

**How to Cite:**

Ragul Kumar, R., & Radha, P. (2022). A novel PWA architecture for assisting homeopathy diagnosis. *International Journal of Health Sciences*, 6(S1), 4480–4490.  
<https://doi.org/10.53730/ijhs.v6nS1.5833>

## **A novel PWA architecture for assisting homeopathy diagnosis**

**Ragul Kumar R**

Final Year MCA Student, MEPCO Schlenk Engg. College, Sivakasi, Tamilnadu, India

Email: [rragul Kumar11@gmail.com](mailto:rragul Kumar11@gmail.com)

**Radha P**

Professor & Director / MCA, MEPCO Schlenk Engg. College, Sivakasi, Tamilnadu, India

Email: [pradha@mepcoeng.ac.in](mailto:pradha@mepcoeng.ac.in)

**Abstract**--Today the automation is expected in every aspect of human life. Homeopathy is one kind of medical field followed by people regarding their health care. The life style of modern men or women could be changed due to the guidelines of this medical diagnosis. For improving the quality of background processes of this medical field, the HOT technologies like cloud computing and dynamic web page developments are being applied. In this work, a novel PWA (Progressive Web App) is proposed to support the medical diagnosis of Homeopathy. The purpose of work is to computerize the Front Office Management of Hospital. It is user friendly simple, fast, and cost-effective. It deals with the collection of patient's information, diagnosis details, etc. The main function of the system is to retrieve the meaningfully information of doctors, patients details and diagnosis details when required. System input contains patient details, diagnosis details, while system output is to get these details on to the screen. It is highly authorized system which permits only administrator or receptionist. Data stored in data base could be retrieved easily. Using the proposed strategy PWA, the data are well protected for personal use and data processing will be done very quickly. PWA users can have the advantage of employing a high level mobile application with a full screen mode once the installation method in their own device The PWA relies on the ideas of one application for all platforms rather like the hybrid approach.

**Keywords**---Progressive Web Apps, Homeopathy, Scripting languages.

## **Introduction**

This work designs a novel PWA architecture for assisting Homeopathy Diagnosis provides the benefits of streamlined operations, enhanced administration, control, superior patient care, strict cost control and improved portability. HMS(Homeopathy Management System) is powerful, flexible and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. More importantly it is backed by reliable and dependable support. This work focuses on FireBase Cloud and PWA techniques. Many of the applications are using MYSQL database as backend. The fire store database is proposed in this work with Reactjs as front-end software. The PWA acts like interface to map the web based application and mobile based application. This work covers registration of patients, storing their details into the system, and customized computerized billing in the pharmacy & labs. The software has the facility to give a unique ID for every patient and stores the details of every patient and the staff automatically. It includes a search facility to know the current status of each room. User can search availability of a doctor and the details of a patient using the ID. The Homeopathy Hospital Management System needs the valid credentials for accessing. It is accessible either by an administrator or receptionist. Only they can add data into the Cloud. The data can be retrieved easily. The interface is very user-friendly. The data are well protected for personal use and makes the data processing very fast. Hospital Management System is powerful, flexible, and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. Homeopathy Hospital Management System is designed for multi-specialty hospitals, to cover a wide range of hospital administration and management processes. It is an integrated end-to end Hospital Management System that provides relevant information across the hospital to support effective decision making for patient care, hospital administration and critical financial accounting, in a seamless flow. It improves the effectiveness and quality of work. Managing the key processes efficiently is critical to the success of the hospital helps the managements in all processes. The literature survey is included in chapter 1. The chapter 2 covers architecture. The methodology and related technologies are explain under the chapter 3. The system design is described in Chapter 4. Chapter 5 covers the outcome of this work. The conclusion and future enhancement are described in Chapter 6. This work was developed using ReactJS as front end and Firestore as backend.

