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Development of an Online Sperm Donation System in Nigeria

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Abstract

This paper explores the role of e-health on the healthcare system in developing countries especially in Africa, with reference to an online sperm donation system which will enable couples having difficulty to conceive. There are a lot of reasons for infertility, some of them are in women and other are in men to find suitable donors. The advantage of this paper is to help donors to register their details (address, contact details and physical features) in the web based sperm donation system. The system must be handy, and must be assessed when needed. The system will allow sperm seekers to search for suitable sperm donors. Disadvantage is some security and privacy concerns related to computer based medical records because the records can be lost, crashed, stolen, or hacked. Each patient has the right to keep their personal data private and secure from any unauthorized access. The system will allow sperm seekers to search for suitable sperm donors. Such a system will have many benefits, for instance, it will reduce cost, easy to update personal contact details, and it enables easy connection of data. In the course of the investigation, an existing system was digested and its deficiencies were detected and emphatically analysed, after which solutions to the problems were proffered in the new designed online system using waterfall methodology, which is reliable and more interactive and various tools was used to achieved solution to the problem in the new system; Photoshop, Fireworks, Visual Paradigm, HTML, CSS, JavaScript, MYSQL, Wamp Server and PHP.

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Introduction

Nowadays, the development of Information and Communication Technology (ICT) in all sectors of life in Africa has made big progress since the 21st century and has offered economic and social benefits (Khovanova-Rubicondo, 2011). Having access to Information and Communication Technologies can improve different sectors of life like the government services, the healthcare, and the education sector. ICT enables communication, sharing knowledge, sharing resources, and sharing ideas and opinions (Vidas-Bubanja and Knezevic, 2011). E-healthcare is the use of ICT in the healthcare system to deliver healthcare services to patients who are outside the care centers (Sharma and Vaisla, 2012). There are a lot of reasons for infertility, some of them are in women and other are in men. In women the common causes are lack of ovulation, and tubes blockage. In men the poor quality of sperms is the most common reason. There are some treatments available but the treatments depend on the reason causing the problem. One of the solutions for this problem could be sperm donation which is considered a new way for getting children. Sperm donation could be a solution not only for couples with fertility difficulties but also for single women. We aim in this project to build a web-based sperm donation system that will enable donors to register their details online and will enable sperm seekers to find those donors. The system will display all of the donor's physical details as eyes color, hair color, skin color, and other features

Role of ICT in the Health Sector

Information and Communication Technology plays a very important role in the health sector in Africa. This role cannot be ignored because the healthcare is directly connected to human health. Using ICT in the health sector will enable the healthcare personnel reach high level of productivity and accuracy. The healthcare personnel do realize how beneficial adopting ICT in the health sector could be. Using ICT in the health sector will improve the basic healthcare services, for instance, it will enable customer contact, allocate patients in different sections of the hospitals, it will enable the doctors and the staff to communicate easily within the healthcare centre and work together, and it will allow providing quality healthcare services (Sharma and Vaisla, 2012). It will improve the information channels that have a huge impact on diseases like aids, and malaria which already has a devastating impact on the country side population in Africa (Anwar et al, 2014). However, there are some limitations associated with the integration of ICT in the health sector, for instance, lake of technology access, and lack of training in ICT. Some studies show that the self-confidence when using ICT is better with those who have post-secondary education.

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Impact of ICT on the Health Sector

There is a general agreement that the use of Information and Communication Technology (ICT) in the health sector has a very positive impact on the healthcare system. The ICT has a positive impact on different aspects of healthcare, for instance;

i. The use of ICT has enabled the sharing of learning and training resources among health workers.

ii. The use of tele-medicine has enabled remote diagnoses, consultation, and treatment.

iii. The use of ICT has enabled access to research findings and has also enabled impressive health research (Eldis, 2014).

iii. ICT in the health care system has enabled responding quickly to public health threats.

iv. ICT has enabled improvements in the way the administrative systems work in the health care facilities.

v. The use of ICT in the health sector has enabled the medical staff can update their skills using an internet based system.

vi. The use of ICT has enabled using some web-based applications and mobile based systems for different useful purposes. For instance, a mobile-based application that enables tracking those who use anti aids drugs through the use of text messages.

vii. Using ICT in the health sector enabled citizens to have access to healthcare services from anywhere and at any time (Rudowski, 2014).

viii. The use of ICT in the healthcare system reduces the cost of the healthcare by providing medical services for free or at lower price. For instance, patients can avoid unnecessary movement.

ix. The use of ICT has a very positive impact on patients by providing some websites that educate people on some diseases like diabetes, aids, and cancer. There are also some courses that are provided online discussing different topics (Rudowski, 2014).

x. The use of ICT in the heath sector has improved the financial management, and has enabled producing structured reports in health centres in Africa (NCBI, 2013).

