

Doctor Sahyog: Health Card

Smita Mande¹, Shubham Puniwala², Prathamesh Gurav³, Prathamesh Gare⁴, Parth Punde⁵, Amey Prayag⁶ and Shubhan Punde⁷

¹⁻⁷Department of Engineering, Sciences and Humanities (DESH) Vishwakarma Institute of Technology, Pune, 411037, Maharashtra, India

Abstract— Health cards are essential in the healthcare industry to keep track of an individual's medical history and health information. This research paper's goal is to present a design and implementation of a health card in the IEEE format. The health card includes features such as an electronic health record, security requirements based on the technology of a unique QR code and unique patient identity number. The electronic health record is kept in a safe database and is accessible by authorized users, the registered and verified doctors and the particular patient. The unique QR code ensures that only the cardholder can access the health information. The health card can improve the efficiency and quality of healthcare services also it can prove as a valuable tool for healthcare professionals.

Index Terms— Health Card, QR code, unique patient identity number, Health Information, Security

I. INTRODUCTION

Many developing countries like India, Bangladesh, Sri Lanka are facing difficulties in better health facilities in order to reach out to remote and rural parts of the country. The health care sector faces one of the major issues in India and thus the advanced and improvised technology is becoming more important now a days. The health sector has been revolutionized by the advent of technology. The development of an Electronic Health Card is one such example, it has become an increasingly important tool in healthcare system. An Electronic Health Card is a secure, portable, and easy-to-use device that stores a patient's medical information and makes it accessible to authorized healthcare providers in real-time. The Electronic Health Card is designed to store a variety of medical information, including personal information, medical history, lab results, medications, and immunizations.

The Health Card represents a leap forward in healthcare technology, revolutionizing patient care and doctor-patient collaboration. With its patient ID, QR code, and intuitive website, it empowers patients to actively participate in their health management while providing doctors with a streamlined platform for accessing and communicating patient information. Furthermore, the QR code's integration with research initiatives opens up new avenues for medical research, fostering innovation and improved patient outcomes. Embrace the Health Card and embark on a journey towards a healthier and more connected future. After studying the different research papers and identifying various unique features of each and every project related to Electronic Health Card, we decided to design an Electronic Health Card which can be accessed using a unique QR code and a unique patient identity number. Every user will be provided with a unique QR code and a unique number on their health cards. The verified registered doctors can access all the information and data of the patient by entering the patient identity number. The system allows display of a limited data of the patient after scanning the QR code, hence the data will be protected and the patient can have his/her privacy. We decided to add this feature to our project for easy and

fast accessibility of data.

Since India is a developing country not only in terms of economy but also in terms of technology. These developing factors have led to use of many advanced technologies this also includes use of scanner for various purposes. Considering QR scanner a basic tool every hospital must have it for scanning medicines, bills, packages and many more things in hospital industry. This scanner can be used to scan the QR code present on our Health Card and access the information of the patient. The system consists of two functions. On one hand it allows the doctor to check administrative data of the patient and enter any required prescription. On the other hand, it allows the patient to enter their personal information, medical data and many more mandatory details. The project seeks to address the issue of relying on patients for crucial health information by providing a secure and accessible electronic record.

II. LITERATURE REVIEW

Most of the models are carried out mainly in the European countries. These projects aimed to improvise the connection between the mobile citizens of Europe and the national health care systems using advanced smart card technology. Several electronic health cards have introduced highly secured encryption of data using encryption keys and digital signature keys which are stored on the system and are utilized to exchange secure and authorized data between clients and database servers [1][2]. Some of the projects have implemented a user-friendly chat-box to create more healthy relation between doctor and their patients. [4] Due to advancement in technology many health agencies have also launched an electronic health card with a unique features like storage where one can store nominal of their own premium insurance [5]. Instead of single-server-environment-based authentication system there has been an introduction of mutual authentication and key agreement scheme for a multi-medical server environment [6]. Many papers have concluded that the use of an electronic health card will have several advantages, such as less administrative and paper processes, lower costs, fewer medical errors, more accurate case follow-up, patient information integrity, the removal of the problem of readable prescriptions, etc.

