



Importance of Digitech Adoption for Providing Efficient Healthcare Services during COVID-19

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ABSTRACT: In recent times, where covid-19 is spread across the world, physicians, as well as patient, needs to keep the social distancing. On the other side, during the lockdown period, where the patient avoids to go outside of their home due to the fear of n-cov infection digital technologies like mHealth serves the purpose to connect with the physician. Physicians are not only able to give the advice based on the symptoms of a disease but are also able to share the preventive care as well as able to answer the queries of patient and advise them. With the help of a digital platform, a physician can share their knowledge and train each other. The study qualitatively validates the use of digital technology during the pandemic situation and develops the scale for the future empirical study.

Keywords: mHealth, Telemedicine, Coronavirus Disease (COVID-19), Healthcare, Knowledge sharing, patient-physician relationship.

I. INTRODUCTION

With the declaration of Novel Coronavirus -19 (COVID -19) as a pandemic by the World Health Organization (WHO) on 11th March 2020, all the economic activities were closed (WHO Website). Like a bolt from the blue, the new year turned out to be a trying time for the healthcare providers across the world. Stage-wise as months passed worldwide the dread and fear of COVID -19 went on spreading. Border-closure, quarantine, sanitizers, thermal-scanning, self-isolation, work-from-home, N95 masks, etc. became the buzzwords and all print-media, electronic-media, social-networks, blogs, posts and awareness campaigns always highlighting about self-reporting, self-hygiene, safe social distancing, etc.; in turn across the countries hiking the fear of COVID-19 has been expanded in the citizens. With each day the number of COVID affected people spiralling up and the number of COVID-19 death increasing steadily, the daunting task in front of all administrative bodies happened to be reaching the remote and extensive parts of the country and also often across geographies through connected synced patient care information sharing. In the SAARC country head video conferencing conducted in the wake of COVID-19 pandemic situation, leaders across all SAARC (South Asian Association for regional cooperation) nations highlighted the importance of all countries staying on the same platform and page related to treatment processes and care delivery measures. Specific highlight and importance have been given to enhanced usage and application of Telemedicine and M-health to identify and extend primary care at the very onset to curb the spread of Novel Corona Virus a.k.a n-cov or covid-19. Since n-cov happens to be a highly contagious and rapidly

spreading virulent strain as evident from its exponential spread, early detection, super synchronization in care delivery, patient-physician involvement and ultimately agile decision making will play a vital role in restraining the spread as highlighted by WHO (World Health Organization), IMA (Indian Medical Association), and various other global bodies including, the UK's NHS (National Health Service), American Red Cross and American Medical Association. Since in stage 1 and 2 containing the virus spread is easy to achieve through checks, and curbs and quarantine, however as evident from past virus epidemics and pandemics, once the stage 3 and 4 or the viral spreading is reached, the spread takes place very fast through social and community spreading, leading to exponential growth in the number of affected patients. At this stage, the synchronous care delivery and patient-physician involvement and interaction minimize as the patient to doctor ratio during treatment drops rapidly and as a result agile decision making and efficient care delivery setup plays a vital role. This paper conceptualizes and highlights those critical stages of rational and logical care service flow and links the antecedent and consequent variables to conceptualize an efficient care delivery synchronous stage-wise nuanced understanding with conceptual linkages. This study aims at logically and conceptually establishing the role of digital technology-enabled healthcare delivery platforms in terms of M-Health and Telemedicine as technology adoption and how it may be efficient in enhancing the synchronous care delivery under pandemic and rapid viral spreading situations through the careful stages of pervasive information sharing Patient-physician coordination.

The following sections discuss, evaluates and highlights the logical linkages attempting at establishing a better-nuanced understanding aiming in the long run to achieve the overarching goal of better patient-physician interaction and agile efficient care decision making and efficient care delivery.

II. LITRATURE REVIEW

Social Exchange Theory: Social Exchange Theory (SET) suggests the social behavior of two parties during the interaction with the analysis of risk and returns. SET posits the human relationship are formed by the subjective analysis of cost and benefits to all the parties [1]. In the context of healthcare, the patient-physician relationship exists when a physician serves a patients' medical needs with mutual consent between the two. The theory also suggests that the perceived benefits to the party should not exceed the effort or cost [2]. In the mutual relationship between patient and physician, the physician pays attention to the healthcare needs, which is vital for the interaction and engagement between patient and physician.

During the pandemic situation of COVID-19, citizens are advised not to leave their home unless and until it is necessary. Citizens are advised to remain in home quarantine in order to save themselves from the COVID-19. Patients get worried about the small healthcare changes as symptoms of COVID-19 are being broadcasted from the internet communities, news agencies, friends and family etc. with this information, patients feel anxious and want to get touch with their medical expert. Then, the patient can use mHealth or telemedicine technologies to get in touch with the medical fraternity in order to keep themselves away from the infection of contagious disease.

m-Health Adoption: m-Health is refereed as an extent to which application of mobile (smartphone) devices and technologies are used for delivering healthcare-related information [3]. Many companies are coming up with their new product of mobile application which provides services of healthcare on mobile. With the change in the traditional healthcare delivery systems, m-Health adoption also increased the efficiency of care delivery system [4]. Due to the increase in smartphone users all over the world, mHealth (Mobile Health) usage also increasing significantly [5]. The recent studies on mHealth and IoT include the adoption from patients' perspective, which includes behavioral Intension [6, 7], well-being and satisfaction [8].

