AN EMPIRICAL STUDY OF COVID-19 VACCINATION MANAGEMENT THROUGH THE IMPLEMENTATION OF DIGITAL SERVICES

Dr. Khushbu Agarwal[1], Dr. Imran Baig Mirza[2] and Dr. Parbin Sultana[3]

[1]Assistant Professor, Pacific Institute of Management, Pacific Academy of Higher Education & Research University, Udaipur, India

[2]Assistant Professor, Department of BBA (Computer Application), Poona College of Arts Science and Commerce, Pune, Maharashtra, India

[3]Professor, Department of Business Administration, University of Science & Technology, Meghalaya, India

ABSTRACT

The present paper intends to explore the application of digital services for vaccination during COVID-19 pandemic in India. In light of a study led by the Indian government with the exceptional vaccination rate utilizing digital vaccination services, we aim to analyze the foundation, arrangement and obstacles to distinguish current status and possible shifts required in upgrading vaccination achievement. This study offers observational help, specifically, for the appropriateness of a changed model making sense of stage acknowledgment for vaccination services and for digital wellbeing services by and large, despite the fact that innovation reception and opposition models were first made for customer merchandise markets. Just utilitarian and mental components influence reception aim in this model, but customization, correspondence, and information management setup regions strikingly affect bringing down reception boundaries.

Keywords: Covid-19, Vaccination, Management, Digital, Services

1. INTRODUCTION

The World Health Organization (WHO) characterized the Covid disease (COVID-19) a worldwide pandemic on March 11, 2020. (Saw et al., 2021). After two years, the COVID-19 pandemic is yet presenting tremendous dangers to general health all over the globe. The WHO warns that the pandemic is far from ended and might continue to cause worldwide outbreaks if vaccination rates drop even if some countries have entered the endemic phase. The priority of nations seeking to attain herd immunity has been to increase the vaccination rate since the COVID-19 vaccines were authorized in late 2020.

1.1 Lack of Research in Vaccination Management

IMF, Worldwide Financial Asset Information, 2022). The COVID-19 pandemic, which was presented the extreme intense respiratory condition caused huge social and financial disturbances all over the planet and finished in the most awful monetary slump resulting in the economic crisis in early 2020. The development of novel ways, such mRNA antibodies, or the improvement of traditional strategies, (for example, disinfection conventions, cleanliness guidelines, testing system, contact tracing, and quarantine) has been the primary subjects of exploration to date (Smith et al., 2021). Considering that vaccination techniques offer the best insurance against the pandemic, as the numerous sickness waves have illustrated, novel vaccinations can have gainful impacts when individuals embrace and use the services (Kis et al., 2021). The management of vaccinations is an overall economic endeavour that requires all the individuals from higher designation from policymakers and pandemic officials to gather and to support in the process of immunizations in the view of the limitations of clinical offices and healthcare experts. Considering this, the review's principal aim revolves around the digital management of vaccination strategies, which considers services like enrolment and permission for the vaccination framework, booking of vaccination date, after-vaccination observation, documentation, and follow-up updates.

On the basis of examination of 5070 research papers on COVID-19 vaccination, Xu et al. (2021) recognized the research areas divided into six categories : (1) perspectives toward vaccination (e.g., vaccination eagerness and deception), (2) immunoinformatic investigation (e.g., immunization plan and DNA immunizations), (3) clinical examination of vaccines (e.g., clinical preliminaries, bioinformatics, and drugs), (4) efficiency of vaccine (e.g., insusceptible reaction, inoculation, and immunizer (Kim & Lee, 2022), (5) ramifications associated with vaccination (e.g. adverse effects, adverse effects, anaphylaxis, allergies, etc.),

(6) organization of vaccinations falls in this group, and however clients' acknowledgment of digital stage advancements for the organization of vaccinations and their utilization have rarely at any point been inspected. In any case, successful vaccination crusades additionally rely on how the vaccinations are controlled and taken care of, utilizing state of the art digital stage services that individuals are now acquainted with from their public activities. (Kitagawa & Wang, 2021) Considering that over half of the 3.4 billion cell phone clients ought to have health applications stacked on their telephones, digital advances are significant in the organization of vaccination crusades to answer rapidly in a pandemic emergency. Almost 60% of patients in India used digital advances to search for data about their side effects and sicknesses (Bertelsmann Establishment, 2022).

