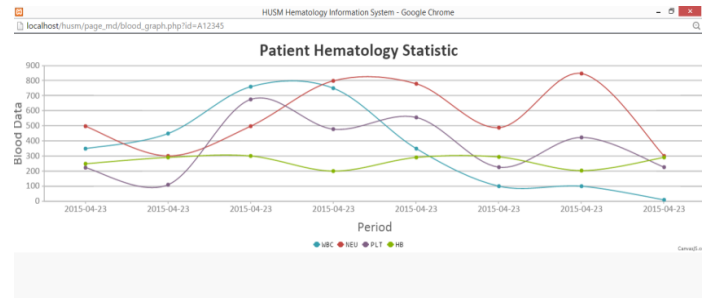


Figure 6 : Statistical of Patient Hematology

7 CONCLUSION

In conclusion, the medical doctor satisfied with the development of the hematology information system. We also have implemented the system in the Hospital Universiti Sains Islam Malaysia. In developing of the system, we relate with the Islamic prospective such as collection of the Al-Quran and Sunnah with related with security features (amanah).

ACKNOWLEDGMENT

The research for this paper was financially supported by the Universiti Sains Islam Malaysia, grant no. PPP/UTG-0213/FST/30/12213.

REFERENCES

- [1] Fabrizio Montecucco, Federico Carbone, Frank Lloyd Dini, Manuela Fiuza, Fausto J. Pinto, Antonietta Martelli, Domenico Palombo, Gianmario Sambuceti, Francois Mach, Raffaele De. Caterina, (2014) "Implementation strategies of Systems Medicine in clinical research and home care for cardiovascular disease patients" European Journal of Internal Medicine 25 (2014) 785–794.
- [2] Mar Marcos, Jose A. Maldonado, Begona Martinez-Salvador, Diego Bosca, Montserrat Robles, (2013). "Interoperability of clinical decision-support systems and electronic health records using archetypes: A case study in clinical trial eligibility" Journal of Biomedical Informatics 46 (2013) 676–689
- [3] Andrew R. Post, Tahsin Kurc, Sharath Cholleti, Jingjing Gao, Xia Lin, William Bornstein, Debra Centrell, David Levine, Sam Hohmann, Joel H.Saltz (2013)"The Analytic Information Warehouse (AIW): a Platform for Analytics using Electronic Health Record Data". J Biomed Inform. 2013 June ; 46(3): 410–424. doi:10.1016/j.jbi.2013.01.005.
- [4] Bernardo Estacio, Rafael, Prikladnicki, Michael Mora,, Gabriel Notari, Alejandro Olchik (2014). "Software Kaizen : Using Agile to Form High Performance". Agile Conference (Agile) 2014. July 28, 2014 – Aug 1, 2014. Pg 1 – 10.
- [5] Gabriela Jurca, Theodore D. Hellmann, Frank Maurer (2014). "Integrating Agile and User-Centered Design" Agile Conference (Agile) 2014. July 28, 2014 – Aug 1, 2014. Pg 24 – 32.4

- [6] Andrew Aken. "An Agile Approach to the Software Development Life Cycle". *Journal of Internet commerce*, Vol. 7(3) 2008
- [7] Aaron M. French. "Web Development Life Cycle: A New Methodology for Developing Web Applications". *Journal of Internet Banking and Commerce*, August 2011, vol.16, n o.2
- [8] Fan Wu, Lili Xu. "Security Analysis and Improvement of a Privacy Authentication Scheme for Telecare Medical Information Systems". 2 July 2013.
- [9] Hsien-ChuWu, Min-Shiang Hwang, Chia-Hsin Liu. "A Secure Strong-Password Authentication Protocol". *Fundamenta Informaticae*. 2005, Vol. 68 Issue 4, p399- 406
- [10] Waidah, I, Rosline, H and Swift, S,. (2010) Detecting Leukaemia (AML) blood cells using CellularAutomata and Heuristic Search. *Intelligent Data Analysis (IDA 2010)University of Arizona, USA*. 54 – 64
- [11] Wan Fatimah Wan Ahmad, Aliza Sarlan, NurZatulffahZakaria (2008) "UniversitiTeknologi PETRONAS Health, Safety & Environment System", *International Symposium On Information Technology 2008 (ITSim08)*, KL Convention Center, 26-29th Aug 2008.
- [12] Norhaziah A, Nor Naimah, M. Nasratun. (2008) "Pet Shop Management System for KlinikVeterinar and SurgeriJawhari" Audio, *Transactions of the IRE Professional Group*
- [13] Rajendran, S, Arof, H, Mokhtar, N, Nubin, M, Yegappan, S, Ibrahim (2011). "Dual modality search and retrieval technique analysis for leukemic information system" *Scientific Research and Essays*. Pp 247-255
- [14] Jeff Zadeh, Dennis DeVolder. "Software Development and Related Security Issues." (2007).*Proceedings of IEEE Southeastcon*. 2007.
- [15] J.D. Meier. "Web Application Security Engineering." (2006). *IEEE Security &Privacy* (vol. 4, no. 4, pp. 16–24). 2006.
- [16] Mark Curphey, Rudolph Araujo. "Web application security assessment tools." (2006) *IEEE Security & Privacy* (vol. 4, no. 4, pp. 32-41). 2006
- [17] Myat Myat Min, Khin Haymar Saw Hla. "Security on Software Life Cycle using Intrusion Detection System." (2005). *6th AsiaPacific Symposium on Information and Telecommunication Technologies APSITT 2005 Proceedings*. 2005.
- [18] C. Rigney, S. Willens, A. Rubens, W. Simpson, "Remote Authentication Dial In User Service (RADIUS)", (2000). *IETF RFC 2865*, June 2000.
- [19] Hassan Rasheed. (2014) "Vulnerability distribution scoring for software product security assessment". *Int. J. of Information and Computer Security*, 2014 Vol.6, No.3, pp.270 – 285
- [20] Lawrence Teo and Gail-JoonAhn (2013). "Extensible policy framework for heterogeneous network environments". *Int. J. of Information and Computer Security*, 2013 Vol.5, No.4, pp.251 – 274
- [21] Shada Alsalamah, W. Alex Graya, Jeremy Hilton, Hessah Alsalamah. "Information Security Requirements in Patient-Centred Healthcare Support Systems". *Studies In Health Technology And Informatics [Stud Health Technol Inform]* 2013; Vol. 192, pp. 812-6.
- [22] Wen-Shin Hsu & Jiann-I Pan." *The Secure Authorization Model for Healthcare Information System*". Springer Science+Business Media New York 2013. 2013.
- [23] Fan Wu, Lili Xu. "Security Analysis and Improvement of a Privacy Authentication Scheme for Telecare Medical Information Systems". *Journal Of Medical Systems[J Med Syst]* 2013 Aug; Vol. 37 (4), pp. 9958. Date of Electronic Publication: 2013Jul 02.
- [24] Hsien-ChuWu, Min-Shiang Hwang, Chia-Hsin Liu. "A Secure Strong-Password Authentication Protocol". *Fundamenta Informaticae*. 2005, Vol. 68 Issue 4, p399- 406
- [25] Jim Kanzler, *Meta5 in Agile Development*, 10 July 2010, available online at : <http://www.meta5.us/2014/07/10/677/>. [Retrieve by : 20 April 2015]
- [26] Radhi Rafiee, Waidah Ismail, Rosline Hassan, Azlan Husin (2015) *Developing of Heamatology with Security Features*. *Journal of Software* (2015).