A novel method in 2019 was implemented in Montenegro where the strategic significance of healthcare systems in national development is addressed. They offer a comprehensive overview of Montenegro's existing health insurance framework, highlighting its categories of insured individuals and the process of issuing health booklets. Several critical limitations in the current system were identified, including restricted operational hours, potential misuse of health insurance booklets, and labor-intensive manual validation processes. To mitigate these issues, the authors propose a novel solution involving SMART cards and an innovative information system architecture. The SMART cards are envisaged to bolster system security, enhance user experience, and facilitate real-time validation. The proposed system's architecture encompasses a multi-use PKI SMART card infrastructure, data storage, and secure data access, with additional security measures such as adherence to the Common Criteria Standard, cryptographic keys, and data export capabilities. This research underscores the potential benefits of modernizing Montenegro's health insurance system through the incorporation of SMART cards and advanced information technology, promising improved efficiency and security while offering avenues for future integration with smart devices and cloud-based infrastructure. [1] Another method addresses the pressing issue of healthcare data management in Indonesia's rural areas, where paper-based records prevail due to limited access to power and telecommunications infrastructure. Advocating for a digital alternative, the paper emphasizes the advantages of electronic health records (EHRs), highlighting their superior accessibility and exchange capabilities. It proposes employing smart cards as a secure medium for medical data storage and sharing, despite their comparatively modest storage capacity, owing to their robust data security features like Application Protocol Data Units (APDU) and digital signatures. To complement smart cards, the paper introduces the Mobile Data Collection System (MDCS), designed for reading and writing smart cards, overseeing data transfer, and preserving data integrity, all while operating with low power consumption, a crucial consideration given the challenges of power access in rural areas. Ultimately, it presents the MDCS concept as a promising solution for enhancing healthcare data management in rural Indonesia, contingent on further research and development to optimize its functionality and effectiveness.[2] A system NETC@RDS, addresses the limitation of existing e-card systems, primarily focused on national contexts, which fail to support the free movement of European citizens across borders. It specifically focuses on the electronification of the European Health Insurance Card (EHIC), which serves as a proof of health insurance entitlement for European travelers. The paper discusses the successful pilot implementations of NETC@RDS, particularly during the Athens Olympic Games in 2004. The initiative aims to create a trans-European network of portals for verification of entitlement rights, streamlining healthcare procedures and contributing to the future electronification of the EHIC. While highlighting the advantages of the NETC@RDS concept, including improved accessibility and data accuracy, the paper acknowledges challenges related to card

format changes, security infrastructure, legal considerations, and cross-border healthcare provision, emphasizing the importance of European coordination and long-term viability for this promising smart card-based solution in the realm of inter-state health insurance.[3] Another method presents the development of an Integrated Electronic Health Record System (IEHRS) that utilizes smart card technology for healthcare automation. The research addresses the limitations of paper-based health records and highlights the advantages of using smart cards, such as portability, ease of access, and data security. The study integrates various medical measurement devices, including blood pressure meters, blood glucose meters, pulse oximeters, and clinical analyzers, into the system, allowing for the collection and storage of patient health data in electronic health records (EHRs). While the paper demonstrates the potential of smart card-based EHR systems, it also acknowledges the need for standardization in healthcare data coding and plans for future improvements, including the integration of higher-capacity smart cards for storing additional medical information like X-ray films and test documents.[4] This 2018 research paper discusses the significance of Indonesia's Health Assurance Agency, known as BPJS, in providing health insurance to the Indonesian population. The paper highlights BPJS's efforts to enhance healthcare quality through the integration of information technology, specifically the implementation of smart card technology. This smart card system consists of both a smart card and a smart card reader, aiming to expedite the search for BPJS members and enable offline storage of insurance premium data. To ensure data security and confidentiality, the paper employs the Common Criteria Framework (ISO 15408) for evaluating the smart card system's security. The research involves three key steps: threat analysis, security objective design, and security functional requirement design. It identifies and analyzes ten potential threats, establishes 12 security objectives, and ultimately defines 36 security functional requirements, out of which 34 have been implemented in a prototype. The study underscores the importance of using a Protection Profile document for building a secure smart card system in the context of BPJS. [5] The paper from 2010 addresses the development of the MyCare Card project, which aims to create a patient-held electronic health record card for emergency situations, especially when patients are unable to provide their medical history. The paper discusses the initial requirements for the project, including surveys conducted with both the public and healthcare professionals to determine the types of data that should be included on the card. The MyCare Card Browser software, which provides access to the data stored on the card, is a central focus of the paper. The MyCare Card itself is implemented as a USB card, combining the advantages of both smart cards and USB sticks. The paper concludes by highlighting the importance of security and authentication in such systems and mentions ongoing trials of the MyCare Card. Overall, the paper provides insights into the development of a patient-held electronic health record system and its associated software in 2010. [6] The concept of the electronic health card (eHC) as a modern replacement for traditional paper insurance booklets was introduced, highlighting its potential benefits such as reducing administrative processes, cutting costs, minimizing medical errors, ensuring the integrity of patient information, and addressing issues like illegible prescriptions. The paper provided insights into the types and components of electronic health cards, explaining how they function within the healthcare system. Moreover, it discussed the challenges associated with eHC implementation, including issues related to authentication, access control, security, privacy, network bandwidth, and the integration of electronic health records. The authors emphasized the importance of citizen and specialist readiness for adopting this technology and the need for proper training. Overall, the paper underscored the transformative potential of electronic health cards in healthcare management while acknowledging the hurdles that must be overcome for successful implementation.[7]