This exploration paper portrays this peculiarities as "digital vaccination management" since reception of digital innovations is a significant part of public management overall and healthcare management specifically. Just 35 papers were found when the expressions "COVID-19 management" and "digital devices" were looked through in the Ex Libris Primo data set and just three of those articles zeroed in on conclusion and treatment, which is additionally the subject of our exploration on immunization management. (adonjic-Simic, Mahrt, Niemand, Speck, & Windrich, 2021)These three examinations give a top to bottom investigation of how computerized reasoning can be utilized as a critical device for following, breaking down, and guessing COVID-19 cases a suggestion for public contribution, digital arrangements, and e-health drives and a depiction of an early advance notice, in-clinic, useful stake investigation application for diagnosing COVID-19. There were no distributions about e-health advances for overseeing vaccinations.

1.2 Barriers to Adopt Digital Platform Services
Two exploration standards can be used to make sense of the acceptance of vaccination services: development reception (mechanical progressions, for example, the acceptance model (TAM) the theory of planned behaviour (TPB), the unified theory of acceptance and use of technology (UTAUT) the unique acceptance model for the re-assessment of advances (DART) and the unified theory of acceptance and use of technology 2 (UTAUT2) and advancement obstruction. We view both review streams as useful and appropriate for addressing our examination question, despite the fact that Slam doesn't see development obstruction as the specific inverse of advancement acceptance. The end that "reception of an advancement is melded by the defeating of purchasers' underlying obstruction" therefore drawn. We made a changed digital immunization reception model (see Figure 1), which is for the most part founded on crafted by Mani and Chouk to address our review issue. This model was propelled by the more unpredictable opposition theory models.
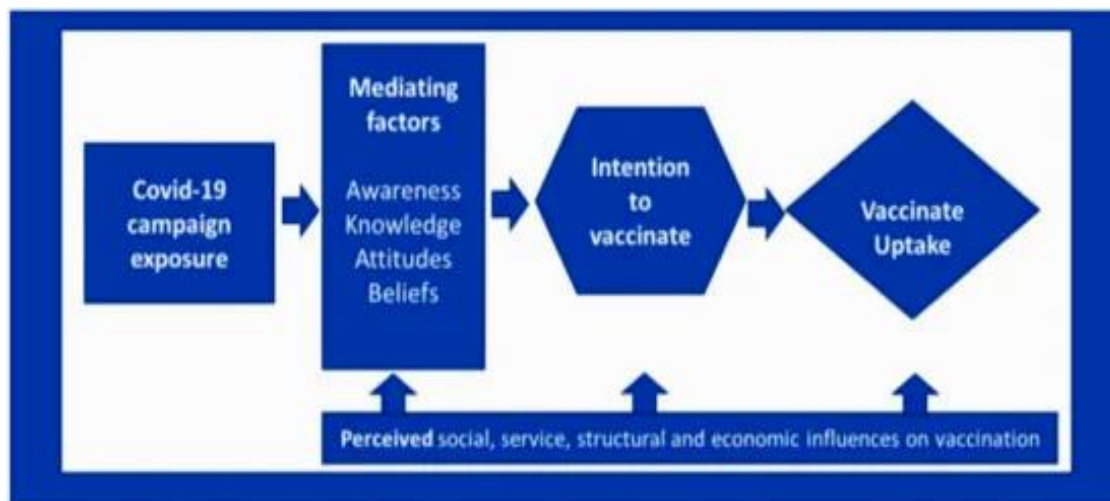

Figure 1: Adoption Model for digital platform services to manage COVID-19 vaccination

The apparent worth of a digital help impacts the aim to embrace comparable to utilitarian hindrances. While embracing a development, esteem boundaries are habitually associated with cost benefit proportions, normally alluding to substitution labor and products. In healthcare frameworks without direct client interaction charges, this likewise applies to the presentation errors between the advancement and the substitution administration. As per exchange cost theory the expense of enrolling on the vaccination stage

ought to be viewed as in this present circumstance alongside the open door cost of renouncing the upsides of elective vaccination strategies, (for example, vaccination by means of versatile vaccination groups and vaccination in centres) (Xu, et al., 2021). The convenience of the creation is another huge impediment to opposition: when a development's working is muddled or doesn't fill in as planned, individuals will generally dismiss mechanical headways. Users might skip or end a meeting in the event that they can't use the digital vaccination administration. The security hazard of the individual data used in the help cooperation is a genuine concern of potential help users that is firmly connected with convenience. When implementing digital services, this security risk barrier is a big problem, particularly for immunization services. medical information is seen to be among the most sensitive, making it the kind of user data that should be protected the most.