Advantages of E-healthcare

COST: The use of ICT in the healthcare system reduced the cost for patients and for the healthcare system itself. As it has reduced the amount of paperwork required in offices and it has also reduced the travel cost as patients rarely need to travel since the use of telemedicine (e-Government for Development, 2008).

TIME: The use of ICT in the healthcare system reduced the time being spent on completing some health tasks. The use of an information system will give us quick access to patients' records and will also allow electronic sharing of information with clinics, hospitals which is also considered quick and accurate (HealthIT.org, 2014). The travel cost is also reduced because the use of telemedicine has reduced the need for patients to travel.

Disadvantages of E-healthcare

There is some security and privacy concerns related to computer based medical records because the records can be lost, crashed, stolen, or hacked. Each patient has the right to keep their personal data private and secure from any unauthorized access. Having access to personal information like name, address, contact number, date of birth, national insurance number, social security number, and medical history must be limited so that only few can have access to this information. Some of the healthcare activities require exchanging information between the hospital and the clinic or between individuals and therefore there is some privacy risks related to that exchange (Olanrewaju *et al*., 2014) Therefore there are some security services that implemented in the healthcare system:

Availability– The personal information of patients should be available in conditions like power cut, disasters, and machine fault where information could be unavailable. There should be computer centres to provide backup of the information that is lost (Olanrewaju *et al*., 2014).

Integrity: It's a security technique that is used to ensure that the data being sent across a network is not being modified and the recipient receives it as it is. For instance, when a client sends updates to the database through the web, the web service must ensure that the data sent is not modified by someone or due to data damage while it has been sent from one place to another through a network (Jianhong and Hua, 2010)

Confidentiality: Is setting up some restrictions that protect certain type of data from unauthorized access. Data like personal information, financial records, and medical health data. Confidentiality prevents sensitive information from any unauthorized discloser. There are different methods that can be used to protect the data, for instance, password protection, and encryption (Zardari,Jung, Zakaria 2014).

Challenges to Integrate ICT in the Health Sector

The use of Information and Communication Technology has many benefits to improve the healthcare system services, but ICT has some barriers that could prevent the integration of ICT within the healthcare system. The following are some of those barriers:

Power Challenges – Electricity is the greatest challenge when deploying ICT in developing countries. There is lack of mains power in most of health facilities in remote parts in Africa and even when the mains power is available they are not reliable and sometimes could be a real threat to electronic equipment. Developing countries rely on diesel generators when there is no power but because the fuel cost is too high and they also require

maintenance which means that they can't rely on generators longer then few hours.

Access to ICT: The Information and Communication Technology services in Africa are not reliable, expensive, and don't exist everywhere. The African Development Bank has announced that in 2000 there were less than 10 million phone lines in Africa (PMC, 2004)

Lack of Training: The lack of training is considered a major barrier when integrating ICT in the health sector. Health staff-members need to be trained on how to use the health management information system to be able to plan, analyse, and use the system effectively.

ICT IN NIGERIA

No doubt, in whole Africa, Nigeria's information and communication technology market is one of the largest and therefore it still attracts more investments in the ICT sector (IT WEB AFRICA, 2013). The use of ICT has made a big progress in Africa, has also contributed significantly in building the country's economy. It has offered huge benefits in different fields of life such as social life by allowing access to valuable information from any place and at any time, offering distance learning, and delivering improved healthcare services. Therefore, the Nigerian Government have decided to integrate ICT in the health sector (PANIR, 2011). Over the last decade the Nigerian government has taken the chance to improve ICT distribution all over the country. Nigeria has made considerable achievements in the ICT sector. The private investment in the ICT sector reached more than 50 million in 1999 and more than 12 million in 2008 (Rudowski, 2014). The telecommunication sector comes after the oil industry in Nigeria and the use of internet and mobile phones is increasing every day. The use of ICT in Nigeria has improved different sectors of life, for instance, the education sector, the industrial sector, the health sector, and the government services. Many Nigerian rely on the use of mobile phones to provide living, they operate call centres in small villages, and they run shops where they sell mobiles and their accessories (Okogun *et al*., 2014). The use of the mobile technology in the healthcare sector can improve the healthcare services by the use of some application that can change the way the health data is managed and retrieved and it also provide access to some emergency health service. The use of mobile technology can also increase the awareness of some diseases like Aids. Such mobile application will allow elderly people to have access to some health services in situations where there is a life threat (Pyramid Research, 2010).

