

# **PEDIATRIC VACCINATION SYSTEM (I-VACCI)**

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## Abstract

Web based pediatrics vaccination system (I-VACCI) is a web based system that is developed to assist health care professional and public health administrator in managing the vaccination for pediatrics. The web based system, I-VACCI, will record vaccination records for Malaysian's pediatrics. The concept of a web-based pediatrics vaccination system is, it stores, records and maintains data of vaccination record for Malaysian pediatrics. I-VACCI helps health care professional to manage better vaccination data such as the types of vaccination given to the pediatrics according to the schedule, generate factual data on the progress of immunization in the country and manage better its operation and optimize its cost. I-VACCI is developed by using *Hypertext Preprocessor* (PHP) and MySQL as the database. PHP is used because it is widely used and powerful language. I-VACCI will be accessed via Internet. Finally, we can conclude that the web based pediatrics vaccination system (I-VACCI) will be an advantage to manage the vaccination that given to the pediatrics and it benefits to various parties.

### **Abstrak**

Sistem Vaksinasi Pediatrik (I-VACCI) adalah satu sistem berasaskan web yang dibangunkan untuk membantu profesional dan pentadbir awam dalam menguruskan vaksinasi untuk pediatrik. I-VACCI akan mencatat rekod vaksinasi untuk pediatrik Malaysia. Konsep sistem berasaskan web vaksinasi pediatrik ini adalah untuk menyimpan rekod dan mengekalkan data rekod vaksinasi untuk pediatrik Malaysia. I-VACCI membantu penjagaan kesihatan profesional untuk menguruskan data vaksinasi yang lebih baik seperti jenis vaksin yang diberikan kepada pediatrik mengikut jadual, menjana fakta mengenai kemajuan imunisasi di negara ini dan menguruskan operasi dengan lebih baik dan mengoptimumkan kos. I-VACCI dibangunkan dengan menggunakan Hypertext Preprocessor (PHP) dan MySQL sebagai pangkalan data. PHP digunakan kerana ia digunakan secara meluas dan merupakan bahasa yang mudah difahami. I-VACCI akan diakses melalui Internet. Akhir sekali, kita boleh menyimpulkan bahawa pediatrik vaksinasi sistem(I-VACCI) berasaskan web akan menjadi satu kelebihan untuk menguruskan vaksinasi yang diberikan kepada pediatrik dan ia memanfaatkan untuk pelbagai pihak.

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## **CHAPTER 1**

### **INTRODUCTION**

This chapter briefly discuss on the overview of this research. It contains five sections. The first section is introduction; followed by the problem statement. Next are the objectives where the project's goal is determined. After that are the scopes of the system and lastly is the thesis organization which briefly describes the structure of this thesis.

#### **1.1 Background**

Prevention of disease is the key to public health. There is a general saying that “prevention is always better than cure”. Vaccines protect people from catching specific diseases. Vaccines also help preventing the spread of infectious diseases in a country. Such diseases include polio, whooping cough, diphtheria, measles, rubella (German measles), mumps, Haemophilus influenza type b (Hib) and tetanus [1]. Parents are constantly concerned about the health and safety of their children. Therefore, they take many steps in order to prevent their children from catching a disease. One of the options is vaccination. Vaccine works to protect infants, children and even adults from illnesses and death caused by many infectious diseases. Vaccination has its own time, period and schedule. The dosage of vaccination remains the same among babies but may be different for adults [1].

Jacobson et al. found that the success of the pharmaceutical industry in developing new pediatric vaccines has resulted in a crowded recommended immunization schedule requiring several clinic visits over the first 12 years of life [13]. The science and practice of immunization has become among the fastest growing and changing fields in medicine. Despite growing knowledge and access to new and better vaccines, young children are not being immunized on time, largely due to missed opportunities to immunize them while they are in the doctor's office [3]. Experts have hailed vaccination as one of ten great twentieth century achievements in public health in the United States. Pediatric vaccines have dramatically reduced infectious disease and childhood mortality [6]. The administration of vaccines to infants and children has had an extraordinarily beneficial impact on public health by reducing morbidity, mortality and the social and economic burden associated with a number of common infectious diseases [2].

Pediatric Vaccination System (I-VACCI) is a web-based system which is designed to assist the physician and other staffs in the clinic with pediatric vaccination record. Child health care providers often find that clinical information system have limited usefulness for pediatric vaccination record. The major important for the child are vaccination management, growth tracking, medication dosing, data norms, and privacy in special pediatric populations. It is more important in providing pediatric care than adult care. Therefore Pediatric Vaccination System (I-VACCI) will be used to record health information of vaccination for pediatrics. It can easily access by authorized users only. Provision of knowledge and decision-support is the tools that enhance the quality, safety and efficiency of pediatric care.

