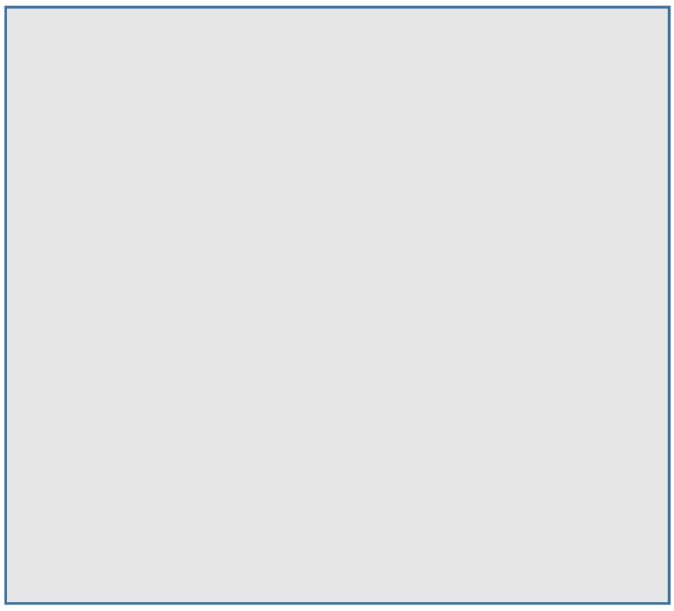

Vaccination Tracking System

Software Requirement Engineering (A)
Summer'19_20

Submitted By

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1. Problem Domain

1.1 Background to the Problem

- Vaccination is recognized as one of the most successful and cost-effective way of saving lives by working with ones body's natural defenses to build shield. Vaccination schedule is a series of vaccines including the timing of all doses which maybe either recommended or compulsory. The recommended immunization schedule is prepared to protect infants and children early in life when children are at increased risk for infectious diseases because their immune systems have not built up yet for the necessary defenses to fight infections and life-threatening diseases. Along with this, it is also important to keep track of the vaccination schedule in order to give children the right amount of doses at the right time. Time is a crucial factor for doses of vaccines and one missing of dose is very risky step for growth a child.

- The Expanded Program on Immunization (EPI) vaccines, provided by the Government of Bangladesh comprise of a series of vaccines given to infant from birth to one year which is recommended. The schedule is maintained in an EPI Tika Card which can easily be lost and also the record files kept at the hospitals are susceptible to easy damage. A centralized database system can make it easier to keep record of all children from birth who received vaccines. Not only this but also parents can forget the schedule of vaccines and miss the schedule where a centralized system can automatically send messages to the parents' phone prior to the schedule to remind them about the vaccine schedule for their children. A developed computerized system can make sure of the correct record and updated parents of upcoming schedule which will be an immense help for the sake of a child's health and the future of the country.

1.2 Solution to the Problem

- Solution to the problem is a centralized vaccination tracking system where an infant will be registered at the time it receives first vaccine. In the series of recommended vaccine for a new born, BCG is the first one which is given right after birth. At that time an infant will be registered with an unique id and also for the next vaccine schedule parents will be reminded of the schedule.

  - The primary goal of this system is to keep track of the recommended vaccine list along with the children information such as name, date of birth, vaccines given, vaccines given at which dosage which date by which doctor, parents name, parents contact etc. so that traditional way of recording vaccines do not get in the way of children health. Loss of Traditional Tika Card may lead to missing of a dose of vaccine which can lead to hamper a child's spontaneous growth. Along with this, parents forgetting the schedule of vaccine will also cause arise of life-threatening diseases. Vaccines are critical to the prevention and control of infectious-disease outbreaks. Establishment of computerized Vaccination Tracking System can assure timely childhood immunization.

