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## VENTURES AND TECHNOLOGIES IN THE TELE-CLINIC FIELD

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### ABSTRACT

*The paper aims to find out new and advanced technologies in the healthcare field, and telemedicine in particular. This gives an idea of startups and companies, that working in these sectors. Also elaborates how these technologies can address the current problems in India and Kuttanad, Kerala. After the analyzing, we found that no company has a comprehensive solution to address the current health challenges and some kind of collaboration is needed. Moreover, a business model of a tele-clinic also proposed, it includes operational and technological overviews.*

**KEY WORDS:** *Technological Management, An operational overview of a Tele-clinic, Business Incubators, Self-Sustainable Model of a Tele-Clinic, New Technologies, Start-ups.*

### 1. INTRODUCTION

This research paper explores new technologies in the health sector, especially telemedicine field. It also mentions the economic viability of setting up a clinic in the region of Kuttanad, India. The study conducted in various startups regarding latest technologies assisted a lot to identify relevant technologies and its costs. While taking the health scenarios in India, a huge gap between the doctors serving in an urban area and the rural area can be solved effectively through new telemedicine technologies.

### 2. LITERATURE REVIEW

#### 2.1. India

India is a diverse country in terms of culture, language, climate and other geographical features, and its population is equivalent to 17.74% of the total world population (Worldometers.info, 2018). As a developing country, we have challenges in health, education and employment sector. In the health sector numerical strength of doctors remains a problem,

especially in rural areas. The National Health Profile, 2018, released by the Central Bureau of Health Intelligence shows that there is just one allopathic government doctor available for around 11,082 people across the country, a figure more than 10 times the recommended ratio of 1:1000 (Online.F, 2018). With respect to technologies in solving India's problem, it can address a lot of issues plaguing in different sectors. While taking healthcare as an example, IoT technology and smartphones have the potential to solve 80 percent of health-related problems (solve, 2018).

#### 2.2. Kuttanad

Kuttanad is a region covering the Alappuzha and Kottayam Districts, in the state of Kerala, India, well known for its vast paddy fields and geographical peculiarities. The region has the lowest altitude in India and is one of the few places in the world where farming is carried around 1.2 to 3.0 meters below sea level. Farmers of Kuttanad are famous for Biosaline Farming. FAO has declared the Kuttanad Farming

System as a Globally Important Agricultural Heritage Systems (GIAHS) (Famous Places in India, 2018). The 2018 Flood in Kerala, submerged the entire Kuttanad region. Kuttanad saw the largest exodus of people to higher areas. Of the 350,000 residents of Kuttanad, as per government records 220,000 had to take shelter at the relief camps during the flood (<https://www.hindustantimes.com/>, 2018).

The health aspects of Kuttanad region are not like as other regions in Kerala. Unscientific and overuse of fertilizers made the quality of soil and water vulnerable. Most of the people are affected by a certain life style as well as life threatening diseases (Downtoearth.org.in, 2018). Usual complaints raised by Kuttanad residents includes the problems related with the accessibility of primary health centers limited and about the PHC's working of few hours in a week with some nurses or ANMs also the services of both general practitioner and specialist remains a dream for them.

### 2.3. Telemedicine and Allied Technologies

In 1996, the Institute of Medicine defined telemedicine as the *"use of electronic information and communication technologies to provide and support healthcare when distance separates the participants"* A series of electrical inventions in the 1800s and the followed invention of telephone by Alexander Graham Bell paved the way for using telemedicine service. From there to this 21<sup>st</sup> century, new technologies furnished the telemedicine service on a large scale. The computer, internet era revolutionized the telemedicine sector by adding video interface, software and other data storage mechanisms. Then, the followed smart phone penetration and the enhanced use of mobile apps ease the complexity in using telemedicine via computer. Currently most of the medical diagnostics devices have options to connect it with smart phones and then to send or store the medical data (md Portal, 2018).

The new technologies improved the telemedicine service in a great extent, recent adaption of blockchain technologies in storing medical data secured the privacy aspect and boosted the comfort level of patients as well as doctors in terms of carrying antiquated paper data (Irishtechnews.ie, 2018). Moreover by integrating geographic information systems or GIS with health data will help us to find the current health trends, to track the communicable diseases and to identify the nature of non-communicable diseases (Leaders, 2018). Additionally these informations are suitable for developing health policy frameworks and programs in the field of child vaccinations, controlling maternal mortality rate (MMR) and infant mortality rate (IMR).