Artefact Design

Entity Relationship Diagram

The entity relationship diagram provides a graphical representation of the sperm donation system database which will include tables, columns, and the relationships between those tables. This design tool is considered very helpful especially when modelling databases that have a big number of tables and contain complex relationships. It also provides detailed information that is extremely helpful when building the actual database (Database Design, 2014).

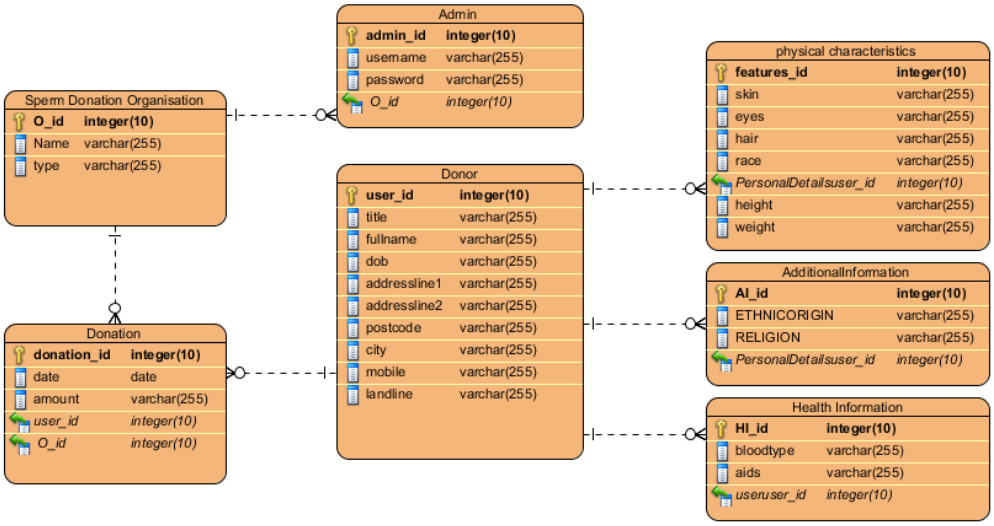

Figure 1: Entity relationship diagram

Site Map Design

The following site shows that our Online Sperm Donation System consists of the following pages. Each page links to some other pages as it can be seen in 4-2 figure. The navigation bar that is used on the online sperm donation system is considered a very important aspect if we want to have a user friendly website. The site map will enable visitors to find what they are looking for due to that sitemaps links to other pages on our sperm donation website (Vandelay Design, 2008).

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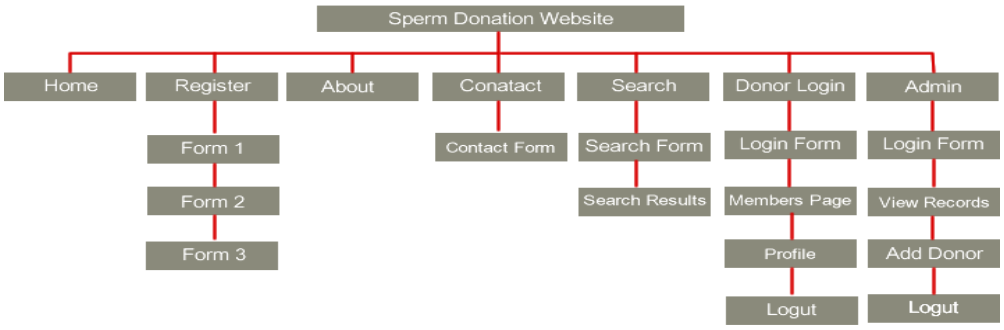

Figure 2: Sperm Donation System Site Map

Figure 2 represents the pages of the online sperm donation system; home page, register page, about page, contact page, search page, donor login page, and admin page. The register page will link the user to the registration form where the user must complete a several sections from. The contact page will link the user to the contact form that can be filled if the user has any questions. The search page consists of the search engine that must be filled to display the number of available donors on the system. The donor login page will link the donor to the login form where the donor must provide a valid username and password. Once the donors provide valid username and password, they can be linked to the profile page. The admin page will link the admin to the staff page once a valid username and password is provided.