  - The solution is also going to provide help to the cases of household relocation. As the database will be managed centrally, the record can be accessed by another area's Govt. hospital with the permission of using the system so that there remain no confusion in the record of a child's vaccine report. It will let doctors keep track of the children's immunization histories in a computerized database. It will give parents their children's immunization histories for daycare, school, camp and foreign travel.

  - The solution to the problem is going to meet the business objective as paper-based vaccine tracking process is no longer adequate to handle hundreds of baby's records. The paper records are prone to be damaged, difficult to read and find. In addition, the paper and spreadsheet-based tracking process are hard to update

making it harder to track vaccine given to each children in a hospital. Vaccination Tracking System can make it easier to record of all the children's given vaccine and yet to be given vaccines.

- The system is a web based application named Vaccination Tracking System which can be a solution to a real life problem. The hospital management system is going to be the user of the system. Each new born with BCG vaccine given will be added to the system with an unique id along with the new born babies information such as name, date of birth, vaccines given, vaccines given at which dosage which date by which doctor at which hospital, schedule for next vaccine parents name, parents contact, alternate contact etc. Parents will be given the old Tika Card but the hospital will manage everything in computerized system. Prior to the date of next vaccine dose, parents will be given a text message through an automated system in Bangla as a reminder of the schedule with the information of vaccine, hospital, unique id, date, time. At the same time doctors will receive notification for upcoming vaccine schedules.

- By doing some research online, it was found that there is no current solution existing at this time which is being used in the Govt. hospital in our country for EPI vaccines but there might be in near future with the collaboration of GAVI (Global Alliance for Vaccines and Immunization).

2. Solution Description

2.1 System Features

Director of the Hospital:

- Login
- Read the Vaccine Record of children

Doctor:

- Login
- Read the Vaccine Record of children
- Search specific children Record with unique id
- Update the Vaccine Record of children

User Information Table:

- Login
- Read the Schedules only for the day

System:

- Verify all Login
- Send Text Messages to the contact numbers of the parents 2 days before the schedule and in the morning on the day of the schedule.
- Send notification to the Doctors of the schedules for vaccine with list with detailed information.
- Send notification to the user information table for the days schedules with child name, parents name and designated doctors name only.
- Show successfully sent all notifications and messages.

User/Parents:

- Login
- Read Vaccine Record if their Children

Quality Attributes:

- **Performance:** The primary performance requirement is response time. The number of concurrent Doctors able to Login should measure the performance of the system.
- **Scalability:** Scalability is simply specified as the increase in the system's workload that the system should be able to process. The system should return the results of the search and update the information as soon as possible.
- **Security**: All information regarding children, their parents, contacts etc data should be protected from the likelihood of malicious attacks as well as the possibility of loss or theft of information.
- **Compatibility:** Hardware, Operating Systems, Browsers and their versions should be compatible with the application to run on.