TABLE I: COMPARISON OF ELECTRONIC HEALTH SERVICES IN A DEVELOPED COUNTRY VS IN A DEVELOPING COUNTRY

In a Developed Country	In a Developing Country
Focuses on improving EHR access and patient identification.	Designed to provide healthcare to underserved populations.
Aims to streamline administrative processes	Targets financial inclusion and equitable healthcare access.
Enhances personalized care and treatment plans based on patient medical history.	Employs health cards as proof of insurance coverage or eligibility for subsidized services.
Enables quick retrieval of patient information during emergencies for efficient decision-making.	Enhances patient identification to ensure accurate delivery of services.
Supports public health management through data tracking and contact tracing.	Facilitates targeted healthcare interventions for specific health issues prevalent in the region.
Improves overall healthcare delivery and patient experience.	Strengthens healthcare infrastructure and capacity in underserved areas.

III. METHODOLOGY

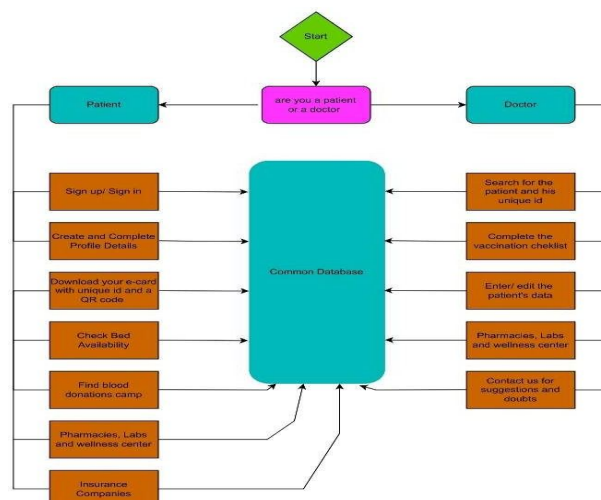
A. System Architecture

After analyzing already existing systems in the market we developed unique ideas and designs to be implemented in our project, the Doctor Sahyog. An QR code and a unique identity number have been included which helps in accessing the information from the servers through the the health card. The system consists of a front-end and a back-end for the website. This website is made to access the healthcard and other related system information. The front-end has been developed using languages like HTML, CSS and JavaScript. We have been working on the back-end using SQL and Xampp for creating a data base.

