

Chapter 30

Leveraging Cloud Technology for Rural Healthcare in India

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ABSTRACT

Cloud technology is used for a variety of purposes in order to handle large volumes of data. This chapter explores a rural healthcare project in India in which cloud technology was introduced in order to store and share large volumes of data. This project benefits from cloud technology because of the ability to store patients' full health history on the cloud and access them wherever services are provided. The impetus for this project originated with the fact that many hospitals maintained their proprietary information systems, and thus, patient history was unavailable to physicians outside of that system. The search engine used in this project is called Indexer, which can search a vast collection of records stored in the cloud and help with the diagnosis. The solution developed supports multi-tenancy of data and uses the Azure platform. The project has taken adequate precautions to protect the data. This project is not focused on privacy protection per se but on saving lives.

1. INTRODUCTION

Kala, a poor widow in her early forties living in a village in the heart of South India, wakes up one night with chest pain. It is night time and she does not want to disturb her children, so she bears the pain silently. The pain is accompanied with heavy sweating. Just as she ponders how to counter the pain, it starts reducing and disappears

in about 20-25 minutes. The next morning, she visits the local primary healthcare center (PHC) and narrates her experience to the physician. Kala and the physician are both unaware that her family has had a history of heart problems. The care provider being a general physician attributes her chest pain to stomach indigestion and recommends some pain killers and medication for indigestion.

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Kala returns home and being the sole breadwinner of her family returns to work immediately. But she experiences a similar chest pain three months later. In spite of their meager earnings, the alarmed family members decide that Kala should be taken to a small hospital in a nearby town. At the hospital, she is immediately referred for an ECG examination by the out-patient department (OPD) physician. The ECG report shows an abnormal heart rhythm and is sent back to the referring physician at the hospital. The general physician does not have access to Kala's past medical reports; fortunately, he can read the ECG report just enough to decipher that Kala needs to be immediately referred to the hospital's cardiology center as an emergency case.

The cardiologist, Dr. John, at the cardiology center also does not have access to Kala's past medical reports, allergy information, and previous procedures that she has undergone. Because of trauma, Kala is unable to communicate critical information about her past medical history to Dr. John. In the absence of this data, he has to take a calculated risk and recommends a coronary angiography. This is followed by a PCI (Percutaneous Coronary Intervention) as the patient is found to be very unstable and at high ischemic risk. Fortunately for Kala, the risk taken by Dr. John pays off and she recovers. But this expensive treatment brings Kala and her family virtually on the streets. Being an unskilled laborer, Kala does not have any medical insurance that can bear the expense of her medical care. It should be also be pointed out that often Government hospitals in small towns do not have the needed infrastructure to support advanced cardiac procedures. Kala meets this medical expense by mortgaging the only piece of land she owns. And, it will take years for her and her family to pay back the loans.

Throughout this process, the doctors who examined Kala did not have access to the complete clinical history of the patient. This lack of medical data handicapped the cardiac specialist from preparing a patient centric treatment plan.

Moreover, lack of expert advice at the initial stage delayed the diagnosis and treatment. This delay could have led to further complications and even fatality! In fact, availability of expert advice at the initial stage could have addressed Kala's cardiovascular disease via oral medication and diet guidance. This would have also helped avoid the expensive treatment that Kala had to eventually undergo.

This scenario highlights the value of past medical data in diagnosis and treatment. If the general physician at the PHC had been aware of Kala's family and her medical history, he would have been able to provide better and faster treatment in the initial stages.

Next, let us look at a different scenario and see things from the perspective of Dr. Ram, a well-known cardiologist working in a tertiary care hospital in a tier-2 city in India. He has worked hard to achieve success in his life and is now reaping the benefits by attracting a large number of patients who only want to be treated by him. In a country like India where physician to patient ratio is very poor, a successful physician finds himself beset with more patients to treat and a more hectic schedule.

Of late, Dr. Ram is spending more time at work. A larger number of patients and with increased expectations are approaching him both at his home and as well in the hospital looking for a cure to their medical problems. The outpatient consulting, the ward rounds, and the surgery (both planned and emergency cases) consume the major portion of his time during the day. As the number of patients increase, the number of surgeries he needs to perform increases, and consequently, Dr. Ram finds himself busy with surgery at the hospital until late in the night.

Over time, Dr. Ram gradually starts to suffer from "physician burnout" which can be equated to loss of enthusiasm for work, feelings of cynicism, and a low sense of personal accomplishment. Though patient care is his priority, he starts wondering whether he is able to actually provide the

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