2.2 UML Diagrams

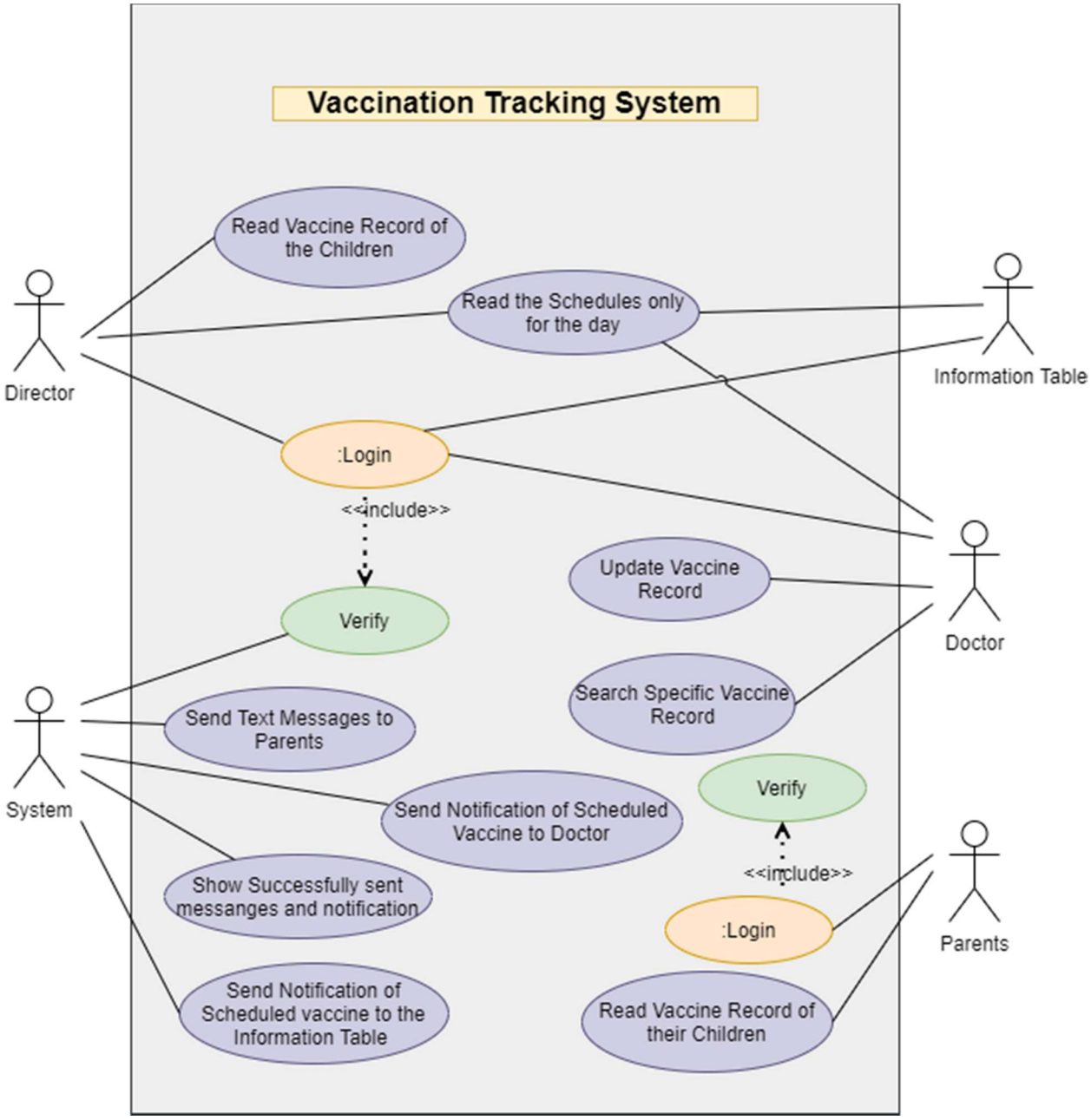

Figure-1: Use Case

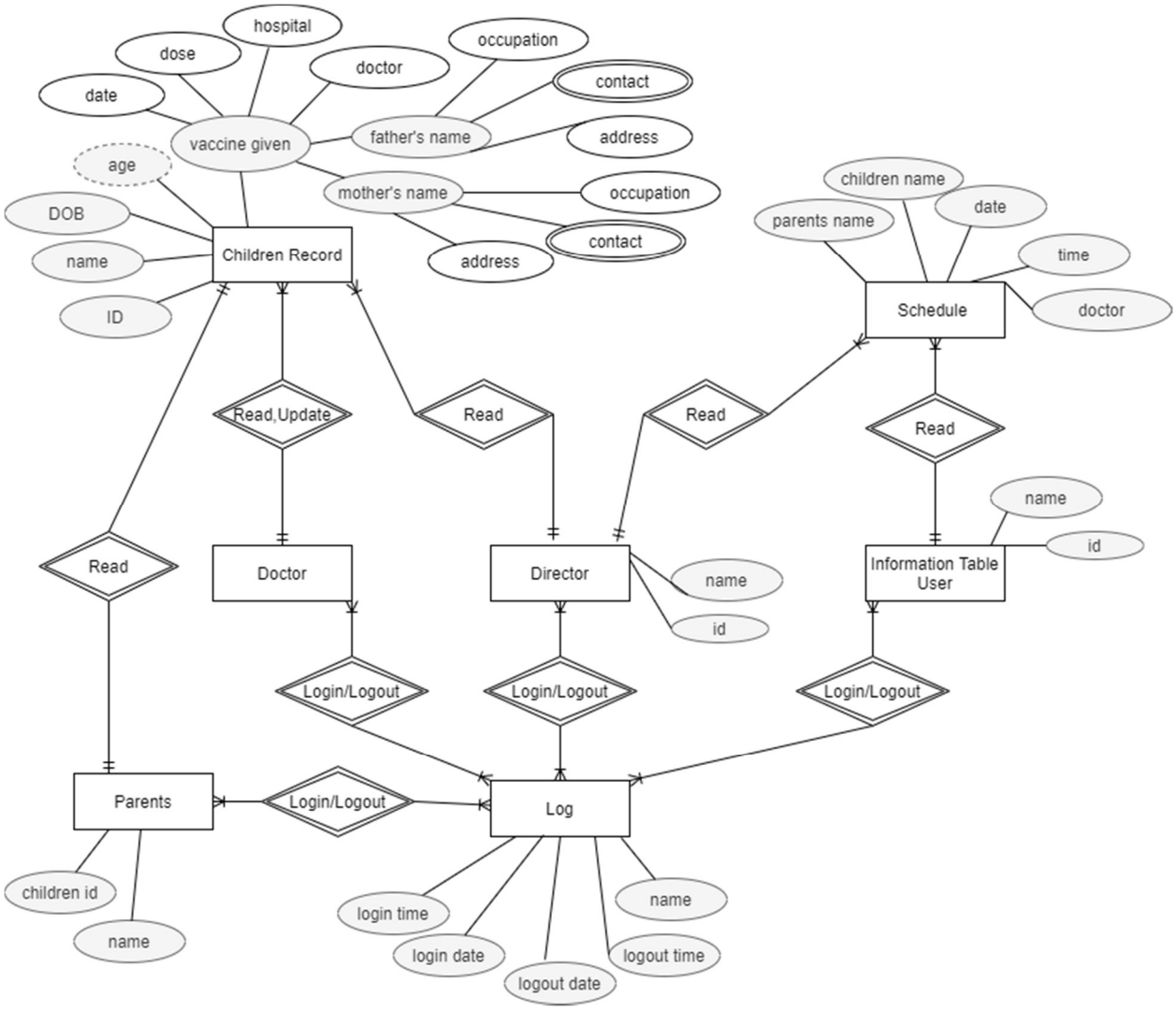

Figure-2: ER Diagram

3. Social Impact

The demonstrated problem is a problem which can cause life-threatening diseases to children at their weakest point of life. Vaccination supports children to build an immunity system against vaccine-preventable diseases. Recommended vaccines are needed to be given at the right time in right dose. Suspension of vaccine dose can be deadly for children and spread diseases to other children. The proposed solution is expected to solve some issues such as suspension of vaccine, lost track of vaccine given, forgot the next vaccine schedule, household relocation causing loss of record of vaccines etc. The social impact of the proposed system is given below:

- Vaccination Tracking System can make it easier to record of all the children's given vaccine and yet to be given vaccines.
- Vaccination Tracking System will give parents their children's immunization histories for daycare, school, camp and foreign travel.
- In case of household relocation, Vaccination Tracking System will let both doctors and parents keep track of the children's immunization histories in a computerized database.
- Some vaccine-preventable diseases can result in prolonged disabilities and can take a financial toll and long-term disability care. In order to avoid this situations, Vaccination Tracking System can be a real help.
- A child with a vaccine-preventable disease can be denied attendance at schools. So, it is important to not to miss the vaccine schedule. Vaccination Tracking System can help parents to keep track of the given vaccines and keep reminded of the next scheduled vaccines.
- Traditional Tika Card can be lost or damaged easily. Vaccination Tracking System with the reminder feature can help parents keep track of the vaccine given.