Immunization is among the most effective and gratifying ways we can protect our patients from disease. The understanding of vaccine science and practices is evolving along with rapid development of new vaccines. The pediatric and adolescent practitioner needs to stay current with these developments, to provide optimal protection for patients. Therefore this I-VACCI should be developed to help the pediatrician in managing vaccination system. A health examination system with a clinical decision system can greatly reduce the burden on clinical workers and markedly improve the quality and efficiency of health examination task. Besides, all the patient detail and report will remain confidential in the system. The usage of paper works can also be reduced.

## **1.2 Problem Statement**

Ria Child Specialist is a leading and famous clinic in the area of Kedah. Currently they are still using manual method in handling pediatrics vaccination details. There is no online system to handle pediatrics vaccination data and all the data seems to be lost easily. Moreover, when the pediatrics wants to fix appointment with the doctor for the next vaccination, staffs need to calculate manually the date for the next visit. Besides, staffs are facing difficulties to retrieve any pediatrics data for record or reference. It consumes time for the staff to find the record of the pediatric one by one.

## **1.3 Objectives**

The aims of Pediatrics Vaccination System (I-VACCI) are as below:

- i. To design and develop an easy and suitable web based vaccination system for pediatrics and to ease the work of the staff in the clinic.
- ii. To record all the pediatrics vaccination information for future reference and enhancement, and also to update and search pediatric vaccination record.
- iii. Provide security for the data or information about the pediatric details, vaccination record and drug prescription that kept in the database.

## **1.4 Scopes**

Scope of Pediatrics Vaccination System (I-VACCI) is as below:

- i. I-VACCI is only used to record the pediatrics vaccination data.
- ii. I-VACCI is only used to fix appointment for the next vaccination.
- iii. I-VACCI is only used by Ria child specialist clinic staff and doctors.

## **1.5 Thesis Organization**

This thesis consists of four (4) chapters. Chapter 1: Introduction is a brief explanation to readers on the project that has been developed. This chapter shows the basic concept of the system, problem statements of the system, objectives, scopes, and how the report is organized. Chapter 2: Literature Review depicts the manual systems and the existing systems as the case studies of the project. This chapter also reviews the technique, method, equipment, and technology that had been used in the case studies. Chapter 3: Methodology discusses about the overall workflow in the development of the project. This chapter also discusses the method, technique or approach that has been used while designing and implementing the project. Chapter 4: Conclusion briefly summarizes the project

## **CHAPTER 2**

### **LITERATURE REVIEW**

This chapter explains about the reviews for the chosen project. This chapter is divided into two sub reviews that require students to study to get complete information about the project.

#### **2.1 Existing System Review**

This section is to review the current system and the existing system that related to vaccination field.

##### **2.1.1 The Immunization Registry Information System (IRIS)**

The Immunization Registry Information System (IRIS) is Iowa's answer to an immunization registry. In general, immunization registries are confidential, computerized state or community based information systems. The Iowa department of public health (IDPH) has developed IRIS to enable public and private providers to consolidate and maintain a computerized immunization record for each person that receives vaccination in Iowa. IRIS is a user-friendly application that all staff members can use. Iris able to store private and confidential immunization records of residents of all ages, print the official IDPH certificate of immunization that is required for all the patients. it also able to produce reminder letters and keep patients from getting unnecessary doses of vaccine. Besides that, IRIS can manage the vaccine inventory and find immunization records of patients that are stored in the program. Produce a variety of other reports that are available on the applications is also a function of this system.



### **2.1.2 The Kansas Immunization Registry**

The Kansas Immunization Registry, also referred to as KSWebIZ, is the statewide immunization registry. It is a web based centralized birth to death database that maintains complete, accurate and secure immunization records for all Kansas residents. The purpose of KSWebIZ is to consolidate immunization information among health care professionals, assure adequate immunization levels, and avoid unnecessary immunizations. The goal of KSWebIZ is to serve as a repository for immunization records that are accurate, up-to- date, and complete. This web-based system enables end users to accurately assess a patient's immunization status. Registry data is used by healthcare professionals to monitor the immunization status of children and adults, assure compliance with state statutes on immunization requirements for individuals, identify geographic areas at high risk due to low immunization rates and document/assess vaccination coverage during disease outbreaks.

### **2.1.3 PING Immunization Application**

The PING immunization application is a web-based, patient-controlled electronic medical record system based on the Personal Internetworked Notary and Guardian (PING) project. Its-goal is to increase immunization coverage by improving shared decision making with patients surrounding immunization issues. The PING immunization application assists patients in managing pediatric immunization records. It leverages PING's nomadic computing support to allow patients to share immunization records with providers, school nurses, WIC offices, and other agencies. The PING immunization application is fundamentally different from immunization registries efforts. Typically, they are governmental entities that record and assess immunization coverage for an entire geographic area. We will also utilize PING's security features to give patients tight control over access privileges to their records.