### 2.4. Business incubators and Startups in India

India has the third-highest number of business incubators in the world after China and US. In these incubators, around 51% are run by educational institutions while the rest are handled by independent with 32% and corporate as well as government supported includes 9% and 8% respectively (vccircle, 2017). Considering the startup ecosystem, India has 5200 startups in different fields ([Startup roundup] The startup pool in India grows to 5, 2018). Indian government also launched startup India program on January 2016 and it enhanced the building of a strong ecosystem for nurturing innovation and startups. Both the Central and different State governments are giving variety of loan opportunities to entrepreneurs under different schemes. These initiatives ease the process of finding seed investments.

## 3. RESEARCH METHODOLOGY

### 3.1. Methods

The results and data presented in this research paper were part of a study on telemedicine startups in Indian business incubators. To achieve this, quantitative research method and literature based research was carried out. Quantitative research focused on collecting data regarding new technologies and startups in the telemedicine sector. The initial process was done via emailing the issue of Kuttanad and the need of teleclinics to 80 business incubators in India, which consisted of 400 companies. From this, we got responses from around 21 business incubators and 100 companies. After conducting the survey with criterias given below, 9 companies from 3 business incubators were shortlisted. Then I visited those firms and a direct face to face interaction with their CEOs and other team members were the major part in data collection.

### 3.2. Sample Group

The process of identification and filtration of companies are done through certain surveys. Initial selection process were based on certain criteria like

- Stage of their – Idea, Concept testing, Research Prototype and Market Readiness.  
Final selection for face to face interaction were based on criteria like
- Stage of their- Commercial product and Market readiness
- Experience in real time implementation.
- Experience in healthcare sector.
- Team expertise- number of engineers and doctors in their team.

## 4. RESULTS

The analysis of data from the 3 business incubators, IIT Madras Medtech, Kallinga Institute of Industrial Technology and Kerala Startup Mission provided a broad idea of companies which working on innovative telemedicine technologies. With

regards to IIT Madras Medtech Incubator, a direct face to face interaction with 3 companies, Conszap, Viverva and Swasth helped us to familiarize the current technologies in the healthcare sector. On the other, the company Medtell in the Kallinga Institute of Industrial Technology incubator assisted us to find the real challenges in implementing new telemedicine technologies in the rural field. At last, the 4 companies, Ente Health, Purple Health, Mobilexion and eyogi in the Kerala Startup mission enlarged our views in terms of technologies and certain unique aspects of health care fields such as mental health and all.

Considering the services they provide, MedTell, Mobilexion and Ente Health have complete services, also Purple Health, Conszap and Swasth contain partial services. Both Viverva and eYogi are giving one exclusive services in terms of awareness videos and mental healthcare respectively. In terms of web and app services, everyone have their own dedicated web platforms as well as android and IOS applications.

With respect to the technologies associated with these companies, Swasth and Ente Health stores medical data by means of blockchain technologies. On the other hand, MedTel is using smart phone enabled medical diagnostic devices and both Mobilexion and Entehhealth are using healthcart technology. Most of the startups are aligning their venture to utilize their data for setting up artificial intelligence in health care.

Considering the implementation part, the three companies offering complete service have experience in real time physical execution. The accomplishment MedTell includes 100 teleclinics across Odisha and now they are planning to expand it to different states across India. Also, a large number of companies have only a few years' expertise in establishing online services on a large scale too.

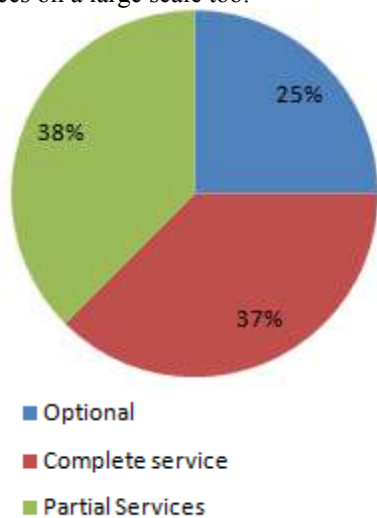


Figure 1: Company/Startup Services

#### 4.1. Conszap

Conszap is a venture promoted by two young tech entrepreneurs (Aishwarya & Kevin) who aspire to change the way healthcare is addressed today. The team is supported and guided by medical tech professionals, IT experts and healthcare providers with long-standing experience in addition to that; it incubates in IIT Madras Med Tech incubator (Conszap.com, 2018). They provide both webs as well as telephonic services to doctors for better interaction with patients. Their web-based platform provides doctors with an Instant Virtual Clinic, allowing them to come online as and when they are available. On the other, phone-based consultation provides doctors with features like a unique pin, DND option, detailed call log details and all. These services ease the virtual consultation process on a large scale and it will directly benefit the patients too. They have around 7 doctors and till now 40+ patients are registered. Company. website:<https://www.conszap.com/>