mHealth increases the reach to qualified healthcare providers, and physicians can provide services at a lower cost and minimal time [9]. However, the adoption of mHealth varies from user to user [10]. We believe that involvement of physician also plays a significant role in patients' adoption of mHealth, as facilitating conditions, social influence and performance expectancy plays a crucial role in intention to use mHealth applications [11]. A physician can motivate the patients and can generate social pressure as well as facilitating condition for the patient, in order to adopt the mHealth. Only a few studies have been done on the physicians' intention to adopt and use mHealth. System

quality, overall quality, perceived value, net benefits, privacy, health improvement programs of mHealth apps helps physicians to adopt [12, 13]. Although the study of physicians' adoption of mHealth platform, no study found on the satisfaction of physicians unlike satisfaction of patients by adopting and using mHealth.

In recent days, the ministry of healthcare of all countries as well as WHO announced to be in-home quarantine and not to visit other places and doctors' clinic also unless and until it is an emergency. Patients may have a misconception about the symptoms. In this situation, mHealth can be useful. As the patient can call or chat with the doctor and ask for the medical help. On the other side, patients tend to go for regular health check-ups, a patient can seek advice from their family doctor using mHealth and avoid going to the clinics and hospitals.

Telemedicine Adoption: Telemedicine is one kind of collaborative technology which enhances coordination, communication and cooperation [14]. Telemedicine refers to the use of communication technology to provide medical information and services [15]. This digital platform is useful for remote monitoring and sensing. In Case of any kind of illness, patient reports to the primary care centre in the village and consulting the doctor from the remote area becomes easy. A patient can have access to the sharp brains working in a metro city in tertiary care organization due to well-integrated platforms.

Telemedicine can be defined as a system of healthcare delivery using an information technology tools as a substitute for face-to-face contact between physician and patient, as a solution of problems like access to care, quality of care and cost inflation [16]. Telemedicine is not only a tool for virtual interaction between the patient and physician but also a tool, which can be used for long-distance training for healthcare professionals [17].

In the contiguous and pandemic situation, telemedicine plays a vital role in treatment as well as training. During the SAARC nation meeting, Afghanistan's Prime Minister suggested to make and follow a model of telemedicine to fight against novel coronavirus. With the help of telemedicine technology, training can be given to the medical staff in small villages from the experts sitting in an urban area, and the patient does not have to travel to an urban area. Travelling of a patient must be stopped during the pandemic situation, telemedicine plays a crucial role not only the management of the disease but also in controlling the spread of disease, as patients will not travel to the city and treatment can be availed at their places only. [18] has described the application of telemedicine and telehealth for coronavirus disease.

Patient-Physician Synchronization: Traditional healthcare delivery system does not allow patients to make an informed decision about the treatment with knowledge of alternative treatments. Hence, patients do not have the motivation to participate in decision making. A few studies are available which incorporates both the parties (patient as well as a physician) in engagement. However, some studies have been

performed only on patient engagement with digital technology usage (mHealth, wearable IoT devices). With the inclusion of a high degree of technology, population health development programs can be achieved, and patient engagement is the most important factor for community health programs [19]. It is essential to engage the patient about their health after the discharge from the hospital also in cases of disorders and acute diseases [20]. Taki *et al.*, (2017) have studied the importance of development and implementation of mHealth engagement index [21]. A patient can get more engaged in the healthcare process with the help of health intermediary like IoT and mHealth [22].

Physician Involvement: Physician involvement and knowledge sharing play a crucial role in a pandemic situation like covid-19 as patient inflow are higher, restorative staffs are busy in attending them. Knowledge sharing and collaboration facilitates physicians' communication and the provision of better services to patients in today's medical environment [23]. Knowledge sharing among the physician is crucial in the present situation of contagious disease, as all the physicians are dealing with a similar kind of symptoms and patients. Physician shares their experiences through digitized healthcare channels and deals with the ambiguity of the knowledge.

Agile Decision Making: Healthcare organization should be agile in order to provide the best healthcare services to the patient with cost optimization [24]. With an increase in the agility of healthcare organization, waiting line queue management is at its optimal level. Queue management in the emergency department is essential. As with the delay in time, physician's challenge to treat disease turned in to pressure, which can cause physician burnout and disadvantageous or fatal to patients [25]. The other reason why agility is vital in healthcare is, every patient shows different kinds of reaction, for the same drugs and medication. A physician needs to identify pharmacological effect quickly, in order to reduce dared consequences of wrong medication, side effects, adverse effect etc. With technology adoption, it is possible to monitor the patient physiology and pharmacology of drugs on the patients [26], which enhances the agility [27].

Care Service Transparency: Transparency includes the pervasive data sharing between patient and physician. Digital technology helps in integration and coordination, by which ease of report making be observed. Transparency includes the communications about the health condition of patients with ongoing treatment procedure, medication details so pervasively, that doctor, as well as patient, can observe at the same time [28]. Care service transparency can be defined as a degree to which, the patient perceives the conduct of healthcare service facility is open and pervasive regarding all the relevant matters with easily accessible and understandable information-sharing platforms [28, 29].

Pervasive information sharing is essential for increasing transparency as it emphasizes on the information flow. Technology adoption in healthcare makes it so fast to

integrate the devices and share the information with the devices with accurate and reliable data on which physician can suggest the right treatment [30-32]. With the transparency not only physician and patient can share the real-time and accurate information but also, nursing station, paramedical staff, pharmacist and administrator can also share accurate information in real-time.