2. REVIEW OF LITREATURE

According to Nishtar (2004), public-private partnerships are now essential since the public sector is incapable of delivering basic services in a timely and effective manner. Instead of the shenanigans that occur when the public and private sectors work together to establish healthcare systems or to abuse the authority bestowed upon them, the research is focused on coming up with a practical approach to deliver sustainable health care services. Global norms and principles, health objectivity, social safety nets, conflicts of interest, reorienting national healthcare systems, contributing to shared aims and objectives, and lack of results are some of the ethical issues that are encountered while putting such models into practice (Asadullah, Faik, & Kankanhalli, 2018). Legislative framework, policies, and operational strategies, decision-making, governance structure, power relations, selection criteria, sustainability, and accountability are some of the operational and process-related problems associated with orientation. It is recommended that the framework be created while taking into account the dynamics of public private partnership agreements as they apply to the social sector as a whole.

The report of CII and KPMG (2009) provides a summary of the Indian healthcare industry, demographic trends, health infrastructure, and finance methods. Public-private partnerships in India have real promise, according to a descriptive research on the topics of healthcare public private partnership and models of public private partnership. It has a tool that may be used to improve or modify Indian scenario. The success of a public private partnership, however, depends on taking into consideration the interests of all parties involved. For the public sector to operate in tandem with the commercial sector, certain improvements and training are required. Public private partnership will be successful in India and will contribute to raising the nation's economy and GDP with mutual collaboration and understanding.

According to Akshay (2010), states like Karnataka, Andhra Pradesh, Tamil nadir, and Kerala have implemented ppp projects. Private firms have joined the health insurance sector with full force to provide novel systems since the public insurance model is failing to provide health insurance. The "Yashaswini Insurance Scheme" for people below the poverty line (bpl) proved to be a great success and resulted in a surplus of Rs. 1.86 crores in 2002. He examined various health insurance programs to see which one is the best for the nation. The two successful models were also compared. He concluded that the as healthcare costs rise and demand rises, these systems appear to be not becoming more effective. So, it is necessary to have a wide framework for policy that may be modified to fit the requirements of the nation. An alternative healthcare model utilizing public private partnership programs must be developed as only Yashaswini and Aarogyasri will not be sufficient to meet the demands.

According to Ravindran (2010) three different stages of privatization have been suggested in Pakistan; Forst, public-private partnerships between private actors and the government of Pakistan; second, enormous scope contracting out of openly supported health services to private and not-for-profit organizations; and third, social showcasing and diversifying the organizations offering regenerative health care. A limited selection of dispersed reproductive health services, sometimes of subpar quality, have been made accessible as a result of privatization, particularly for women. Pakistan's underfunded healthcare infrastructure need for significant investment, with funds coming from both the public and private sectors, in order to achieve health equity.

According to Tekin & Çelik (2010), the turkish healthcare industry is working to improve and enhance its health care system via public-private partnership methods. The Turkish ministry of health is modelling its PFI program after that of the UK. a financial model is considered to be public private partnership. Although

turkey began developing a public private partnership model in 2005, the first model wasn't put into use until 2009. There were three parties involved in the execution of the public private partnership model: those in favour, those against, and those who were neutral. It was discovered that the ministry of health lacked the necessary management, engineering, finance, administrative, and human resource infrastructure to support applications for public private partnership. The institutionalization of public-private partnerships, the creation of legal frameworks, the use of scientific methods in standard contracts, transparency, the selection of an appropriate public-private partnership model for the nation, political support, project selection, pre-preparation, practice, and the protection of public benefits are strategies that have been suggested in response to the ongoing criticism of public-private partnerships (Hermes et al., 2020).

Public owned healthcare facilities confront enormous obstacles, particularly in developing nations, according to Sekhri et al. (2011). The public sector struggles with poor equipment, infrastructure, frequent shortages of drug supplies, and poor treatment standards. Public-private partnerships are becoming more popular across nations as a way to use private capital and knowledge to advance public policy objectives. Public private integrated partnerships are a novel type of public private partnership that aim to increase healthcare accessibility, effectiveness, and efficiency (Collis, et al., 2022). An integrated partnership enables the private sector to actively recruit both personnel and financial resources to assist the government in carrying out its duties of ensuring that everyone has access to high-quality public healthcare services.