## **Materials and Methods**

Homeopathy hospitals currently use a manual system for the management and maintainance of critical information. the current system requires numerous paper forms, with data stores spread through out the hospital management infrastructure. Often information is incomplete or does not follow management sandards. Forms are often last in transit between departments requiring a comprehensive auditing process to ensure that no vital information is lost. Multiple copies of the same information exist in the hospital and may lead to inconsistencies in data in various data stores.

There are numerous articles and books available to illustrate the Hospital Management system. but One of the major challenges existing hospital

management systems face is around operational efficiency and wait times between different processes, departments and persons. A hospital resource and patient management system based on real-time data capture and intelligent decision making” Author(s): Musa, A. Lancashire Bus. Sch., Univ. of Central Lancashire, Preston, UK Yusuf, Y, Meckel.M. Systems and Informatics (ICSAI), 2012 International Conference. This paper highlights such limitations of existing systems and proposes a RFID(Radio Frequency ID) and wireless sensor based , location and information management framework that facilitates real time tracking of hospital assets, personnel and patients as they move through pre-set procedures as part of daily activities of the hospitals. The International Journal for Research in Engineering Application & Management system covers the visual simulation and providing ability to analyse the ongoing operations so they can be corrected to achieve increased process efficiency and service levels.

Digvijay H. Gadhari, 2Yadnyesh P. Kadam, 3Prof. Parineeta Suman 1,2,3Department of Computer Engineering, Saraswati College of Engineering, Kharghar, Mumbai, Maharashtra, India. International Journal for Research in Engineering Application & Management (IJREAM). The author of this paper focuses more on needs of hospital manager and the ecosystem in which he/she operates. The internal and external Environment shaping factors ESFs that bear an impact or association on daily hospital activities and decision making process that the hospital manager has to go through in each situations. Some of the challenges that this ecosystem needs to work on are high demand pressure, greater customer satisfaction level and low profit margins. This paper more so contributes to Planning, Design and development aspects of any Hospital management system by highlighting ESFs that should be considered.

Sayali Sunil Tandel, Abhishek Jamadar, “Impact of progressive web apps on web app development” , International Journal of Innovative Research in Science Engineering and Technology (IJIRSET), Vol. 7, Issue 9, September 2018. When compare to standard web application the pwa web application is more reliable ,fast and engaging when enabling notifications, even on the web App, users will receive notifications or be alerted to any pertinent info within the application, even if the browser isn't open. Even the bandwidth is low while using this application there is no lagging in between that time because of service worker play a great role for using offline mode.

The Hospital Management System is designed for any hospital to replace their existing manual paper based system. The new system is to control the information of patients, staff and operating schedules and patient invoices. These services are to be provided in an efficient, cost effective manner, with the goal of reducing the time and resources currently required for such tasks. For improving the quality of background processes of this medical field, the HOT technologies like cloud computing and dynamic web page developments are being applied. In this work, a novel PWA (Progressive Web App) is proposed to support the medical diagnosis of Homeopathy. The purpose of work is to computerize the Front Office Management of Hospital. It is user friendly simple, fast, and cost-effective. It deals with the collection of patient's information, diagnosis details, etc. The main function of the system is to retrieve the meaningful information of doctors, patients details and diagnosis details when required. System input contains

patient details, diagnosis details, while system output is to get these details onto the screen. It is highly authorized system which permits only administrator or receptionist. Data stored in data base could be retrieved easily. Using the proposed strategy PWA , the data are well protected for personal use and data processing will be done very quickly. The overall architecture of the proposed work is presented in Figure 1.