UML Diagrams

The Use Case Diagram consists of a set of use cases, actors, and relationships between the use cases and the actors. It provides a graphical representation of the functionality of the system. The figure 3 displays our use case diagram that consists of several use cases, three actors, and relationships (Tutorials point, 2014).

Figure 3: Use Case Diagram

Activity Diagram

The activity diagram represents the sequence of the actions of the sperm donation system. As it can be seen in the figure 4 the activity diagram displays the flow of actions through a series of action. The figure shows the following:

The admin can login to the system, view all records, and delete records. The visitor can visit the homepage, browse through the website and can apply online to become a member. Similarly, the donor can login by providing a valid username and password, and edit their profile.

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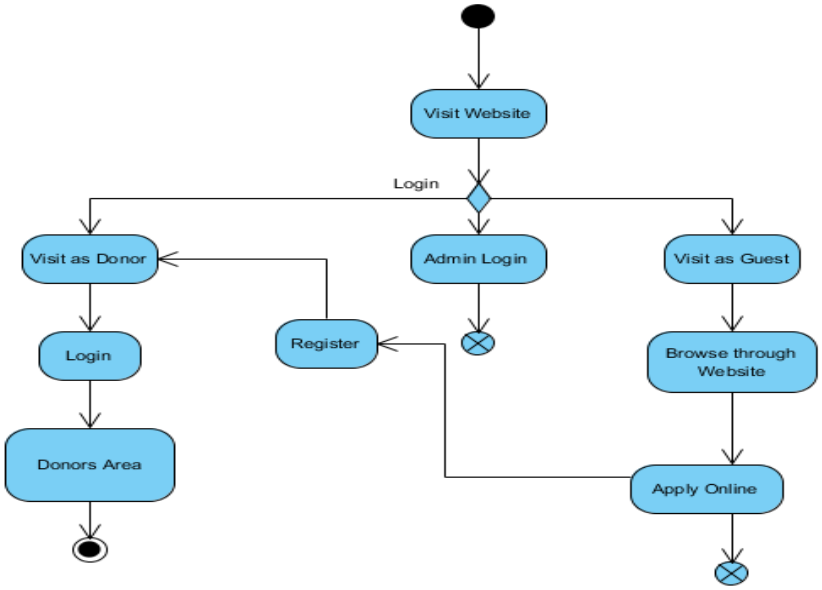

Figure 4: Activity Diagram

Development

The development includes several steps; developing the database, developing the website pages, and the back end code. First we will go through all of the techniques that are necessary to develop the system. Secondly we will go through the development of the database and provide screenshots of the database. Then we will go through the development of the website, and finally we will discuss how we have managed our project and the methodology that we have chosen to achieve our goal.

Database Development

As we have mentioned previously that we are building a web application that is data driven and therefore we need to build a database using WampServer. The sperm donation system database that we have developed is called "Sperm Donation". The database consists of seven tables; the organisation table, the donor table, the admin table, the physical characteristics, the health information, and the additional information.

Table 1: The database

Table	Action	Rows	Type
additionalinformation	Browse Structure Search Insert Empty Drop	2	InnoDB
admin	Browse Structure Search Insert Empty Drop	0	InnoDB
features	Browse Structure Search Insert Empty Drop	3	InnoDB
health information	Browse Structure Search Insert Empty Drop	0	InnoDB
organisation	Browse Structure Search Insert Empty Drop	0	InnoDB
user	Browse Structure Search Insert Empty Drop	3	InnoDB

Donor Table

The donor table holds information that is related to the donor personal details. It consists of twelve fields; the donor id, full name, username, password, date of birth, address line 1, address line 2, postcode, mobile number, and landline.

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Table 2: donor table

Browse | Structure | SQL | Search | Insert | Export | Import | Operations

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
1	user_id	int(11)			No	None	AUTO_INCREMENT	Change Drop
2	title	varchar(255)	latin1_swedish_ci		No	None		Change Drop
3	fullname	varchar(255)	latin1_swedish_ci		No	None		Change Drop
4	username	varchar(255)	latin1_swedish_ci		No	None		Change Drop
5	password	varchar(255)	latin1_swedish_ci		No	None		Change Drop
6	dob	varchar(255)	latin1_swedish_ci		No	None		Change Drop
7	addressline1	varchar(255)	latin1_swedish_ci		No	None		Change Drop
8	addressline2	varchar(255)	latin1_swedish_ci		No	None		Change Drop
9	postcode	varchar(255)	latin1_swedish_ci		No	None		Change Drop
10	city	varchar(255)	latin1_swedish_ci		No	None		Change Drop
11	mobile	varchar(255)	latin1_swedish_ci		No	None		Change Drop
12	landline	varchar(255)	latin1_swedish_ci		No	None		Change Drop