Care Service Efficiency: During the pandemic situation where all classes of citizens may have developed the symptoms, it is a crucial and challenging task for health fraternity to provide effectiveness at the minimal cost. With the help of sophisticated technology in healthcare, the transmission speed of the data is increased with accurate information sharing. A physician can accurately analyze and monitor the patients' condition and prescribes the advice to the patient at the same time. Care service efficiency refers to the extent to which hospital achieves high quality of service at the minimal cost in the process of patient care [33].

III. RESEARCH METHODOLOGY

The main objective of the study is to build a relationship model involving the valid constructs linking m-Health and telemedicine adoption theory which describes the use of m-Health and telemedicine technology during the pandemic of Covid -19. For testing and confirmation of the theory, a three-step methodology has been applied. An extensive systematic literature review has been performed during the first stage, and a pool of items has been generated. This extensive literature review helped in finding out the theoretical support as well as in the generation of the model. The initial pool of items was reviewed by three academicians to check the initial relevance with the said constructs.

For accessing the convergent and discriminant validity Q sort method was used [34]. Total eight experts were invited for taking part in Q sort procedure. Moderator has explained the research objective, scope and brief description of each construct with the definition and experts were requested to distinguish each item into one of the other constructs including the N/A (Not Applicable) for omitted items. The results were evaluated based on the hit ratio [35] and raw agreement score [36]. The Q sort method was performed in 5 different steps which includes.

- Definition of domain of disclosure, which includes the definition and understanding of the constructs.
- Development of the set of statements, which includes selection of measurement items from Focused Group Discussion and Extensive Literature Review
- Selection of Participants, where for reviewing initial pool of items three academicians were selected and eight experts (Industry practitioners as well as academicians) were selected
- Q Sort by Participants – Where in a group of two participants distinguished the items and omitted the items which were not representing the constructs
- Analysis, where the final scale has been developed to measure the underlined constructs based on the responses generated from the experts.

In the process of Q sort, at a time 2 experts were invited, the list of the proposed items was given to them. The experts must assign the items to the constructs, where it is suitable to assign. On the other end, experts were empowered to remove the items if they find that the item is not suitable to any of the construct and it can be put in the category of N/A. After round 1, the remaining items were assigned to other 2 experts and this process have iteratively followed till the time hit ratio and raw agreement score was reached to the accepted level. Number of initial items, number of items omitted in each round and final number of items, which we got after the Q sort process is described in below table.

Table 1: Initial Items, Items removed at each round, Final Items after performing Q Sort for 4 rounds.

Construct	Initial Items	Items Omitted in				Final Items
		R1	R2	R3	R4	
Digital Technology Adoption	14	4	2	1	2	5
Care Service Transparency	9	3	2	1	0	3
Physician Involvement	9	2	1	2	0	4
Patient Physician Synchronization	7	1	1	1	0	4
Agile Decision Making	9	3	2	0	0	4
Care Service Efficiency	10	4	1	1	0	4
Total	58	17	9	6	2	24

The Table 1 describes that, for construct Digital technology adoption 14 initial items were taken into study at initial stage. After 1st round of Q sort, 4 items were omitted and subsequently 2, 1 and 2 items were omitted in 2nd, 3rd and 4th round. And remaining 5 items were finalized for the scale. The same process has been followed for all the constructs into study. Appendix 1, describes the whole process in a systematic manner with the tables and calculations. Below Flowchart shows the step by step methodology for Q sort method.

With scale development, the qualitative case-based method was also applied. For developing the case study, in-depth telephonic interview of patients and physicians were contacted. All the patients were not infected by corona disease; some patient has psychologically accepted that they might have infected with the corona and some patients needed medical advice for their lifestyle diseases. We have interviewed some patients who used mHealth applications for clarification of their doubts regarding covid-19 and its symptoms some patients who did not use mHealth apps for covid -19, but they have used mHealth for some different purposes. The methodology involves the case studies of global healthcare initiatives provided by mHealth applications. The entire process of mHealth apps has been studied, which provided mental relief to the patient during the situation of covid-19.

Fig. 1 shows the flow chart how the process was conducted.

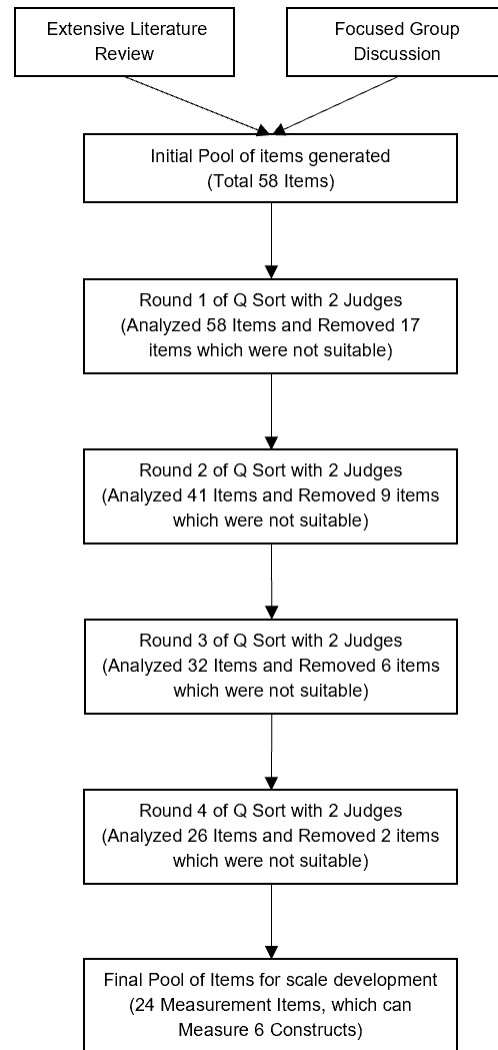


Fig. 1. Graphical Flow of the Q- Sort Process.