B. Features

Doctor Sahyog is a website UI with 2 portals one for the patient and another one for the doctor. The patient module consists of a Dashboard page where all the basic info of the patient is shown and can be accessed by scanning the qr code present on the health card. Since anyone can scan the qr code the system displays only the basic information in it. For other details we have made a pin authentication where he can access past opds and other medical records. The website includes a user interface for accessing patient information and a database to store and retrieve medical records. The website has highly secured encryption and authentication protocols which are used to ensure the protection of patient data. The website is patient centric as well as doctor centric, the system have a patient login where he can check his prescriptions, book an appointment and order medicine from any nearby pharmacy. The system also includes a doctor login where a doctor can check a patients data by searching a patient ID, doctor can also access the OPD section and fill an OPD form for a patient. It also offers features such as appointment scheduling, prescription requests, and the ability to communicate directly with your healthcare providers. The Health Card's patient portal aims to empower you by putting your health information at your fingertips, enabling you to make informed decisions about your well-being. Through this intuitive and user-friendly interface, you can take charge of your health and actively participate in your care, all while ensuring the privacy and security of your sensitive data. For healthcare professionals, the Health Card streamlines the process of accessing patient information and fosters efficient collaboration. Doctors can use their personalized login credentials to access the dedicated doctor portal on our website. Once logged in, they can quickly retrieve patient records by scanning the patient's Health Card QR code or searching by patient ID. The doctor portal provides a comprehensive overview of each patient's medical history, allowing physicians to make informed decisions based on accurate and up-to-date information. It also facilitates secure communication channels between doctors and patients, enabling seamless exchange of messages, test results, and treatment plans. With the Health Card, doctors can streamline administrative tasks and focus more on delivering personalized, high-quality care. The QR code embedded in the Health Card serves as a powerful tool for research and analysis. Researchers and scholars can leverage this technology to access patient profiles for authorized studies and clinical trials. By scanning the QR code, researchers are directed to the patient's profile page, which offers a comprehensive overview of their health data, contributing to the advancement of medical knowledge and the development of evidence-based practices.

C) Flowchart



IV. RESULTS AND DISCUSSIONS

Doctor Sahyog, an electronic health card has served its purpose appropriately. It has helped to create a better connection between a patient and his doctor, it acts like a bridge between them. It has become more simpler for the hospitals to access the information, data and past records of a patient. Using the health card will lead to advancement in not only health industry but also in technology and economy. This has proven beneficial also for the patients as they can access their health information from anywhere anytime easily. The health card includes security and protection of users data and information therefore they can have their privacy protected. Doctors using the health card can save their time by directly accessing the patient record by scanning the QR code or entering the unique patient ID instead of opening and reading past records. It has also helped to store the Vaccination records very easily in form of a checklist. Doctor Sahyog has been a really helpful and reliable in the health industry. The Electronic Health Card provided patients with greater control over their medical information, allowing them to carry their medical history with them at all times. As a patient, the Health Card provides you with a gateway to personalized healthcare management. By simply scanning the unique QR code on your card, you can access your dedicated profile page on our secure website. This portal serves as a centralized hub where you can conveniently view and update your medical records, including diagnoses, treatments, medications, allergies, and more. Some of the major discussions are-

Seamless Transfer of Medical Information:

- When a patient is transferred from one healthcare facility to another, health cards can ensure a smooth transition of medical information.
- For instance, if a patient needs to visit a specialist or is admitted to a hospital, their health card can be used to quickly access their medical records, enabling the healthcare provider to have a comprehensive understanding of the patient's health history, previous treatments, and medications.

Emergency Situations:

- Health cards are particularly valuable during emergencies when immediate medical attention is required.
- Paramedics and emergency responders can quickly access vital information from the patient's health card, such as allergies, pre-existing conditions, and medication details.
- This information helps in making critical decisions and delivering appropriate and timely care, potentially saving lives.

Public Health Management:

- Health cards can play a crucial role in managing public health initiatives such as vaccination programs and disease surveillance.
- By linking individuals' health cards to their immunization records, authorities can efficiently track vaccination rates, identify vulnerable populations, and take measures to prevent the spread of diseases.
- Health cards can also aid in contact tracing during outbreaks, enabling timely interventions to control the transmission of infectious diseases.