Check All / Uncheck All *With selected:* Browse | Change | Drop | Primary | Unique

Results

The home page is the main page and the first page the user will visit. It consists of a logo, navigation, bar, content, and footer. All of the other pages will have similar look to the main page. It provides some information on how to help some couples realize their dream. The navigation bar consists of seven links; home, register, about, contact, search, and admin

.

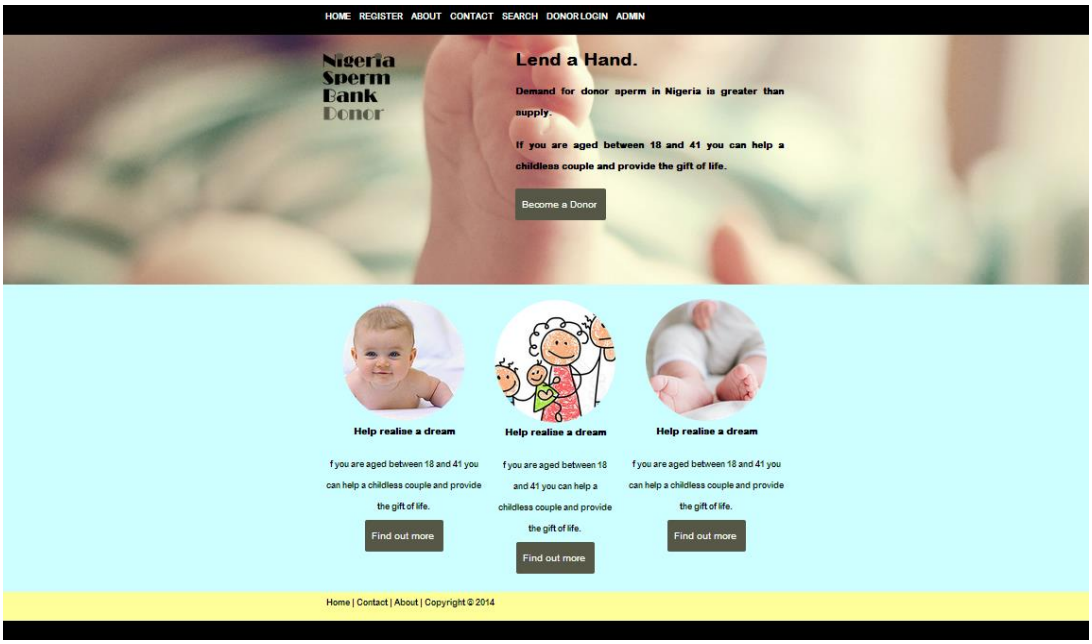

Figure 5: The home page

Register Page

The form 1 page consists of the first form that the user must fill to become a donor which is the personal details of the donor. The user must provide valid data and then click next. It consists of twelve fields; the donor id, full name, username, password, date of birth, address line 1, address line 2, postcode, mobile number, and landline. After the user fills the form he/she will be redirected to the second form which is the physical characteristics

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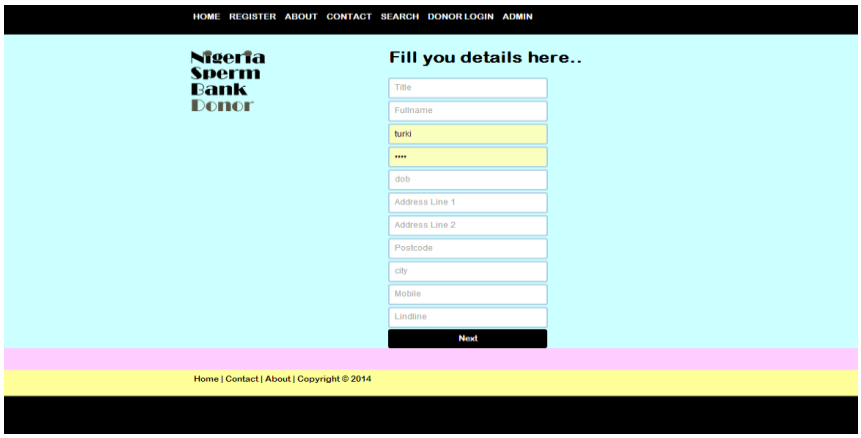