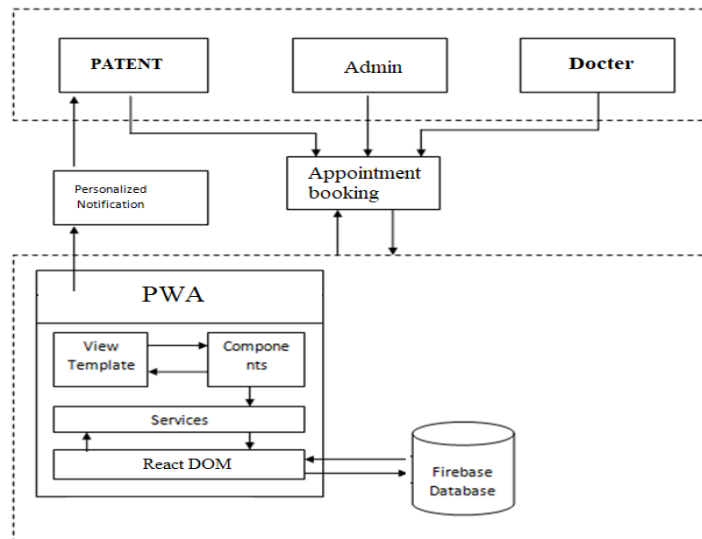


Figure 1. Overall Architecture of the proposed work

The web application development method is carried out in two phases which incorporates backend and frontend development. The application is developed using VS Code (Visual Studio Code) is computer code used for writing and redaction of the code at the developing environment. It supports all the most operating systems like windows, macOS, linux. It is well-liked among the developers, thanks to its options that embody the support for debugging, syntax highlight, snippets, code refactoring and intelligent code completion.

### Backend development

Backend development refers to the application's server side. It usually consists of 3 elements which incorporates a server, an application associated with the information. The backend code can communicate with the database and provides information to the browser. The backend language used for developing is Nodejs. For the application developed for html, css, javascript, Reactjs. The application runs within the server that is receiving the requests from user. The data is managed by the database, Firestore database is used for the project. Fetching of the data is done using by ReactJS that allows us to perform HTTP requests and to easily manipulate those requests and their responses.

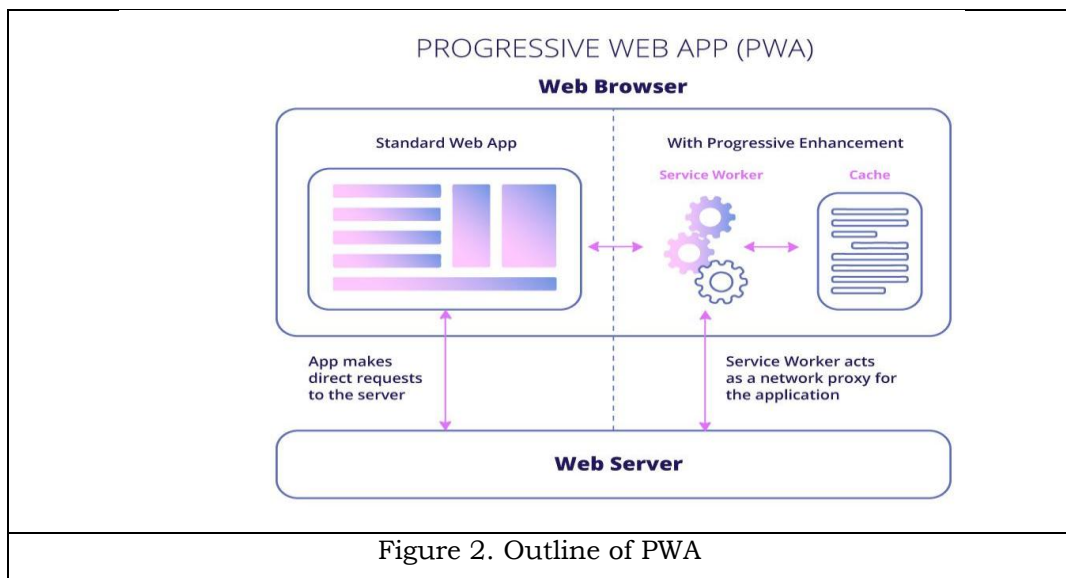
### Frontend development

Frontend development is based on user side development. It is basically the user manages and user interface. The frontend tools are HTML, CSS, java script,