Screenshots from our UI Website

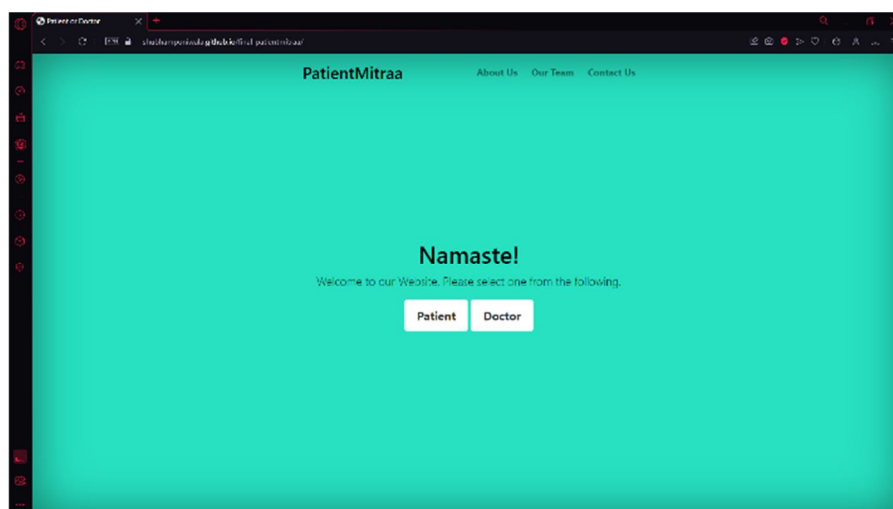


Fig 1: are you a Patient or a Doctor

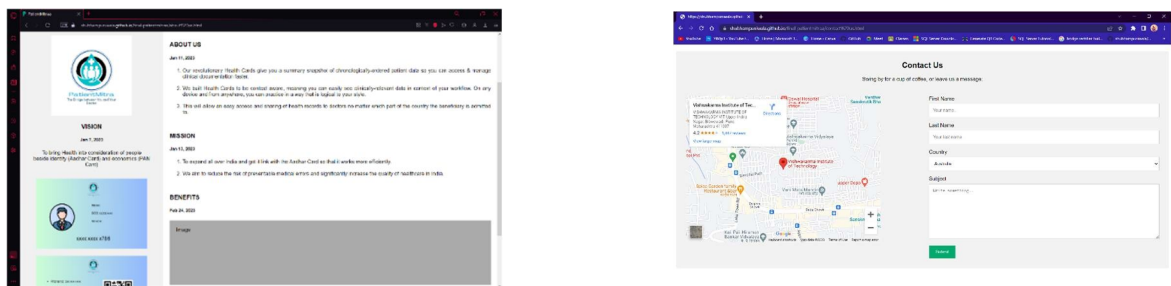


Fig 2: The home page stating our Vision and Mission (left) and contact us page with a Google map stating direction to meet us (right)

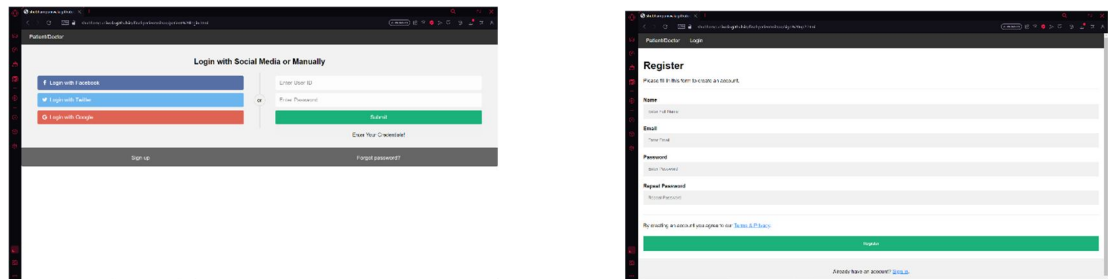


Fig 3: Login (left) and sign-up (right) pages

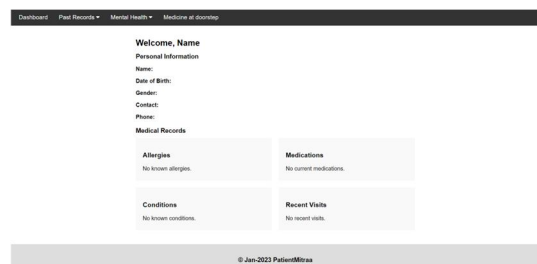


Fig 4: Generated QR Codes (left); Interface after scanning QR Code- Patient's Dashboard (right)