3. METHODOLOGY

3.1 Research Design

3.1.1 Federal State with Highest Vaccination Rate in India as Research Area

The government of India with the most noteworthy vaccination rate was chosen to assist us with addressing our review question on which stage configuration best conquers reception obstacles (see Table A1 and Figure A1). As per the "Public Vaccination Methodology" delivered by the India government in October 2020, every bureaucratic state in India was expected to expand its inoculation programs. Following a choice technique on November 27, 2020, selected on a digital vaccination stage for its inhabitants. The digital platforms were used for (1) booking of vaccination arrangements (enlistment), (2) greeting messages with QR codes and updates, (3) security QR code registration, (4) affirmation management (registration structures), (5) holding up list with information security consistent patient calls, (6) distribution of vaccination lodges, (7) checking list, (8) vaccination documentation with vaccination group and worker code sweep, and (9) government information announcing. Nonetheless, the quick reserving of the accessible vaccination dates caused strain, inconvenience, and fury among the general population (Fagherazzi et al., 2020). A preregistration list for vaccinations was made thus, and it came full circle in January 2021. Subsequent to gathering enrolments for quite a long time, the residents' all's decisions, (for example, vaccination site, daytime, work day, and accomplice code) were randomized and, utilizing a smart calculation, the enlistments were circulated as per the inclinations. On January 27, 2021, the primary randomized designation took led with legitimate authorization to guarantee an equitable and fair portion methodology. In April 2021, the India government changed the vaccination plan and included 65,000 doctors who had been inoculated independently in their own offices in the vaccination program.

3.1.2 Understanding the Adoption by Means of a Survey of Vaccinated People

There were 46 inquiries in the study, which was wilful and unknown. Nine inquiries concerning setting and control factors (like orientation, age, and instruction) were asked toward the start of the review prior to continuing on toward inquiries regarding stage administration evaluation and future reception aims for digital health services. On a seven-point Likert scale, respondents demonstrated the amount they concurred or contradicted the proclamations (scores of 1-3 are negative, 4 is unbiased, and 5-7 are positive) (Woldeyohannes & Ngwenyama, 2017). The reliant variable "reception goal" is functional zed utilizing an intelligent, first-request build that was changed from for the healthcare setting. Reception expectation is characterized as the aim to embrace digital health services. It is partitioned into utilitarian, mental, and individual hindrances as per the philosophy of Mani and Chouk (2018), and every one of these classes is functional zed in intelligent, first-request develops for its relating boundary. The operationalization of as an intelligent, first-request idea was applied to examine correspondence arrangement to decide how rapidly the help's data was viewed as given. Like this, the scale created by Burnham et al. is used to quantify the degree

of personalisation in a help. Information management shows how exceptional the digital stage is to answer constantly and rapidly to customer needs. First-request develops are shaped from the reflected parts of the two builds.

The India public were educated from the beginning to use the technology to get the COVID-19 vaccination, making the base populace very appropriate to answer the review issue. Thus, the example is less helpless against the supportive of progress predisposition that is normal in development studies, which holds that individuals will generally embrace change and development with a good 404 substantial respondents were used to gather. Members were given severe privacy guidelines, which diminished the opportunity of a social attractiveness predisposition. An extensive collinearity assessment strategy was embraced to check for neurotic co linearity to diminish the probability of normal technique predisposition. The whole co linearity test yielded difference expansion factors (VIFs) that were under 3.3. Accordingly, the outcomes show that there is minimal possibility that the model has normal strategy inclination. Because of its advantages as far as test dissemination and size, a part based underlying condition model was used to break down the dataset to assess the exploration model and the connected hypotheses. Utilizing way gauging estimations and a case-wise substitution missing methodology, the model was processed utilizing Smart PLS 3.0. The standard blunder assessments were performed utilizing a nonparametric bootstrapping with 5000 replications and individual level changes

3.2 Hypothesis

H1.1. The perceived price barrier (value barrier) has a negative impact on the intention to use the digital platform service.

H1.2. The intention to use the digital platform service is adversely affected by the usability barrier (perceived complexity).