Material-UI and ReactJS. These facilities provide a better experience for the users. The HTML is used to create a web page. For a pleasing design, the CSS is used for the styling purpose with full featured options like Material-UI and linguistics UI. The javascript has many main frameworks like angular react, view.js and JQuery. ReactJS program line interface makes the start of associate ReactJs project quite simple. React interface consists of commands that facilitate the developers to develop and start on their project in no time. The installation ought to be done globally else it'll get downloaded within the current directory. Usage of React interface for developing React applications is suggested since it saves the time as installation and configuration of all required dependencies and wiring everything up isn't needed just in case of interface.

### **Progressive Web Apps**

PWA (Progressive web Application) are web apps developed using a number of specific technologies and standard patterns to allow them to take advantage of both web and native app features. PWA may be a mobile development approach that seeks to overcome the challenges or weaknesses of earlier approaches like native, ancient internet etc. Adopting the approach of PWA produces special reasonably internet apps which requires no installation before exploitation and is served from a foreign server via a secured machine-readable text Transfer Protocol (HTTPS) in contrast to regular mobile internet apps that might be served exploitation the protocol. PWA users can have the advantage of employing a high level mobile application with a full screen mode using the installation method in their own device (Akter, S., Wamba, S.F. 2016). The PWA relies on the ideas of one application for all platforms rather like the hybrid approach (Dhanashri et. al, 2020). The PWA is Quick, generally rendering content on user's device in just seconds. Stable, even on weak quality Internet connections or on weaker devices and can even work offline. PWA combines the options of each native and traditional internet application that gains the preference over all different architectures. The foremost necessary feature of PWA is that, it can be simply be installed from the home screen with one click it in the device (Akter, S. & Wamba, S.F. 2016). PWA combines the options of each native and traditional internet application that gains the preference over all different architectures. The foremost necessary feature of PWA is that, it need not be downloaded from a playstore. It will simply be installed from the home screen with one click. Whereas, the native applications includes many procedures for putting in it on the device. PWA's perpetually have associate in nursing favorable position due to its ability to work offline and on low networks, also provide the push notifications. progressive web apps includes internet app manifests as its half through that websites which will be put in to a device's home screen without play store (Sayali & Abhishek, 2018). The basic architecture of PWA is mentioned in Figure 2.



## ReactJS

ReactJS is a declarative, efficient, and flexible JavaScript library for building reusable UI components. It is an open-source, component-based front end library responsible only for the view layer of the application. Commonly known as React, it gives coders resources for developing reusable and easily integral UI components that reduce development time and provide a responsive user interface for website, web app and mobile app. The User Interface or UI is anything a user uses to interact with a website, such as a button, a link, menu tabs, or search bars. React offers an extensive collection of such UI components that front-end developers use for creating personalized interactive elements. React mainly focuses on building the View Layer (consisting of all the parts of a page visible to users) of an application. Many users describe React as a framework instead of a library.

### Advantages of ReactJS

The two main features that make React more than just a library are JSX and Virtual DOMs. JSX or JavaScript extension combines HTML syntax with JavaScript making it easier for developers to interact with the browser. Virtual DOM is a virtual copy of the DOM tree created by web browsers that React creates for simplifying the process of keeping track of updates in real-time. It has the features as given below:

- Smooth Learning Curve
- Large Community
- Reusable Components
- Virtual DOMS
- JSX
- Unidirectional Data Flow

- Redux
- React Hooks

Therefore, React, developed way back in 2011, is still very much relevant and is highly recommended for web development.