IV. RESULT AND ANALYSIS

With the help of performed Q sort method, items were kept for the scale development process. Inter judge the reliability and construct reliability was checked during the four rounds for getting accurate measurement scales. Raw agreement score hit ratio and Raw Agreement Score were found to be above 0.90, which is in the range of ideal value of 0.81 – 1 [36]. The results for the initial rounds are described in Appendix.

Table 2: Result of Scale Development.

Indices	Round -1	Round -2	Round -3	Round -4
Hit Ratio (Placement)	0.70	0.78	0.81	0.92
Raw Agreement Score	0.64	0.70	0.73	0.91

Current Study Scales Proposed: (Post Expert review, FGD, Q-sorting & Qualitative validation via

Case study-based research Awaiting Final large-scale empirical study validation)

Digital Technology Adoption

I am using digital technology such as mHealth and telemedicine:

- *To ensure the real-time connectivity with the patient.*
- *To keep the patient's health safe from the contagious disease.*
- *To ensure the treatment is given as per the disease stage.*
- *To keep the track of each patients' health condition digitally.*
- *Integrated dashboard helps us to perform the duties in well organized manner.*

Care Service Transparency

- *My patients are able to share the vital information with me.*
- *I empower my patient to know what I am advising.*
- *I willing to disclose my thinking about my decision with patients.*
- *My patients are open with me.*

Physician Involvement

- *share my knowledge about the medicines with others in my community.*
- *I share the experience of mine with the covid-19 patient in my community.*
- *My fellow physicians helps me with their knowledge on disease.*
- *I keep reading the post shared by others and learn about the symptoms and treatment.*

Patient-Physician Synchronization

- *My patient frequently contacts me for any kind of health issue.*
- *My patient contacts me whenever they needed my advice on covid -19 as well as in other disease.*
- *Through the platform I also update my patients about the vital signs and symptoms the pandemic disease for their understanding.*
- *I keep posting the preventive procedure for my patient during the storm of contagious disease.*

Agile Decision Making

- *I am able to make the quick decision about the health condition of my patient.*
- *I can increase the short-term capacity for increased number of patient.*
- *I can increase the capacity for quick lab testing and diagnosing the issue.*
- *I am able to suggests the treatment in real time.*

Care Service Efficiency

- By using the digital technology, I am able to*
- *Achieve the reduction in patient serving time.*
- *Achieved accuracy in patient service.*
- *Improved on time service delivery to the patient.*
- *Reduced the cost for high quality services.*

V. CASE STUDY

During the telephonic interview process, we have found some small case lets, we have described them in the portion of case study.

Case 1: In a telephonic conversation with a healthcare provider pulmonologist told us that, a youngster in Hyderabad used mHealth application to clear the

confusion that is he contaminated by covid -19? He explained to us; patient was very anxious and worried about his health after he saw the news on YouTube about a pandemic of coronavirus. He has searched for the symptoms, and he found that he has some of the symptoms. He opened mHealth application on which he has already registered himself, and he saw that there is a special section made by mHealth provider for information about novel coronavirus. He clicked on that and requested for the consultation. Within 5 minutes, the form regarding the symptoms was sent to him, which included the types of cough (dry or with mucus), body temperature (Measured with the thermometer at home), etc. the inquiry was allotted to me and I called him and we discussed about the symptoms and I confirmed that patient is not suffering from the SARS CoV – 2. Upon the confirmation patient described that, after he saw the news and read about the symptoms only he found the difficulty in breathing and felt like fever (which was not there, while checked with the thermometer). The physician advised him to take precautionary measure and contact him again if he continued to feel the same, for further checking.

Case 2: An 80-year-old person has used mHealth application with the help of his children. A patient has a history of diabetes and cardiac disorder, and his next consultation with his specialist was due. During the time of the lockdown of the city, he preferred not to go to the doctor's place. Instead, he decided to use mHealth for the consultation. During the search, he found the doctor is there on the mHealth platform, and the patient requested the consultation. Doctor asked him the morning sugar level at the morning and the patient answered as the patient has a habit of checking the blood sugar level. Also, patiently answered his average heart rate and blood pressure during those days as he was also using Samsung Active Watch 2. On the other end, when a physician requested for a lab test of HbA1c, patient ordered the same via mHealth platform with the help of his son. The representative from laboratory contacted and came to the patients' house, collected samples and emailed the results for the same which can be emailed to the physician. The doctor suggested some change in the medication and dosage and sent the revised prescription on the app, from where the patient has ordered medicine online, which came to the patient within 24 hours. Like this patient did not go out and kept himself away from the possible infection of covid -19.