H1.3. The intention to use the digital platform service is negatively impacted by the perceived security risk barrier.

H1.4. The self-image barrier has a detrimental impact on the intention to use the digital platform service.

H1.5. The requirement for human interaction, a tradition barrier, has a detrimental impact on the intention to use the digital platform service.

4. RESULTS

200 people who took the survey—2/3 of whom were female and 1/3 of whom were male—completed it on average in 12 minutes. There were 100 legitimate responses. 40% of the population is under 46 years old, 50% is between 25 and 40, and 10% is over 68. 26% of the respondents worked in the healthcare sector, and 50% had a university degree. Age and health accounted for 35% of all immunizations, according to the national vaccination classification, making them the two most important factors. 86% of respondents indicated positive or neutral satisfaction with government as the provider of the immunization, and 85% said they would use digital health services in the future (Rasheed et. al2021). 11% of users said they were prejudiced and concerned about technology, while 10% of users thought the digital vaccine platform was challenging to use. 83 percent of respondents (positive/neutral) believed that the configuration of digital platforms was appropriate for their problem (personalization), 83 percent believed that it kept them informed (communication), and 76 percent believed that it responded quickly (data management). The majority of respondents gave the digital vaccination platform extremely high praise in the configuration areas of personalization (by 52%) and communication (by 53%) (See Table 1).

Table 1: Descriptive Results of Digital Vaccination Management Survey

Variable	Description	M	SD
Duration	Time to fill out survey.	609	356
Age	(1–4) <46, (5–6) 46–67, (7–8) >67	5.70	1.63
Gender	(1) male, …, (5) female	3.45	1.77
Education	(1–5) school/job, (6–7) B./Master	4.23	1.92
Healthcare w	1 (yes), 2 (no)	3.56	2.12
Priorisat. Group	(1–4) age, (5) care, (6) health, (7) job	1.23	2.65

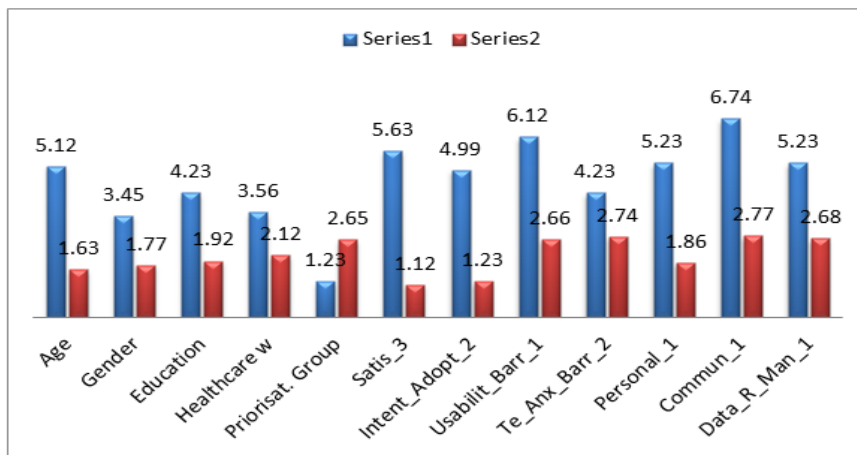| Satis_3	Satisfied with vaccination process	5.63	1.12
Intent_Adopt_2	intend to use dig service in future	4.99	1.23
Usabilit_Barr_1	digital portal was easy to use	6.12	2.66
Te_Anx_Barr_2	not using d. tech. to avoid errors	4.23	2.74
Personal_1	portal appropriate for concern	5.23	1.86
Commun_1	portal keeps me well informed	6.74	2.77
Data_R_Man_1	portal responded quickly	5.23	2.68

Figure 1: Results of the Digital Vaccination Management Survey in Brief

The viability of the estimating develops was surveyed by testing them without underlying linkages to affirm our reception model. Then, a develop explicit exploratory head part examination was performed. Marker trustworthiness for all designs is proposed by the pointer loadings, which reliably outperformed 0.708 (Abdul et al., 2021). Then, Cranach's alpha was determined so that each develop might perceive how dependable it was. The discoveries were over 0.7, which is a sufficiently dependable outcome. The typical fluctuation removed (AVE), which was acquired in the wake of looking at joined legitimacy and the separate, surpassed the negligible degree of 0.5. Results from the examination with the squared intercorrelation of the builds were in like manner adequate. The recommended research model's course coefficients and meanings were assessed utilizing the primary model (see Table 2 for further data).