## **Firestore**

Cloud Firestore is Firebase's fully managed cloud-native NoSQL document database that is fast and serverless. It simplifies syncing, storing, and querying data for mobile, web, as well as IoT apps. With the benefit of Google Cloud, it offers great scalability. It provides live synchronization and offline support. Google Cloud Firestore is a collaboration of the Google Cloud platform with Firebase thus leveraging the benefits of both. It combines the expertise earned from the Firebase Realtime Database with the scalability of the Google Cloud Platform. It also offers an automatic upgrade. Cloud Firestore is a serverless solution designed to provide a great developer experience and to simplify app development. It is integrated with both Google Cloud Platform and Firebase that is Google's mobile development platform, offering benefits of both. Being a serverless solution, Cloud Firestore is very helpful for prototyping, iterating, and getting a production system up and running quickly and with ease. It offers live synchronization and offline support. Cloud Firestore offers the benefits of ACID transactions that are atomicity, consistency, isolation, and durability, across hundreds of docs and collections. It requires less data flattening or denormalization as it is more structured and utilizes nesting of objects. Cloud Firestore supports indexed queries, thus it enables users to combine filtering and sorting on a property in a single query. It offers atomic (either all or nothing executes) write and transaction operations that can be batched and completed atomically. This also means that the transactions will keep repeating until completion, automatically. Cloud Firestore is a fast NoSQL database designed for scaling with the powerful infrastructure of Google Cloud Platform offering automatic horizontal scaling (in and out) as per the application's load. With Cloud Firestore, it is easier to handle and organize at scale even complex, hierarchical data as it stores data as a collection of documents, using sub-collections within documents. Cloud Firestore is a multi-region solution that scales automatically. It provides flexible and robust security for both mobile and web platforms with Cloud Firestore Security Rules (with flexible rules syntax), and for server SDKs with Identity and Access Management. With Cloud Firestore, you get automatic data validation with non-cascading rules (where the rules don't cascade by default without a wildcard) that combine authorization and validation. Cloud Firestore allows you to write rules. It is relatively new and designed as an improvement over the previous Firebase database. It has numerous benefits as discussed above. It is preferred over the three listed here, for its ease of use and powerful querying.

Every patient record covers s ID, Name, Symptoms, blood pressure details, heartbeat, remedies, comments and family diseases. The basic details patients includes the personal details such as age, phone number, mail ID, gender, permanent address, work type, height, weight, residential address etc. The doctor details such as ID, Name, Work experience, Email ID, Qualification details and family diseases are stored.

This work has the following main modules:

**Module 1: Patient Form Module**

This module covers from the Gathering Patient Basic Information, Patient Health History, Patient Work And Lifestyle History, Diagnosis Report and Gathering Aadhar Id Proof.

**Module 2: User Dashboard Module**

This module covers from the process of intake until discharge of an account of the patient's engagement with the health-care team. Communication, empathy, examination, evaluation, diagnosis, prognosis, and intervention are all part of the process.

**Module 3: Doctor Dashboard Module**

This module will handle the process of monitoring a patient's medications to verify that they are taken correctly and that the intended therapeutic outcome is achieved.

**Module 4: Appointment Schedule Module**

This process is a tool that helps hospital admin manage their appointments. Internet booking is one of the tools available in an appointment Booking.

**Module 5: Payment and Expense Management**

It is used to support the admin in the payment management process. This will help the hospital with the full payment processing and accounts payable process.

**Module 6: Remedies Suggestion Module**

It aims to secure Give Suggested Remedies based on disease for doctor enhance healthcare quality and outcomes.

## **Results and Discussions**

The application is adopts PWA and implemented using angular as the front end and opencart API as the frame work. The data is stored in firebase cloud for easy storage and retrieval. The application is created using ReactJs. The main intent of this application is to work on advanced technology and provide easiness and comfort for the customers to handle it. By default it provides more attraction and user-friendliness. The user first has to signup in the page by using his/her credentials.