Figure 6: The register Page

Donor Login Page

This page consists of a login form that the donor must fill to be able to login to the members' area. The donor must provide a valid username and password. If the user enters an invalid username and password, then the system will display an error

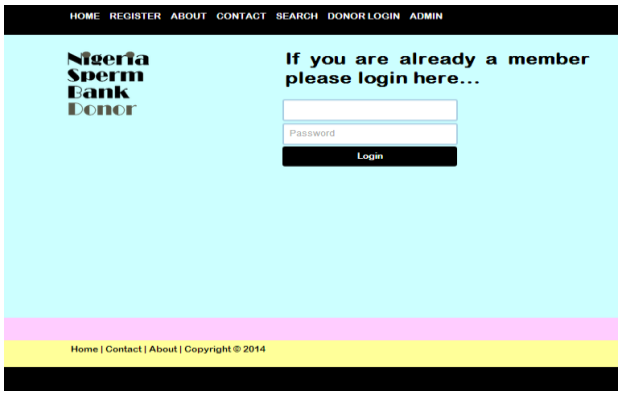

Figure 7: The donor Login Page

Search Donor Page

The search donor page contains a search engine that must be filled by the user to search for donors. The search engine consists of four fields; skin color, eyes color, hair color, and race. Once the form is filled the user must click on submit

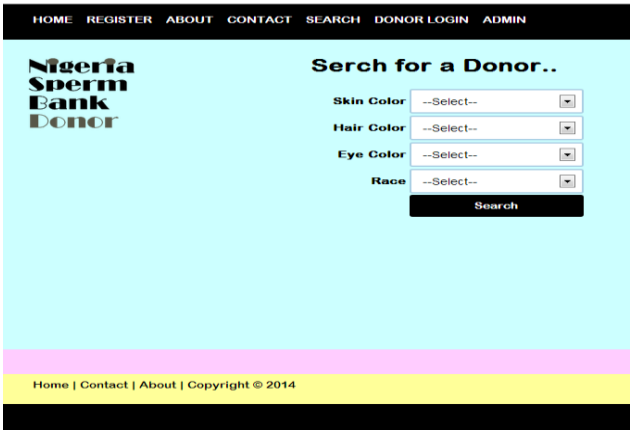

Figure 8: Search donor Page

Donor Records Page

This page displays a table of all records of available donors. The table shows all details and it also consists of a delete link to enable the donor to delete a donor.

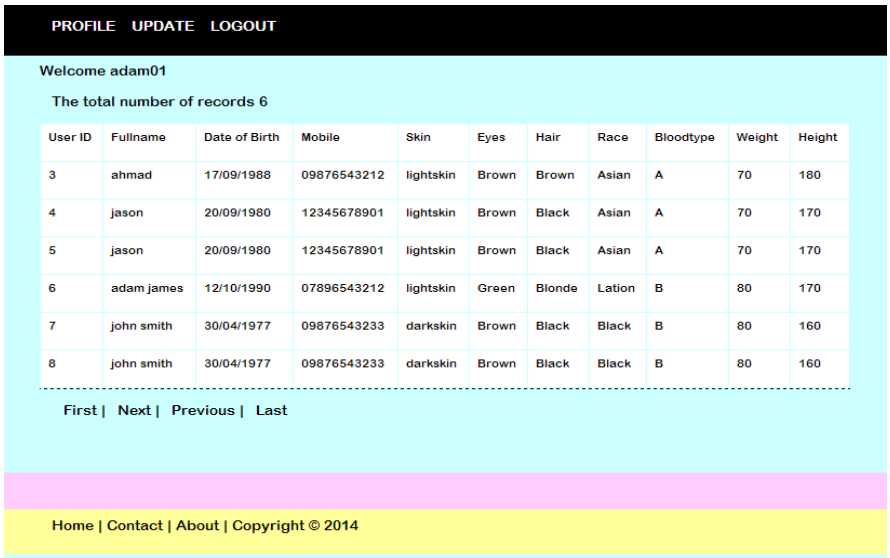

Table 3: Donor Records Page

Conclusion

We have discussed the role of ICT in the health sector, and the impact of ICT in different fields of life, especially the healthcare system. We have illustrated the advantages and disadvantages of the use of ICT in the health sector and we have explained the barriers that could prevent the integration of ICT. ICT plays a very important role in all fields of life, especially in the health sector.

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