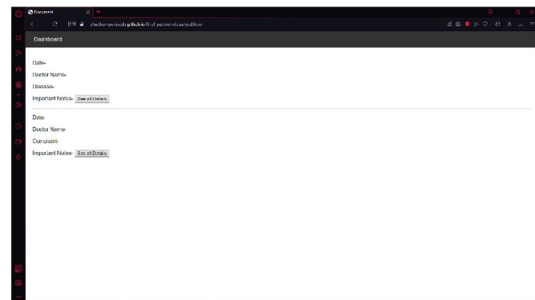
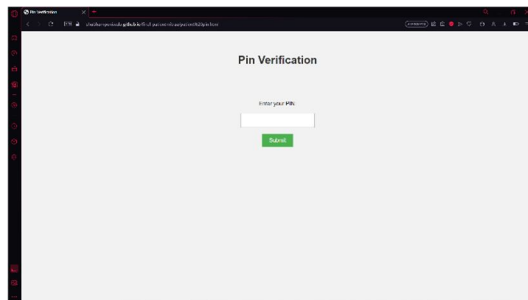


Fig 5: Pin Authentication for a 2 factor security (left); Patient's OPD details (right)

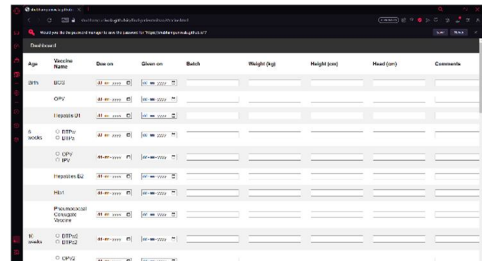
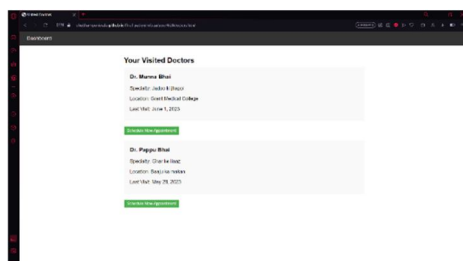


Fig 6: Your Doctors (left); vaccination check list (right)

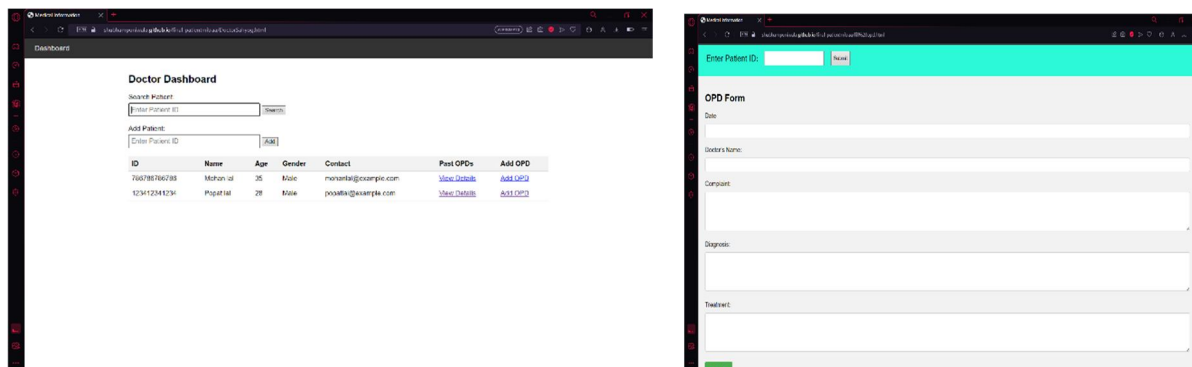


Fig 7: Doctor's Dashboard- with fill ops and view past ops (left); OPD form that the doctor will be filling (right)



Fig 8: Sample Card (Front and Back)