## User interface screens

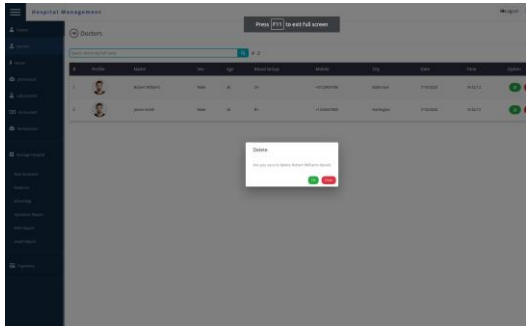


Figure 3 Confirming doctor's appointment

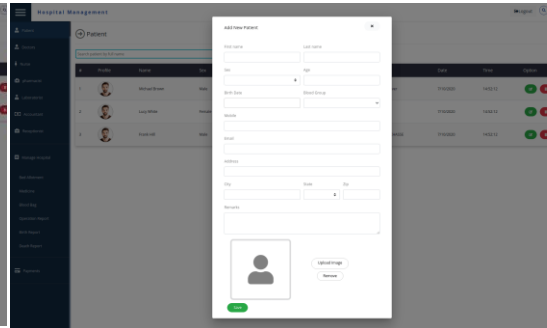


Figure 4 Gathering Patients details

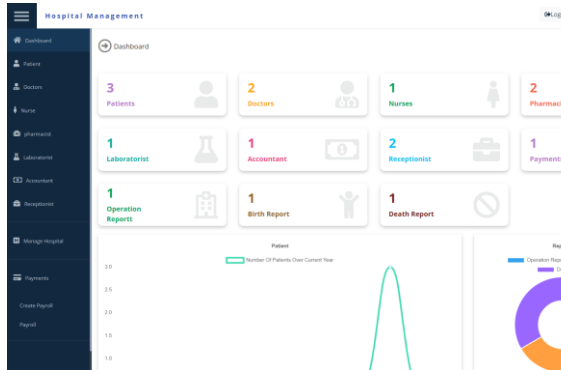


Figure 5 Dashboard view of Doctor

 A screenshot of the 'Hospital Management' application showing a list of appointments. The table has columns for Profile, Name, Sex, Age, Blood Group, Mobile, City, Date, and Time.
 

#	Profile	Name	Sex	Age	Blood Group	Mobile	City	Date	Time
1		Michael Brown	Male	38	A	+123456789	Pearl River	31/03/2020	9:34:15
2		Lacy White	Female	30	B+	+0123456789	Tulsa	31/03/2020	9:34:15
3		Frank Hill	Male	36	AB	+0234567890	BELLE CHASSE	31/03/2020	9:34:15

Figure 6 List of Appointments

## Role of PWA in webpage rendering

Google Lighthouse can be run as a Chrome Extension, from the command line, or used programmatically as a Node module. Lighthouse focuses on performance metrics and the quality of PWAs. The standard Lighthouse report provides information on a wide array of factors, in an easily digestible format. Some notable inclusions for website performance. First page is the first point where the browser has all the information that it needs to render the page. This is with reference to the first time the browser will paint an image of the rendered page on the screen. Style sheets are a type of template file consisting of font and layout settings to give a standardized look to documents. The time taken for the first paint from the style sheet of PWA enabled webpage is smaller (85 ms) when compared to webpage without PWA (1769 ms).



Figure 7. Web page rendering with or without PWA

The potential savings of PWA enabled webpage is smaller (187 KB) when compared to webpage without PWA (283 KB).

### Conclusion

This developed work is more efficient in implementing all managements processes related to Hospital. Hospital administrators would be able to significantly improve the operational control and thus streamline operations. This would enable to improve the response time to the demands of patient care because it automates the process of collecting, collating and retrieving patient information. Most of the industries can convert our application into progressive web applications because it gives more advance future when compare to previous application. This paper itself to design and develop a PWA for an assisting Homeopathy Diagnosis. The features of PWA such as responsive, connectivity, independent, installable (everything to end up on the homescreen to be competitive with the native apps), safe and gives offline access when low bandwidth with the help of the service worker. This is user friendly system, which will stratify the needs of all stakeholders of hospital Management system.