Table 2: Results from Structural Equation Modelling.

Item	Image Barr	Individual Inertia	Perceived Dependence B.	Perceived Value Barrier	Security Risk Barr	Technology Anxiety Barr	Tradition Barr	Usability Barr	Intention to Adopt
Communication	-0.185	-0.120	-0.312	-0.099	0.007	-0.168	0.058	-0.068	
Data Management	-0.123	-0.008	-0.032	-0.098	-0.085	-0.162	0.118	-0.245	
Personalization	0.265	-0.163	0.131	-0.131	-0.136	0.156	0.079	0.099	
Intention to adopt	-0.261	0.030	-0.106	0.109	0.090	0.095	-0.058	-0.052	-0.05
Age									-0.32
Education									-0.08
Gender									
Vaccination Timing									0.02

With values ranging from 0.10 to 0.51, the measured R2 confirms an adequate match between the data and the model. The VIFs were processed while considering the chance of multicollinearity at the underlying level, yet they generally fell beneath the fundamental limit of five. The following stage was to compute the standardized root-mean-square lingering (SRMR = 0.08), which was used to assess the model's fit. The worth is adequate with the safer limit for covariance-based underlying condition modelling, regardless of whether the nature of this marker has not yet been totally affirmed for PLS-based primary condition modelling. We examined the effect of utilitarian, mental, and individual impediments on the expectation to embrace (ItA) digital vaccination services for the principal set of hypotheses (see Table 3).

Table 3: The findings of hypothesis H1 focused on adoption difficulties.

Hypothesis	Structural Relation	Original Sample	M	SD	t	P
H1	Usability Barrier (Rev) ->ItA	-0.236	-0.322	0.012	4.231	0.0001***
H2	P. Value Barrier ->ItA	-0.156	-0.215	.0451	3.551	0.170
H3	Security Risk Barrier ->ItA	-0.312	-0.125	.0233	4.361	0.008**
H4	Image Barrier (Rev) ->ItA	-0.344	-0.362	.0145	5.126	0.001***
H5	Tradition Barrier ->ItA	-0.356	-0.251	.0344	5.888	0.400

5. DISCUSSION

5.1 Platform Services for Vaccination Processes—Implications for Further Research

This study proposed a changed reception model that makes sense of stage services for vaccination services, as well as by and large for new digital health services, instead of the opposition model of Mani and Chouk which was initially created for estimating the acceptance of new advances in shopper products markets. This study offers observational help for the model's relevance. In view of the three stage design areas of customization, correspondence, and information management, eight deterrents to the agreeableness of digital vaccination services were found. Most of variable loadings support the model.

The usability barrier should be listed as the main influencing element since it has the greatest impact on adoption intention. In the end, this investigation confirms Ram and Sheth's findings. The second most significant element, the major image barrier, supports the results of researchers like Laukkanen, who found that people may avoid using digital innovations if their identities do not match the functions that are being presented for them. However, image is frequently seen as a network of associations, particularly in the context of commercial communication, from which expectations emerge that are not always connected to one's own self-concept. To fully understand the impact of image on innovation acceptability, more research is required. Interestingly, neither tradition nor technical weaknesses (perceived dependency and technological fear) have a substantial impact on our approach. Only image does.

It's rather striking the way that little worth matters. This differentiations with purchaser items statistical surveying, where it has been exhibited that one of the principal factors impacting acceptance of a development is seen esteem, which is characterized as the shortfall of money related and execution esteem Concentrates on digital innovations that tended to COVID-19 likewise uncovered that the biggest effect on technology reception was anticipated execution (as an intermediary for esteem) The worth of the inoculation is very perfect (given the risk of mortality from COVID-19 and given the re-established opportunity of monetary activity), and there is no other option (however COVID-19 testing might be a brief substitute), which is one defence that may be given. Subsequently, the worth in the conventional significance of a cost benefit proportion isn't as significant in this present circumstance. A substitute clarification has to do with the elements of the mandatory India healthcare framework, where patients are not informed the expenses of medicines, drugs, immunizations, and so forth, therefore such expenses are not imbued in their recollections.