Case 3: In a telephonic talk with the physician, she disclosed that she is a part of an online community and her online community is sharing he knowledge via the platform. The other doctors in the online community are talking about what they are observing in the patient, and if some new symptoms are there, which are not discussed, the physicians in that community discussing about the same. The discussion includes the probability of generation of the symptoms due to covid -19 or any other disorders or not. The possible medicine and drug for the covid -19, how the patients' are reacting to the particular treatment, new developments and government regulations on covid-19, etc. the physician

confirms that with the help of knowledge sharing she can take the fast decision for her patients and starts the treatment earlier. As she does not have to experiment with the medicines about which the knowledge is already shared in her online community, she can react fast on the patients' issues.

VI. PROPOSITION DEVELOPMENT

Linking Digital technology adoption with care service transparency: It is essential to talk about transparency while talking about healthcare. It is essential to follow a transparent communication between a healthcare provider and a patient. In other words, a healthcare provider should be transparent to the patient and in communicating the severity of disease, medicines and its adverse effects and nature of the treatment. On the other side, under the pandemic situation, the patient should also be transparent to the physician and not exaggerating the medical conditions in order to opt for the best healthcare services. Technology enables the pervasive way for data transmission via coordination and integration between the devices [28]. Patient and physicians both can see the record in real-time on mHealth platform, at telemedicine centre and during the hospital stay about the real condition of disease, treatment is undertaken, and possible outcomes.

mHealth platforms are providing all the information regarding the disease symptoms of COVID-19. From which the patient can see the symptoms related to them. On the other end, the temperature range of fever is also given on the platform. The patient can check the temperature with a thermometer at home and write down the temperature. After describing the symptoms which are felt by the patient, the physician calls a patient in detail talk. A piece of pervasive and transparent information is being shared by physician and patient, which helps physician to take a call on the treatment (As sometimes it happens that, physician over the call confirms that, COVID-19 does not infect the patient, hence isolation is not required). The patient who is admitted into hospitals and are isolated, they can observe their medical condition, treatment, medicines are given, information of adverse drug reaction etc. using technology which helps patient to maintain their IT-enabled self-esteem [37].

Proposition 1: Level of digital technology adoption enhances the level of care service transparency

Linking digital technology adoption to physician involvement: Physician knowledge sharing is vital for the pandemic situation. During the contagious situation, where patient inflow is higher, physicians need to use digitized technology for knowledge sharing. Telemedicine can be used for long-distance training of physicians as well [17]. When a patient comes for consultation from the medical experts of a tertiary health center, attendant of the telemedicine center also learns about the treatment. On the other hand, specific training sessions can also be arranged for workers in the telemedicine center about awareness and precautions [38].

With the help of mHealth platforms, physicians can create online communities to share knowledge which is

gained during the process of treatment. Physician shares knowledge in online communities to enhance their reputation and sense of worth [39]. Using technology facilitates the knowledge sharing process among physicians [40]. Physicians can collaborate in integrated mode, independent mode or assist mode in order to gain new knowledge from other physician and treat the patient effectively and efficiently [23].

Proposition 2: Level of digital technology adoption enhances physician involvement in terms of knowledge sharing

Linking Digital technology adoption to Patient-Physician synchronization: With the implications of mHealth and telemedicine, real-time data can be obtained by the physician as well as a patient. With the help of real-time data, physiological symptoms can be monitored [30,26]. If a physician has access to the real-time information about the physiological measures of a patient, time for the interaction between physician and patient can be displaced by information, and physician can provide healthcare services with much more efficiency [41].

With the use of mHealth and telemedicine, the patient can contact the physician over a phone call or chat and describes the symptoms of COVID-19. If physician finds that, a patient might be infected, then a physician can advise to a patient for the check-up of the symptoms and physician can have time to create the isolation, as well as, hospital staff will be ready with the corona testing kit. When a patient arrives, and all the things are ready, the process may be fast and quick decision can be taken about the treatment.

Proposition 3: Level of digital technology adoption enhances the level of patient-physician synchronization.

Linking care service transparency to agile decision making: With the use of sophisticated technology accurate, adequate and timely information can be obtained [29]. With the transparent data integration and analytics, the time is displaced by care, which is called as temporal displacement of care [41]. Delay in decision making about treatment will deteriorate the doctors' challenge into the stress [25]. With transparent data sharing and real-time analytics, the physician can analyse the issue in real-time and give a solution when quickly when patient complaints, sometimes before that and enhances patient satisfaction.

For example, in a current n-cov situation, when the patient shares the issue and problems, physicians analyse it in real-time and advise the patient accordingly. If the patient is advised to be isolated in hospital than, by the time the patient reaches the hospital, isolation room is ready with all original equipment needed in order to save others from the infection.

Proposition 4: the level of care service transparency enhances the level of agile decision making

Linking Physician involvement to agile decision making: Agility is an ability of health service organizations to excel and act quickly to respond to the variety of situations created by external conditions Pipe *et al.*, (2012) [42]. During the contagious situations, physicians tend to work as complementary to each other

as a partner. They work together for a common benefit and leverage each other's competencies to provide efficient health care services [43]. Sharing knowledge adds a new experience for physicians to deal with a variety of patients' conditions. On the other end, physicians can discuss the medicine's effectiveness and which medicine to be prescribed to deal with the situation.