### 2.1.4 Comparison between Three Existing Systems

Below are the comparisons of three existing systems.

**Table 2.1** Comparison of three existing systems

<b>Features</b>	<b>Immunization Registry Information System (IRIS)</b>	<b>Kansas Immunization Registry (KSWebIZ)</b>	<b>PING Immunization Application</b>
Purpose	Developed IRIS to enable public and private providers to consolidate and maintain a computerized immunization record for each person that receives vaccination in Iowa.	This application is to consolidate immunization information among health care professionals, assure adequate immunization levels, and avoid unnecessary immunizations.	PING immunization application assists patients in managing pediatric immunization records.
Technique used	Web based system	Web based system	Web based system
Devices	Wireless Personal Digital Assistants	RFID readers and tags, motion sensors, and a wireless sensor mote	No devices
Security	It has been implemented with a multilayered security infrastructure to ensure secure access to healthcare processes and sensitive patient data	No security implemented	There is security features to give patients tight control over access privileges to their records.

## **2.2 Security**

This section will review on types of security applied in web based system. Example of security applied is password encryption.

### **2.2.1 MD5 Encryption**

With the increasing popularity of computers and the Internet in the past two decades, people have paid more attention on information and network security which results in a number of Encryption algorithms coming into being. MD5 algorithm is currently the mainstream for the cryptographic check and file check. In the databases of many sites, even in the UNIX and LINUX operating systems, users log in passwords to preserve by taking the check form of MD5 . MD5 was developed from MD, MD2, MD3 and MD4. It can compress any length of data into an information digest of 128bits while this segment message digest often claims to be a digital fingerprint of the data. This algorithm makes use of a series of non-linear algorithm to do the circular operation, so that crackers cannot restore the original data. In cryptography, it is said that such algorithm as an irreversible algorithm, can effectively prevent data leakage caused by inverse operation. Both the theory and practice have well security, because the use of MD5 algorithm does not require the payment of any royalties, time, and cost less which make it be widely used in the general non-top-secret applications.[25]

### **2.2.2 SHA-1 Algorithm**

In cryptography, SHA-1 is a cryptographic hash function designed by the United States National Security Agency and published by the United States NIST as a U.S. Federal Information Processing Standard. SHA stands for "secure hash algorithm". The three SHA algorithms are structured differently and are distinguished as SHA-0, SHA-1, and SHA-2. SHA-1 is very similar to SHA-0, but corrects an error in the original SHA hash specification that led to significant weaknesses. The SHA-0 algorithm was not adopted by many applications. SHA-2 on the other hand significantly differs from the SHA-1 hash

function. SHA-1 is the most widely used of the existing SHA hash functions, and is employed in several widely used applications and protocols. SHA-1 produces a 160-bit message digest based on principles similar to those used by Ronald L. Rivest of MIT in the design of the MD4 and MD5 message digest algorithms, but has a more conservative design. The original specification of the algorithm was published in 1993 as the Secure Hash Standard, FIPS PUB 180, by US government standards agency NIST (National Institute of Standards and Technology). This version is now often referred to as SHA-0. It was withdrawn by NSA shortly after publication and was superseded by the revised version, published in 1995 in FIPS PUB 180-1 and commonly referred to as SHA-1.[6]

### 2.2.3 Comparison between SHA-1 and MD5

MD5 and SHA-1 are two algorithms used for hashing passwords. MD5 and SHA-1 strengthens web password authentication. By this comparison we can conclude that SHA-1 is slower than MD5 but the larger message digest makes it more secure against brute-force collision and dictionary attacks.

Type of File	Size	Time consumed by MD5	Time consumed by SHA1
eac7.exe	18.0MB	180.2592msec	210.3024msec
Foxitreader.msi	3.65MB	20.0288msec	40.0756msec
Synopsis.doc	58KB	10.0144msec	10.0144msec
Test.txt	14.4KB	0.01msec	0.01msec

**Table 2.2:** Comparison of algorithm with respect to time and size

Two hashing algorithms MD5 and SHA1 are used to compute hashes of files with different extensions. We can also conclude that algorithms take more time in calculating hashes of the files with large sizes. When we observe the time consumed by SHA1 we found that SHA1 is slow and takes more time because it takes fewer rounds in calculating hash as

compared to MD5 which completes its hashing process in four rounds. It is found that SHA-1 is more secure but slow in execution as SHA-1 includes more rounds than MD5 in calculating hashes.[18]

## **2.3 Scripting Languages**

There are many tools can be used to create dynamic and interactive web pages. PHP and ASP.NET is the most popular programming tools for develop web pages.