V. FUTURE SCOPE

The future scope of our Doctor Sahyog is vast and promising. So firstly we are going to launch a mobile application. With the continuous advancement of technology, electronic health cards are likely to play even more critical role in the healthcare industry. We have planned to work further on this project by adding new features like linking of user's Aadhaar card and PAN card to our electronic health card which will make it even simpler for the users to access their information and data. Successful linking of the Aadhaar card and PAN card will provide us with a huge platform to implement our project. We are even going to add pages like bed availability in hospitals, blood donations, labs and other wellness centers. We even aim to add insurance companies so that it becomes easy for the user to check which insurance he can claim in which hospital. In the future scope of this paper, we have planned to add many new exciting features for both the patient and the doctor, creating it more user friendly and interactive. Features like booking an appointment with a doctor in a particular hospital, ordering medicines online from any nearby pharmacy and reading health blogs, health news will be a useful and interesting feature for a patient. For doctors we will be adding features like accepting or declining an appointment, reading and posting health blogs and allowing them to interact with their patients online for developing a better bonding and relation with each other. Doctor Sahyog is a unique project which is going to be helpful in the Indian health sector.

VI. CONCLUSION

Doctor Sahyog is a project which will bring changes and improvement in the health sector. The platform serves a bridge between a patient and his doctor. This implementation of health card enhances accessibility, improves patient care, and streamlines medical record management. It's not only beneficial to doctor's but also to patient's. This efficient and secure health card system ensures quick retrieval of patient information, facilitating informed medical decisions and minimizing errors. The proposed Electronic Health card system would be successful when people will understand the advantages of this Electronic Health card system and about the need of this technology for advancing the current healthcare system in India. By centralizing medical records and utilizing QR code technology, it promotes seamless healthcare delivery and empowers patients to actively participate in their own

health management. With the advancement of technology, the future of health cards looks promising, and they will continue to play a vital role in the healthcare industry.

ACKNOWLEDGMENT

We would like to convey our sincere appreciation to our project guide, Smita Mande, for her thorough guidance, support, and helpfulness throughout this course project. Her extensive knowledge and expertise in the field has been instrumental in shaping our research methodology and approach.

REFERENCES

- [1] Ivanović and P. Raković, "E-health Card Information System: Case Study Health Insurance Fund of Montenegro," 2019 8th Mediterranean Conference on Embedded Computing (MECO), Budva, Montenegro, 2019, pp. 1-5, doi: 10.1109/MECO.2019.8760284.
- [2] R. Hermanto, A. Indrayanto and A. Sasongko, "Smart card mobile data collection system concept for health and medical data collecting activities in rural area," 2013 3rd International Conference on Instrumentation, Communications, Information Technology and Biomedical Engineering (ICICI-BME), Bandung, Indonesia, 2013, pp. 399-402, doi: 10.1109/ICICI-BME.2013.6698534.
- [3] Pagkalos, S. Kortesis, G. Pangalos and M. Hassapidou, "Deployment of the NETC@RDS service: A new step towards a European e-health space," 2010 3rd International Conference on Biomedical Engineering and Informatics, Yantai, China, 2010, pp. 2511-2515, doi: 10.1109/BMEI.2010.5639699.
- [4] K. W. Ashan Pivithuru, A. Srinivasan, A. Wijeratnam, I. Nassar, S. S. Chandrasiri and P. K. Suriyaa Kumari, "E-patient Card: An Integrated Electronic Health Recording System for Patient," 2021 3rd International Conference on Advancements in Computing (ICAC), Colombo, Sri Lanka, 2021, pp. 395-400, doi: 10.1109/ICAC54203.2021.9671145.
- [5] Y. A. Setyoko and R. Yasirandi, "Security Protection Profile on Smart Card System Using ISO 15408 Case Study: Indonesia Health Insurance Agency," 2018 6th International Conference on Information and Communication Technology (ICoICT), Bandung, Indonesia, 2018, pp. 425-428, doi: 10.1109/ICoICT.2018.8528804.
- [6] S. Barman, H. P. H. Shum, S. Chattopadhyay and D. Samanta, "A Secure Authentication Protocol for Multi-Server-Based E-Healthcare Using a Fuzzy Commitment Scheme," in IEEE Access, vol. 7, pp. 12557-12574, 2019, doi: 10.1109/ACCESS.2019.2893185.
- [7] H. -R. Firoozy-Najafabadi and A. H. Navin, "Electronic health card: Opportunities and challenges," 2012 6th International Conference on Application of Information and Communication Technologies (AICT), Tbilisi, Georgia, 2012, pp. 1-5, doi: 10.1109/ICAICT.2012.6398486.