For example, in new COVID-19 situation, where there is no medication available, and no exact symptoms have been found out, physicians are discussing patient conditions and experimenting the medicines which can be used for treatment or control of the disease. Some physicians have found out that, medicine for AIDS along with H1N1 flu, can treat the patient, on the other side some physicians have discovered that medication used in Malaria (Hydroxychloroquine) is treating a patient. The physician can try these medicines and give feedback upon it. The knowledge sharing supports the physicians during the difficult task of treating the patient with a quick response to the constant stimuli.

Proposition 5: the level of physician involvement in knowledge sharing enhances the agile decision making

Linking patient-physician synchronization to agile decision making: In these days of the pandemic, the healthcare sector is not focusing only on the treatment of the patient but also focuses on the overall health management for the patient [44]. With the help of mHealth and telemedicine, patients have more information about their health than the traditional systems. The more informed patient participates in the decision-making process also, and a joint decision has

been taken on the treatment cycle of the patient involving, patient, physician and hospital [44]. On the other hand, with the help of automation in information sharing, the goal of pervasive information can be generated, which decreases the errors in information sharing in compare with manual data and information sharing and helps physician to identify and treat the root cause of the disease.

Proposition 6: the level of patient-physician synchronization enhances the level of agile decision making

Linking agile decision making with care service efficiency: A quick decision can be explained as a fast and flexible decision making according to the situation and other stimuli that external environment offers. When a healthcare provider is flexible enough in reaction with the external environment, more effective treatment can be given at the lower cost.

In the new situation of pandemic spread of novel coronavirus, in the first stage, there were few kits available with the government hospitals and few beds available only. Now, during the 3rd stage where more citizens are identified positive with n-cov, the government has permitted five Indian private companies to make the kits, the kits manufactured by these private companies are cheaper and more efficient in terms of identifying the presence or absence of n-cov. In compare with the previous kits, which takes approximately 5 hours, the newly manufacturing kits will take only 2 to 2.5 hours for identification [45].

Proposition 7: the level of agile decision making enhances the level of care service efficiency

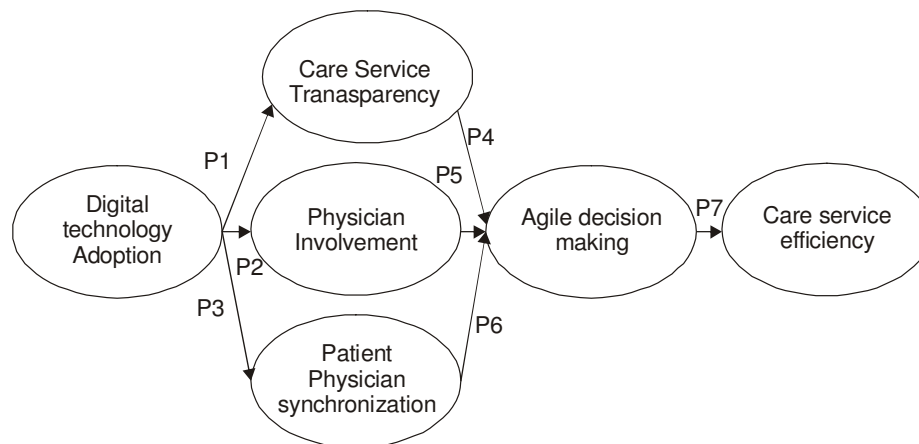


Fig. 2. Proposed Model.

VII. STUDY IMPLICATIONS AND PRACTITIONERS OUTCOME

This study attempted at creating a logical flow and antecedent consequent linkage to create a logical map of how processes flow leading to the outcomes of interest. The overarching ambition of this paper was to build a mental map and rational flow diagram for the practitioners to understand the nodes of interest in the care delivery flow and which nodes of interest require specific attention and tries to address the logical flow

bottlenecks; thereby aiming at achieving superior reach and care delivery efficiency, which might be pivotal in reaching large masses across large countries varying in demographics and geographical reachability.

Though the study does not claim anything about the adoption of digital technology into healthcare and its possible consequences, the study gives enough shreds of evidence from the theory that using the digital technology like telemedicine and mHealth is better during the pandemic situation as it ameliorates the patients' confusion due to information overload and

provides the mental relaxation when the consultation is over as patient has a feeling of attachment with the medical expert through digitized technology.

For the nation like India, where mobile and internet usage has been increasing tremendously in last decade, it is the time to use the healthcare technology also with the help of mobile phone and internet connectivity linked with mobile or computer in order to ensure the good health and physical as well as mental fitness. Many private players are available with the robust business model and application infrastructure, which helps patients to resolve their medical queries in a much more economically cheaper way. Some players also offer annual plans for medical and health consultation.

With the help of case studies study clearly states that, digital technology adoption is useful in healthcare sector for physician as well as patients. Using a technology can be helpful during the pandemic also. It is not advisable to go to the hospital for a minor issue during the storm or pandemic situations as hospitals are big bed for infections. Patient can be infected with the virus or bacteria during the hospital visits. However, the medical urgency of the patient should be addressed by a qualified healthcare provider if it is just a psychological which can be treated by just a counselling (Case Study 1) or a lifestyle disorder, where intervention from more healthcare stake holder is needed, as shown in case study 2, mHealth and telemedicine can serve for the wellbeing of the patients. Via case study 3, the study suggested the importance of knowledge sharing for a provider and how technology is helpful for physicians to share the knowledge with each other to treat the patient in a better manner. Below Mentioned Table 3 shows the outcome and implications of technology for each of the case study.