Figure 2: Conszap CEO Aishwarya and Cofounder Kevin (From Left)

#### 4.2. Viverva Health Media

Viverva is a startup founded by B.Arbindraj and the mentors are V.Ramanathan, R.Balakrishnan. This venture is currently incubating in IIT Madras Med Tech incubator. They are aiming to spread digital preventive healthcare awareness and patient education by establishing a network of screens across waiting areas of hospitals. All of their screens are controlled centrally; therefore all the videos can be telecasted from one place to all the screens. They implemented 20+ screens in 15 different hospitals across Tamilnadu. Most of their videos are in line with the local language and so it reaches the grass root level of the society too.



Figure 3: Viverva CEO- B Arbindraj



#### 4.3. Swasth

Swasth is a startup which incubates in IT Madras Med Tech incubator. This venture is founded by Sirish Raju Singaram and its executive team as well as executive team consists of Chittu Nagarajan, Dr.Skanda Singaram, PBC Paul, Dr.Mohanashankar, Sadagopan Chakravarty, Geetha Narayanan. Swasth is a blockchain and cloud based interconnection between the patient and the telemedicine clinic that gives patients the opportunity to have easy access to their medical history and to be better informed and involved in their care, therefore decreasing patient waiting times, cost and increasing the quality of care. This startup may be a solution for the following challenges like lack and unavailability of records, lack of standards, lack of reliable data and poor spread of health insurance. They already implemented these in several diabetic centers across Tamilnadu.

Company website: <http://swasth.tech>



**Figure 4: Swasth CEO - Sirish Raju Singaram & Executive Team Member- PBC Paul (From Left)**

#### 4.4. MedTel

MedTel, as a startup started their journey in the KIIT-Technology Business Incubator in Odisha with a seed fund of \$50,000 and the founders are Dr Lalit Ranjan Manik and Shashank Shingal. The MedTel team comprises of doctors and engineers including Ajit Choudhury, Dr Devendra Tiwari and Dr Yera Dhanurdhar (clinics, 2018). They have devices for measuring all vitals and in addition to that, a dedicated 24\*7 call center and doctor assist. The Doctor's assistants are always there in the video or audio consultation for the effective relay of information between the Doctor and the patient. There are several well-trained (by Medtel itself) officials, in every step, which help in running this machinery as effectively and efficiently as possible. In terms of applications and other web services, they developed their own software and applications for recording health data, managing appointment and all. With respect to the implementation aspect, they have 100+ clinics across the Odisha. Their centers are called as TeleHealthPods (THPs). They are like a walk-in clinic, equipped with a basic smart device (like a tablet or computer etc) for the Doctor to be virtually present. They are also equipped with devices such as a Glucometer, ECG, Spirometer etc and they call it as a point of care devices (POC's). They are cloud-enabled, they upload

the information of every patient (identified via their phone number) on servers and send it to all the required parties, and they also store the information for retrieval of any patient information in the future. Company website: <https://medtel.in/index.php> Video: <https://www.youtube.com/watch?v=pdHaYpBiqS0>



**Figure 5: MedTell CEO Lalit Manik Ranjan (Third from Right) and Team Members**

#### 4.5. Ente Health

Ente Health is a Telemedicine startup operating in Infopark Kerala since 2016, which is founded by Jijo G John and the operating team includes Dr. Gigy, Reena and Reni. Their telemedicine platform consists of desktop site, Android and IOS apps, and the iHealthpoint telemedicine cart. The desktop and apps have features for registration, uploading patient records, chat facility, cloud-based tele calling facility and payment gateway. The IHealthpoint cart comprises of 32 inch TV, HD quality camera, printer noncontact temperature monitor, BP apparatus, Xray digitizing facility, Glucomete and UPS. The cart is made up of hospital stainless steel and can be cleaned with disinfectant solutions. They have 100+ doctors and around 1000+ patients served till now, and catered to a large number of patients on a regular basis for the last two years. Company website: <https://www.entehealth.com/home>



**Figure 6:Ente Health executive member**

#### 4.6. Purple Health

Purple health is a health and wellbeing technology platform, incubating under Kerala startup mission initiative. Their telemedicine

platform includes video-chat, message-chat, email, call and booking. They are the technology partners of Indian Medical Association (IMA), and Indian Dental Association (IDA), Reliance General Insurance. Currently, they are working with over 500 clinics in Kerala and India and have a doctor listing portal with over 25000 doctors in India. In terms of devices, they have a diagnostic technology that can get pulse, blood pressure, temperature and oxygen saturation readings from a device to a mobile app and then to patient record for a doctor.