4. Development Plan

The development plan of this application will follow all activities of the Software Development Life Cycle model. The Agile-Scrum Framework will be followed in managing and working on this project. In each sprint, after implementation there will be peer review meeting and requirement technical review along with daily scrum. There will be close collaboration between team and user, and changing requirements will be welcomed positively A project scheduling with relevant possible activities assumed are given below:

		Name	Duration	Start	Finish	Predecessors
1		**Requirement Phase**	**23 days?**	**9/18/20 8:00 AM**	**10/20/20 5:00 PM**	
2		Identify Business Requirements	2 days?	9/18/20 8:00 AM	9/21/20 5:00 PM	
3		Identify Key Users	1 day?	9/22/20 8:00 AM	9/22/20 5:00 PM	2
4		Develop Use case	2 days?	9/23/20 8:00 AM	9/24/20 5:00 PM	3
5		User Interface Prototyped and Approved	10 days?	9/25/20 8:00 AM	10/8/20 5:00 PM	4
6		Functional Requirements Writing	2 days?	10/9/20 8:00 AM	10/12/20 5:00 PM	5
7		Project Test Plan	3 days?	10/13/20 8:00 AM	10/15/20 5:00 PM	6
8		Meeting Between BA and Maketing Team	1 day?	10/16/20 8:00 AM	10/16/20 5:00 PM	7
9		Finalize SRS Document	2 days?	10/19/20 8:00 AM	10/20/20 5:00 PM	8
10		**Design Phase**	**30 days?**	**10/21/20 8:00 AM**	**12/1/20 5:00 PM**	
11		Define Technical Architecture	2 days?	10/21/20 8:00 AM	10/22/20 5:00 PM	
12		Design UI and System Interface	7 days?	10/23/20 8:00 AM	11/2/20 5:00 PM	11
13		Design Network and Database	7 days?	11/3/20 8:00 AM	11/11/20 5:00 PM	12
14		Functional Design Document	2 days?	11/12/20 8:00 AM	11/13/20 5:00 PM	13
15		Integration Test Plan(draft)	5 days?	11/16/20 8:00 AM	11/20/20 5:00 PM	14
16		System Test Plan(Draft)	5 days?	11/23/20 8:00 AM	11/27/20 5:00 PM	15
17		Update Plan and Refine Estimations	2 days?	11/30/20 8:00 AM	12/1/20 5:00 PM	16
18		**Programming Phase**	**43 days?**	**12/2/20 8:00 AM**	**1/29/21 5:00 PM**	
19		Acceptance Test Plan(draft)	6 days?	12/2/20 8:00 AM	12/9/20 5:00 PM	
20		Integration Test Plan(Final)	7 days?	12/10/20 8:00 AM	12/18/20 5:00 PM	19
21		System Test Plan(Final)	5 days?	12/21/20 8:00 AM	12/25/20 5:00 PM	20
22		Code and Document	18 days?	12/28/20 8:00 AM	1/20/21 5:00 PM	21
23		Test and Debug	7 days?	1/21/21 8:00 AM	1/29/21 5:00 PM	22
24		**Testing Phase**	**24 days?**	**3/2/21 8:00 AM**	**4/2/21 5:00 PM**	
25		Integration testing	10 days?	3/2/21 8:00 AM	3/15/21 5:00 PM	
26		System test and report	12 days?	3/16/21 8:00 AM	3/31/21 5:00 PM	25
27		Acceptance Test(Final)	2 days?	4/1/21 8:00 AM	4/2/21 5:00 PM	26
28		**Installation and Acceptance Phase**	**15 days?**	**4/5/21 8:00 AM**	**4/23/21 5:00 PM**	
29		System Installation	10 days?	4/5/21 8:00 AM	4/16/21 5:00 PM	