### References

- Akter, S., Wamba, S.F. (2016). Big data analytics in Ecommerce: a systematic review and agenda for future research. *Electron Markets*. Vol. 26, pp. 173–194.
- “A hospital resource and patient management system based on real-time data capture and intelligent decision making” Author(s): Musa, A. Lancashire Bus. Sch., Univ. of Central Lancashire, Preston, UK Yusuf, Y, Meckel.M. *Systems and Informatics (ICSAI), 2012 International Conference*.
- Adetunji, Oluwatofunmi&Chigozirim, Ajaegbu&Nzechukwu, Otuneme. (2020); Edging Out the Pitfalls of Traditional Mobile Development. *American Scientific Research Journal for Engineering, Technology, and Sciences*. 68. 85-99.

- Dhanashri, J., Priyanka,P.,Vaishnavi, U and Sanjay S (2020). Progressive Web Application For Salons Using Artificial Intelligence, IEJRD, International Multidisciplinary Journal, Vol. 5, pp.8-14.
- Digvijay H. Gadhari, Yadnyesh P. Kadam, Prof. Parineeta Suman ,Department of Computer Engineering, Saraswati College of Engineering, Kharghar, Mumbai, Maharashtra, India. International Journal for Research in Engineering Application & Management (IJREAM).
- Dr. Rizwan Ahmad, Vice Deanship of Quality and Development, Emerging technology of multiplexing in clinical diagnostics,
- Gellersen, Hans &Gaedke, Martin. (1999). ObjectOriented Web Application Development.. Internet Computing, IEEE. 3. 60 - 68. 10.1109/4236.747323. ijhs.org.sa,ISSN:1658-3639,PUBLISHER:Qassim University.
- Journal of Innovative Research in Science Engineering and Technology IJRSET. Vol. 7 No. 9.
- Radha P (2018). Intelligent models for predicting and classifying the bio energy of human body, international journal of current engineering and scientific research (IJCESR), Vol. 5 No. 3, 44-54.
- Miss.J.Sabthami, Dr.K.Thirumoorthy, Dr.K.Muneeswaran, Mining Association Rules for Early Diagnosis of Diseases from Electronic Health Records, Middle-East Journal of Scientific Research, Volume No: 24, Issue No: 2; PageNo: 248-253, 2016.*
- Miss.T. Mahara Jothi, Dr.K.Thirumoorthy, A Survey on Web Forum Crawling Techniques, International Journal of Innovative Research in Science, Engineering and Technology, Volume No: 3, Issue No: 3; PageNo: 1708-1714,2014.*
- Radha P (2019). Correlating Health-Oriented Human Traditions with Basic Science and Automating Health-Related Processes Using Modern Science, International Journal on Human Arenas. Vol. 1 No. 1, 1-20.
- Sayali Sunil Tandel, Abhishek Jamadar, “Impact of progressive web apps on web app development” , International Journal of Innovative Research in Science Engineering and Technology (IJRSET), Vol. 7, Issue 9, September 2018.
- Sayali, S.T., Abhishek, J. (2018). Impact of progressive web apps on web app development , International Journal of Innovative Research in Science Engineering and Technology IJRSET. Vol. 7 No. 9.
- Sayali, S.T., Abhishek, J. (2018). Impact of progressive web apps on web app development , International
- Weinberger, Joel & Saxena, Prateek &Akhawe, Devdatta&Finifter, Matthew & Shin, Eui& Song, Dawn. (2011). A Systematic Analysis of XSS Sanitization in Web Application Frameworks.
- Walker, J & Chapra, S. (2014). A client-sideweb application for interactive environmental simulation modeling.
- Parbat Thakur, “Evaluation and Implementation of Progressive Web Application”, bachelor’s thesis, Helsinki Metropolia University of Applied Sciences, 2018.