Company website: <https://www.purplehealth.com/>



**Figure 4.7: Purple Health CEO Vikram Nair and COO Mini Balaraman (From Left)**

#### 4.7. Mobilexion Technologies

Mobilexion is the first startup company incubated by TIMed (Technology Business Incubator for Medical Devices and Biomaterials), of Sree Chitra Tirunal Institute of Medical Sciences and Technology and the founder is George Varkey. They have a product known as UMACS, which consists of UTM cart for measuring all vitals, MVCS Video conferencing system and a set of mobile applications. The primary features of UMACS include secured data, open source technology, highly customizable, HER integration and the compatibility with other systems. Their main cart includes unlimited online video sessions, Direct HER integration, Cloud based software, Reporting and Analytics, Encrypted Audio, Video and Messaging, Integration of Vital monitor, Steth, ECG. Company website: <http://www.mobilexion.com/index.html>



**Figure 8: Mobilexion CEO George Varkey and Team Members (From Right)**

#### 4.8. eYogi Tele-Consultation Solutions

eYogi is a mental wellness platform founded by Vino Mathew and they incubated in Indian Institute of Management Kozhikode. They have clinical psychologists, psychiatrists and social psychologists who can be consulted for mental health therapy using telephonic medium. Currently they have 20+ doctors and 100+ registered patients. Their smart counseling has following features, anytime counseling, anonymity, experienced counselors access and convenience. The initial process of tele consulting includes 45 minutes long discussion and it charges around 400 to 900 INR. They have exclusive packages for certain universities, MNCs and parents in an affordable way. Their long term vision includes developing AI system with the help of data. Company website: <https://www.eyogi.in/>



**Figure 9: eYogi CEO Vinod Mathew and Cofounder Vipin (From Right)**

### 5. CONCLUSION AND RECOMMENDATIONS

Most of the startups have impressive technologies to ease the telemedicine process, but effective implementation aspect remains a concern for several companies. A better execution of these technologies in a relevant way can address the current healthcare problem in India. From our analysis, the technological diversity among these startups is appreciable and most of them are either completely or partially dependent upon internet but the concerning factor is about internet availability in rural India. With respect to Kuttanad region, the internet connectivity is not a problem and so this removes one of the major hurdles in implementing telemedicine clinics.

An ideal tele-health clinic in Kuttanad region should include, LCD or Tab video conference module, smart phone or health cart enabled diagnostics devices for measuring vitals like blood pressure, glucose level in the blood, hemoglobin level and pulse rate. Also, a net enabled ECG device will ease the data sending process too. Other software mechanisms for digitalizing the appointment booking, medical data storage and other e-prescription services are needed.

With respect to human resources, an ANM or general nurse with adequate digital literacy is mandatory to run this clinic smoothly and effectively. Considering the location aspect of this region, medicine delivery can be termed as an added advantage.

While considering these clinics as sustainable revenue generating model, other than capital costs following were the estimated costs of daily and monthly expenses. After considering the income aspect with an average patient count of 20 makes these ventures a profitable one. While expanding these clinics widely, the profit margin will increase on a large scale.

The operational overview of a proposed clinic consists of several procedures like

- Appointment booking or Registration
  - This can be done through online platforms like websites or mobile applications. It includes inputting of demographic details such as name, gender and age. After that the interface will displays the available doctors and patients can select the doctors according to their need. After that, doctor will confirm the timing slot and willingness through chat
- Information needed for registration
  - a) Name, Age and Gender of patient;
  - b) Photograph taken during registration at clinic ;( Optional)
  - c) ECG taken during registration at clinic (Optional);
  - d) Vitals taken during registration at clinic;
  - e) Scanned images of all discharge summaries and lab results available;
  - f) Chart of the available vitals and lab results ordered chronologically;
  - g) Complaints reported to the nurse at clinic;
- Telemedicine Session
  - a) The session proceeds in the following way
  - b) Video chat between doctor and the nurse
  - c) Video chat between doctor and the patient
  - d) Close Examination Camera session
  - e) Digital stethoscope session
  - f) ECG, Blood, Urine lab session (if required)
  - g) Concluding video chat session with patient and nurse

At the end of all procedures, patient gets doctor's prescription digitally, moreover a home-delivery option for medicines are also available to the patient at an affordable rate.

#### • Patient Data

Respecting patient's privacy, we can store all data with the help of blockchain technology. This data can be used for implementing AI as well as framing policies in health care sector.

Considering the fact that, no company has comprehensive technological solutions, we need collaboration among startups to run an advanced tele-health clinic.

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