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Figure-3: Task Schedule

5. Marketing Plan

For the marketing plan it has been assumed that the system has been almost developed. There will be three types of marketing plan. They are-

- Short Term Plan: At the time of the birth of a child, with the first BCG vaccine given, a child will be registered in the system with an unique id. Doctor or nurse will let the parents know that there is a new system to track their baby's vaccine record with a reminder. Also it will be advertised in TV ads, Social media ads, Newspaper, Billboard that a new vaccine tracking system has been made available at the hospitals to keep track of all the records of vaccination so that no babies will miss their vaccine.
- Long Term Plan: We will try extend some features in the system. Whenever a child gets checked up by a doctor their medical history with prescription will be added in the system with proper health record. Later on, all types of vaccine list will be added in the system with the record.
- Continuous Plan: In the current system parents can login through web, there will be mobile application made for this system. Parents will be able to see location of the nearby health center with google map integration. If possible, there will be the facility to get vaccine at home where health workers will make home stop vaccination for ill children.

6. Cost and Profit Analysis

COCOMO model: This project is considered as an Organic i.e. a relatively simple software projects in which a small teams with good application experience work to a software development project

Here,

PM = Person-months needed for project

SLOC = Source lines of code = 10,000 sloc/1000 = 10

P = Project complexity = 1.05

DM = Duration time in months for project

T = SLOC-dependent coefficient = 0.38

ST = Average staffing necessary

Coefficient< Effort Factor> = 2.4

Effort, PM = Coefficient< Effort Factor> * $(\mathrm{SLOC}/1000)^{P}$

= 2.4 * 11.22018454

= 26.9284429

= 27 [approx.]

Development time, DM = 2.50 * $(\mathrm{PM})^{T}$

= 2.50 * 3.49879285

= 8.746982126

= 9 months

Required Number of people, ST = PM/ DM

= 27/9

= 3

6.1 Cost Estimation:

Cost Type	Description	Cost Assumption
Development Cost	Designer Cost	60,000 BDT
	Site launch (hosting)	80,000 BDT
	Computer and Resources	6,00,000 BDT
	Maintenance (yearly)	2,00,000 BDT
	Server Hosting (yearly)	95,000 BDT
	Developers	8,00,000 BDT
	Internet, Electricity, IPS, Generator Cost	2,00,000 BDT
Marketing Cost	Advertisement	50,000 BDT
	Facebook Marketing	55,000 BDT
	YouTube Marketing	55,000 BDT
	Billboard	2,00,000 BDT
	Hospital Campaign, Brochure	70,000 BDT
Total= (Development+Marketing)		24,65,000 BDT

6.2 Profit Estimation:

For each new born record, charged= 100 TK (5131 births 21st September) [https://countrymeters.info/en/Bangladesh]

After end of EPI course, for other vaccines cost will be charged. For the long term extended health record initial fee will be applicable.

Profit will be estimated based on ROI (return of investment). We are assuming that the result of ROI will be seen in 6- 8 months.

We believe that this project will be very helpful in keeping track of this generation's vaccine and health record. We are hoping that it will be a successful project and it will meet our expectations of social benefit.

7. References

1. https://www.who.int/health-topics/vaccines-and-immunization?gclid=CjwKCAjwzIH7BRAbEiwAoDxxTqJNPyn9n8CrRMho8DXCqLL1Nr4A1XnLQTSgXSIZDpA-_yevvOiNPhoCr2cQAvD_BwE#tab=tab_1
2. http://inceptavaccine.com/immunization-schedule.php
3. https://www.biometricupdate.com/201909/id2020-and-partners-launch-program-to-provide-digital-id-with-vaccines