The table 3 suggests the outcome of the adoption of technology used. In case 1 where a youngster has used mHealth for discussing the issue with pulmonologist, provider was able to know about the medical condition just with simple question answer and advised to the patient.

Table 3: Level of user satisfaction and care service efficiency.

Case Study	Level of DigiTech Adoption	Level of Care Service efficiency	Level of user satisfaction in compared with traditional healthcare system
Case 1	High	High	High
Case 2	High	Moderate	Moderate
Case 3	Moderately Low	Moderate	High

The same process the physician was doing in to traditional doctor – patient interaction and that's why, patient is satisfied as he obtained the same level of care services without visiting the hospital or clinic. In Case 2 where a geriatric patient used the services of endocrinologist, moderate efficiency and moderate satisfaction level obtained, as he has to wait till next day morning for the lab test which result came in afternoon.

Which was the different from the traditional perspective as when he is physically present in clinic, clinic is providing him a facility of fast testing and report given to him within an hour which is normal waiting time. Although waiting time in clinic visit is high patient is satisfied as all his health-related queries have been answered during the interaction only.

In case 3, for knowledge sharing the use of said digital technology use was moderately low, as physicians tends to know the recent developments from the scientific papers and journals and then discuss about the treatment with each other. However, provider felt that adoption of digital technology helped them to transfer their knowledge in to application in real-time and at low cost, on the other end, physician also confirmed that knowledge transfer using the DigiTech is less time consuming also than the traditional ways like conferences and conclaves.

Table 4, mentioned, reflects the outcomes of the cases in a brief.

Table 4: Case Study Outcomes.

Case Study	Outcome
Case Study 1	mHealth enabled telemedicine service has been used for a tele consultation with a healthcare provider as a patient had a psychological blockage that he got infected with corona virus. With the digital technology, physician was involve and patient has a feeling of satisfaction as there was a synchronization because of the technology platform. Which given an indication of efficient care services.
Case Study 2	Efficient care service was provided to the geriatric patient suffering from lifestyle disorder of diabetes. Patient felt that blood sugar level is not in a control and connected physician. the physician was able to involve due to transparent services and made a quick decision for dose adjustment and provided efficient service to the patient. Patient can get the quality services by staying at home only, which patient want to as the spread of the virus is higher. Varalakshmi (2020) has described the scenario of spread in the infection with a mathematical model. And patients are advised to take healthcare from home only to the extent it is possible. mHealth helps them to take the step forward towards digital wellbeing [46].
Case Study 3	Physician involvement and physician participation described in the case study, which stated that, when physician shares knowledge with each other in real time the efficient services can be provided. Physicians always keep sharing their knowledge through conferences and conclaves, however in the pandemic situation real time knowledge sharing needed and on the other hand, due to lockdown situation, the conferences and conclave cannot be conducted. mHealth platforms helped physician to increase their knowledge so that with a quick decision-making efficient care can be provided to patient.

The significant contribution of the study is to build a theory based on which future empirical study can be performed. The study is useful for policymakers, private doctors who are practicing in their clinics, social entrepreneurs and hospital administrators.

VIII. LIMITATION AND FUTURE SCOPE

Although we have included the point of telemedicine liked with the patient care and knowledge sharing among the physician under the construct physician involvement, we were not able to interview telemedicine experts as they are busy day and night to treat the patients during this time of pandemic situation created by a novel coronavirus. On the other end, the actual adoption of technology cannot be measured due to non-availability of empirical data. However, with theory development and extensive literature review, enough pieces of evidence are provided for the future of the healthcare sector.

In the future studies, the propositions can be converted into the workable and testable hypotheses, and data can be collected from patient and physicians for the dearth of empirical validation using Exploratory factor analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modelling (SEM), highlighting the paths and linkages to establish the relationship between the linkages. Also, some more case studies on physician knowledge sharing can be included once the pandemic situation of covid -19 comes under control, and physicians' interview can be taken.

IX. CONCLUSION

The study describes a theoretical understanding between digitized technology adoption, patient-physician involvement, physician knowledge sharing, agile decision making and care service efficiency. Q sort method was used to develop the correct measurement items, which can be used as measurement scales for the future empirical study. The study addresses the theoretical understanding with the foundation of future empirical research via the development of measurement scales for each construct.

Conflict of Interest. No conflict of interest as the study is based on the extensive literature review and experts' opinion were taken for scale development via Q Sort.

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APPENDIX-1

Round 1: Inter Judge Agreement Score.

R1	Judge 1	Total
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	Constructs	Digital Technology Adoption	Care Service Transparency	Physician Involvement	Patient Physician Synchronization	Agile Decision Making	Care Service Efficiency	N/A	
Judge 2	Digital Technology Adoption	10						4	14
	Care Service Transparency		6					3	9
	Physician Involvement			7				2	9
	Patient Physician Synchronization				6			1	7
	Agile Decision Making					6		3	9
	Care Service Efficiency						6	4	10
	N/A	4	3	2	1	3	4		
Total		14	9	9	7	9	10		
Total Item Placed: 58		Number of Matched Agreement: 41					Agreement Ratio		0.64

Here, $(Total\ Item\ Placed * Matched\ Agreements) - (Sum\ of\ Row\ Totals * Column\ Totals) / (Total\ Item\ Placed)^2 - (Sum\ of\ Row\ Totals * Column\ Totals)$