### **2.3.1 Hypertext Preprocessor (PHP)**

PHP is a widely used and powerful language. It is a scripting language that was originally designed for web development which is to produce dynamic web pages. Whether included in a web server as a module or executed as a separate Common Gateway Interface (CGI) binary, it is able to access files, execute commands and open network connections on the server. PHP is designed specifically to be a more secure language for writing CGI programs than Perl or C. It can be deployed on most web servers and on almost every operating systems and platforms for free of charge. PHP succeeds an older product, named PHP/FI. PHP/FI was created by Rasmus Lerdorf in 1995, initially as a simple set of Perl scripts for tracking accesses to his online resume. He named this set of scripts 'Personal Home Page Tools'. As more functionality was required, Rasmus wrote a much larger C implementation, which was able to communicate with databases, and enabled users to develop simple dynamic web applications.[9]

**Table 2.3:** Advantage and Disadvantage of PHP.

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"> <li>• Open Source, readily available and dual-licensed.</li> <li>• Very Easy to understand the syntax.</li> <li>• Interfaces very easy with Apache or MySQL.</li> <li>• Platform agnostic. Can run on Windows Linux or Mac servers. Also very scalable.</li> <li>• Lots of hosting services have it ready to use, does not need special configuration.</li> <li>• Easy to access other web-based tools through PHP (i.e. Google maps, etc.).</li> </ul>	<ul style="list-style-type: none"> <li>• Need to add JavaScript, java or other client-side language in your output.</li> <li>• Need to manage variables coming in and going out and between pages due to different types of browser.</li> <li>• Web programming (regardless of language) is open to security flaws due to unknown vulnerabilities.</li> </ul>

### 2.3.2 Active Server Pages (ASP.net)

Active Server Pages are a Microsoft technology that allows developers proficient with either Visual Basic or VBScript to easily adapt their skills and knowledge to the web with very little effort at all. Asp uses ActiveX Data Object (ADO) to connect to several popular database management systems including Microsoft Access and SQL Server, Oracle, dBase and Visual Fox Pro. We can also talk to Mysql databases using ODBC through ASP. The Mysql database can either be on the same server, or on the other side of the world; running Windows, Linux, Solaris, FreeBSD, MacOS X, or any other one of the several operating systems that Mysql supports. There are two different ways to connect to a Mysql database using the MyODBC driver: via a DSN, and via a connection string. MyODBC is the Open Database Connectivity (ODBC) compliant driver that we can use to connect to a

Mysql database. Connection strings allow us to connect to a database using an ADO connection [4].

**Table 2.4:** Advantage and Disadvantage of ASP.Net.

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"> <li>• ASP.NET makes development simpler and easier to maintain with an event-driven, server-side programming model</li> <li>• ASP.NET pages are easy to write and maintain because the source code and HTML are together.</li> <li>• The source code is compiled the first time the page is requested. Execution is fast as the Web Server compiles the page the first time it is requested. The server saves the compiled version of the page for use next time the page is requested</li> <li>• Have good security features.</li> <li>• Easily works with ADO .NET using data-binding and page formatting features</li> </ul>	<ul style="list-style-type: none"> <li>• ASP.NET applications can only run on Windows platform.</li> <li>• The framework tends not to support automatic unit testing with tools like NUnit very well, which makes test-driven development difficult.</li> <li>• View state can get really large or have negative effects on performance. This is especially true for some of the more complex server controls.</li> <li>• ASP.NET does not fit the general architecture of internet and web based applications.</li> </ul>

## 2.4 Operating Systems

Operating systems serve as executing platforms and resource managers for applications. Operating system that communicates directly with hardware is known as the host operating system, whereas virtual operating systems have all the features of a real operating system but they run inside the host operating system. Windows, Mac and Linux are the most popular operating systems in computer field.

### **2.4.1 Linux**

Along with the increasing concern on the safety of operating system, Linux has become popular in the domestic market with its security and efficiency [14]. Linux over the past few years has gained in popularity as the operating system for embedded networking equipment. Its reliability, low cost and undisputed networking capabilities made it one of the most popular choices for the networking devices. As Linux clusters have matured as platforms for low-cost, high-performance parallel computing, software packages to provide many key services have emerged, especially in areas such as message passing and networking [10].

### **2.4.2 Windows**

Microsoft Windows 1 is arguably the most successful commercial software in history. Since the first release of Windows NT 3.1 in July, 1993, there have been 700 million Windows users in the world. Window system offer many benefits to users, such as being able to work on multiple tasks concurrently or working with a number of windows each connected to different remote machines or applications. Unless these windows are managed efficiently, users can easily become overwhelmed by the number of windows. Windows has changed the way people work, communicate, entertain and live [24].