Despite the fact that latency has been shown to be a central point impacting the reception of developments this study has not distinguished a significant effect. Lawmakers and professionals have over and again asked the newbies and antibody defaulters to immunize to drive up vaccination rates during the COVID-19 pandemic. This vaccination reluctance inertia is not apparent in our analysis. Future research is needed to determine if this conclusion can be generalized to the healthcare system or if it is uniquely related to factors like the general population's subjective perception of COVID-19's lethality

5.2 Platform Services for Vaccination Processes—Implications for Management and Policy

How to manage a pandemic and optimize the quick uptake of linked health services is a crucial concern for pandemic managers and policy makers. In order to manage vaccination operations, this paper suggests a digital vaccination service paradigm. The configuration areas of customization, communication, and data management are useful ideas to take into account while implementing such services, since they all significantly affected the adoption hurdles. Although not all hurdles had a substantial impact on the vaccine candidates' decision to adopt, the cumulative impact of all barriers should not be disregarded.

Our research indicates that usability and functionality are quite important. The main influencing element for configuring platform services should be noted as the usability since it had the most impact on adoption intention. The click flow (see Appendix A.6) appears to be crucial in determining whether consumers on digital health platforms convert or bounce. As a result, using a patient-centred approach, the management and design of the assistance provided throughout the digital vaccination experience is of paramount importance. The largest effect of personalisation on usability may be seen throughout the whole model. The ability to shape a help as per the demands and inclinations of the subjects supports its practicality for the user and ought to subsequently reduce related originations of development obstruction, making customization the main concern for strategy producers and pandemic-battling officials.

Usability, image, perceived dependency, and technology anxiety are the most common effects of communication, the second area of platform configuration, on adoption obstacles. The administration of vaccinations depends heavily on information processing on platform services since healthcare sectors have a predominate risk-avoidance attitude. This relates to the creation, dissemination, and updating of information. People can assess the worth of an invention because they can compare it to the harmful status quo and grasp its qualities more clearly with detailed information. Correspondence offers designated data to separate boundaries (e.g., convenience), coordinate user inclinations with stage arrangement (i.e., separate the picture hindrance), and separate the apprehension about specialized shortcomings (i.e., separate the reliance on technology and uneasiness obstructions). It essentially influences whether or not an individual would acknowledge a digital help mentally. In India, the data cycle was conveyed not just on the site of the bureaucratic health service yet in addition on the specific site, https://social.niti.gov.in/ (got to on March 23, 2022), with clarification and direction, as well as a continuous interaction with email updates, data connections, course direction, SMS updates, and a check list for the vaccination cycle in the assigned vaccination places.

6. CONCLUSION

Internationally, COVID-19 has become a top priority because to its widespread effects, and all nations have made every effort to contain the dreadful situation to the best of their abilities. The use of vaccines is a crucial tactic that may help avoid the disease's horrifying effects and lower mortality rates (Mbiine et al., 2021)The planning, obtaining, distributing, and pricing of the vaccinations were major responsibilities of the federal government, while the state governments concentrated on carrying out the program. The central government's monopoly on vaccine procurement led to large purchases at discounted prices. Vaccine makers, however, quoted higher costs for the state governments and private health units while keeping relatively cheap rates for the central government as a result of the implementation of liberalized policies, which also resulted in differential pricing. The initiative was hastened by the following adjustment to the vaccine strategy, which increased the central government's engagement in procurement. Dependence on the private sector for vaccination distribution did not considerably help the program go through more quickly.

REFERENCES

1. Saw, Y.E.; Tan, E.Y.Q.; Liu, J.S.; Liu, J.C. Predicting Public Uptake of Digital Contact Tracing During the COVID-19 Pandemic: Results from a Nationwide Survey in Singapore. J. Med. Internet Res. 2021, 23, e24730.

2. Smith, I.M.; Bayliss, E.; Salisbury, H.; Wheeler, A. Operations management on the front line of COVID-19 vaccination: Building capability at scale via technology-enhanced learning. BMJ Open Qual. 2021, 10, e001372.

3. Kis, Z.; Kontoravdi, C.; Shattock, R.; Shah, N. Resources, Production Scales and Time Required for Producing RNA Vaccines for the Global Pandemic Demand. Vaccines 2021, 9, 3

4. Kim, D.; Lee, Y.J. Vaccination strategies and transmission of COVID-19: Evidence across advanced countries. J. Health Econ. 2022, 82, 102589.