Item Placement Ratio

R1	Actual Categories								Total
Theoretical Categories	Constructs	Digital Technology Adoption	Care Service Transparency	Physician Involvement	Patient Physician Synchronization	Agile Decision Making	Care Service Efficiency	N/A	
	Digital Technology Adoption	20						8	28
	Care Service Transparency		12					6	18
	Physician Involvement			14				4	18
	Patient Physician Synchronization				12			2	14
	Agile Decision Making					12		6	18
	Care Service Efficiency						12	8	20
	N/A	8	6	4	2	6	8		
Total		28	18	18	14	18	20		
Total Item Placed: 116		Number of Hits: 82					Hit Ratio		0.70

Round 2: Inter Judge Agreement Score

R2	Judge 1								Total
Judge 2	Constructs	Digital Technology Adoption	Care Service Transparency	Physician Involvement	Patient Physician Synchronization	Agile Decision Making	Care Service Efficiency	N/A	
	Digital Technology Adoption	8						2	10
	Care Service Transparency		4					2	6
	Physician Involvement			6				1	7
	Patient Physician Synchronization				5			1	6
	Agile Decision Making					4		2	6
	Care Service Efficiency						5	1	6
	N/A	2	2	1	1	2	1		
Total		10	6	7	6	6	6		
Total Item Placed: 41		Number of Matched Agreement: 32					Agreement Ratio		0.70

Here, $(Total\ Item\ Placed * Matched\ Agreements) - (Sum\ of\ Row\ Totals * Column\ Totals) / (Total\ Item\ Placed)^2 - (Sum\ of\ Row\ Totals * Column\ Totals)$

Item Placement Ratio

R2	Actual Categories								Total
	Constructs	Digital Technology	Care Service Transparency	Physician Involvement	Patient Physician	Agile Decision	Care Service	N/A	

Theoretical Categories		Adoption			Synchronization	Making	Efficiency		
	Digital Technology Adoption	16						4	20
	Care Service Transparency		8					4	12
	Physician Involvement			12				2	14
	Patient Physician Synchronization				10			2	12
	Agile Decision Making					8		4	12
	Care Service Efficiency						10	2	12
	N/A	4	4	2	2	4	2		
Total		20	12	14	12	12	12		
Total Item Placed: 82			Number of Hits: 64				Hit Ratio		0.78

Round 3: Inter Judge Agreement Score

R3	Judge 1								Total
Judge 2	Constructs	Digital Technology Adoption	Care Service Transparency	Physician Involvement	Patient Physician Synchronization	Agile Decision Making	Care Service Efficiency	N/A	
	Digital Technology Adoption	7						1	8
	Care Service Transparency		3					1	4
	Physician Involvement			4				2	6
	Patient Physician Synchronization				4			1	5
	Agile Decision Making					4			4
	Care Service Efficiency						4	1	5
	N/A	1	1	2	1		1		
Total		8	4	6	5	4	5		
Total Item Placed: 32		Number of Matched Agreement: 26					Agreement Ratio		0.73

Here, $(\text{Total Item Placed} * \text{Matched Agreements}) - (\text{Sum of Row Totals} * \text{Column Totals}) / (\text{Total Item Placed})^2 - (\text{Sum of Row Totals} * \text{Column Totals})$

Item Placement Ratio

R3	Actual Categories								Total
Theoretical Categories	Constructs	Digital Technology Adoption	Care Service Transparency	Physician Involvement	Patient Physician Synchronization	Agile Decision Making	Care Service Efficiency	N/A	
	Digital Technology Adoption	14						2	10
	Care Service Transparency		6					2	8
	Physician Involvement			8				4	12
	Patient Physician Synchronization				8			2	10
	Agile Decision Making					8			8
	Care Service Efficiency						8	2	10
	N/A	2	2	4	2		2		
Total		10	8	12	10	8	10		
Total Item Placed: 64		Number of Hits: 52					Hits Ratio		0.81

Round 4: Inter Judge Agreement Score

R4	Judge 1								Total
	Constructs	Digital	Care Service	Physician	Patient	Agile	Care	N/A	

		Technology Adoption	Transparency	Involvement	Physician Synchronization	Decision Making	Service Efficiency		
Judge 2	Digital Technology Adoption	5						2	7
	Care Service Transparency		3						3
	Physician Involvement			4					4
	Patient Physician Synchronization				4				4
	Agile Decision Making					4			4
	Care Service Efficiency						4		4
	N/A	2							
Total		7	3	4	4	4	4		
Total Item Placed: 26			Number of Agreements: 24				Agreement Ratio		0.91

Here, $(\text{Total Item Placed} * \text{Matched Agreements}) - (\text{Sum of Row Totals} * \text{Column Totals}) / (\text{Total Item Placed})^2 - (\text{Sum of Row Totals} * \text{Column Totals})$

Item Placement Ratio

R4	Actual Categories								Total
Theoretical Categories	Constructs	Digital Technology Adoption	Care Service Transparency	Physician Involvement	Patient Physician Synchronization	Agile Decision Making	Care Service Efficiency	N/A	
	Digital Technology Adoption	10						4	14
	Care Service Transparency		6						6
	Physician Involvement			8					8
	Patient Physician Synchronization				8				8
	Agile Decision Making					8			8
	Care Service Efficiency						8		8
	N/A	4							
Total		14	6	8	8	8	8		
Total Item Placed: 52			Number of Hits: 48				Hit Ratio		0.92

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