5. Kitagawa, T.; Wang, G. Who should get vaccinated? Individualized allocation of vaccines over SIR network. J. Econom. 2021, 232, 109–131.

6. Radonjic-Simic, M.; Mahrt, C.; Niemand, S.; Speck, A.; Windrich, M. Decentralized Open Platform for Vaccination—A India Example: COVID-19-Vacc. J. Open Innov. Technol Mark. Complex. 2021, 7, 186.

7. Xu, Z.; Qu, H.; Ren, Y.; Gong, Z.; Ri, H.J.; Zhang, F.; Chen, X.; Zhu, W.; Shao, S.; Chen, X. Update on the COVID-19 Vaccine Research Trends: A Bibliometric Analysis. Infect. Drug Resist. 2021, 14, 4237–4247.

8. Asadullah, A.; Faik, I.; Kankanhalli, A. Digital Platforms: A Review and Future Directions. In Proceedings of the 22nd Pacific Asia Conference on Information Systems, PACIS 2018, Yokohama, Japan, 26–30 June 2018; p. 248.

9. Hermes, S.; Riasanow, T.; Clemons, E.K.; Böhm, M.; Krcmar, H. The digital transformation of the healthcare industry: Exploring the rise of emerging platform ecosystems and their influence on the role of patients. Bus Res. 2020, 13, 1033–1069.

10. Collis, A.; Garimella, K.; Moehring, A.; Rahimian, M.A.; Babalola, S.; Gobat, N.H.; Shattuck, D.; Stolow, J.; Aral, S.; Eckles, D. Global survey on COVID-19 beliefs, behaviours and norms. Nat. Hum. Behav. 2022, 6, 1310–1317.

11. Fagherazzi, G.; Goetzinger, C.; Rashid, M.A.; Aguayo, G.A.; Huiart, L. Digital Health Strategies to Fight COVID-19 Worldwide: Challenges, Recommendations, and a Call for Papers. J. Med. Internet Res. 2020, 22, e19284.

12. Woldeyohannes, H.O.; Ngwenyama, O.K. Factors Influencing Acceptance and Continued Use of mhealth Apps. In HCI in Business, Government and Organizations. Interacting with Information Systems; Nah, F.F.H., Tan, C.H., Eds.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, India, 2017; pp. 239–256.

13. Rasheed, J.; Jamil, A.; Hameed, A.A.; Al-Turjman, F.; Rasheed, A. COVID-19 in the Age of Artificial Intelligence: A Comprehensive Review. Interdiscip. Sci. Comput. Life Sci. 2021, 13, 153–175.

14. Syed Abdul, S.; Ramaswamy, M.; Fernandez-Luque, L.; John, O.; Pitti, T.; Parashar, B. The Pandemic, Infodemic, and People's Resilience in India: Viewpoint. JMIR Public Health Surveill. 2021, 7, e31645.

15. Mbiine, R.; Nakanwagi, C.; Lekuya, H.M.; Aine, J.; Hakim, K.; Nabunya, L.; Tomusange, H. An Early Warning Mobile Health Screening and Risk Scoring App for Preventing In-Hospital Transmission of COVID-19 by Health Care Workers: Development and Feasibility Study. JMIR Form Res. 2021, 5, e27521.

16. Nishtar, S. Public – private 'partnerships' in health – a global call to action. Health Res Policy Sys 2, 5 (2004). https://doi.org/10.1186/1478-4505-2-5

17. CII and KPMG. 2009. "The Emerging Role of PPP in Indian Healthcare Sector." Policy Paper. Available online at: www.ibef.org/download/PolicyPaper.pdf.

18. Ravindran, T. S. (2010). Privatisation in reproductive health services in Pakistan: three case studies. Reproductive Health Matters, 18(36), 13-24.

19. Tekin, P. S., & Çelik, Y. (2010). Analysing public-private partnership policy as a financing method in Turkey health sector with political mapping. In 7th Biennial Conference in Organisational Behaviour in Health Care, Mind the Gap: Policy and Practice in the Reform of Health Care (Vol. 62).

20. Sekhri, N., Feachem, R., & Ni, A. (2011). Public-private integrated partnerships demonstrate the potential to improve health care access, quality, and efficiency. Health affairs, 30(8), 1498-1507.