NOVEL APPROACHES OF PUBLIC POLICY INTERVENTIONS FOR VALUATING

AND HARNESSING DATA FROM THE DIGITAL HEALTH METAVERSE

TO ENHANCE HEALTH MANAGEMENT THROUGH

EMERGING TECHNOLOGIES

by

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Admissions Director

Dedication

I adore and gratefully dedicate my research studies to my family who has been with me during this journey and supported will the end of DBA and also friends who constantly motivated me to achieve this goal. I would like to express my deepest gratitude to a multitude of individuals, particularly my parents, my spouse, my children, my mentor, and also my friends who constantly motivated me to achieve this goal who were by my side during the entire process.

I started out on this route with a lot of enthusiasm, but I quickly found that I was getting lost in the maelstrom of business commitments and other priorities, which eventually became a struggle that lasted for about a year and a half. My resiliency and dedication were put to the test when I faced multiple challenges of balancing the necessity for thorough attention with the desire to obtain a successful outcome. I like to express my gratitude to a large number of individuals for contributing to the completion of my research.

My father Lakshmi Reddy C (Retd.), in particular, deserves special recognition for his contributions to my family. He listened to my frustrations and periods of feeling trapped and sluggish with patience because he was patient. There were times when I considered I was so burdened by my work and other commitments in my life. During the course since past three years, he has never allowed me to falter and has been there for me to provide unwavering support and assistance in refocusing my attention on my work and my PhD. While I was concentrating on my study, my spouse and children were always there to provide me with support. This was especially true during the past two years, when everything else was put on the back burner. The advice that my father gave me was, "You

must finish this Journey, diversions do come on your way, but keep your focus ..."

The person who served as my mentor, Dr. Atul Tripathi Sir, was always encouraging and always available to offer helpful recommendations for study and publications. On WhatsApp or email, he was always available to receive a message. In the past, I was always aware that if I posed a query, he will respond within a short span of time. As a result of his determination, I was able to simultaneously present in a Industry seminar. In light of the fact that I come from the business world rather than the academic world, it was a significant adjustment for me to be able to concentrate on writing and research while maintaining a prominent day job. My mentor's unwavering support and encouragement kept me going when I needed it the most. I am relieved to have finished my report after putting in numerous hours of work and receiving encouragement from him, my friends, and my family.

Due to the fact that they are currently working in the sector, my children Darshan, Manavi and Shanvi, were of great encouragement and support. In conclusion, this gratifying trip that was fraught with a great deal of uncertainty was only possible because of his support that I received from my mentor, Dr. Atul Tripathi, as well as from my family and friends.

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ABSTRACT

NOVEL APPROACHES OF PUBLIC POLICY INTERVENTIONS FOR VALUATING

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2025

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The implementation of health policies plays a crucial and critical role in the healthcare industry, as it involves the process of transforming policy objectives into practical measures and achieving the desired results. In the context of India, it is evident that despite the implementation of several health and technology policies, there continue to exist substantial deficiencies in both their efficient development and implementation. However, the advent of the digital health metaverse presents new opportunities for transforming healthcare delivery. This metaverse incorporates several technologies such as Digital Twins, Augmented Reality (AI), Artificial Intelligence (AI), Virtual Reality (VR) and Machine Learning(ML). This research proposal presents a thorough study that seeks to examine the criteria that contribute as a gap in the implementation of health and technology policies in India. Additionally, it explores novel strategies that utilize the future

potential and value of the digital health metaverse in addressing these gaps in policy formulation and implementation.

The legislative bodies of the Indian parliament have enacted rules and regulations to manage the health ecosystem in India, so establishing the authority of the Indian government in this domain. Several Indian acts and laws are in place, such as the Consumer Protection Act of 2019, the Surrogacy Bill of 2018, the Mental Health Act of 1987, the Pharmacy Act of 1948, the Biomedical Waste Management and Handling Rules of 1998, Drug and Cosmetics Act of the year 1940 and new Digital Personal Data Protection Act 2023, among others.

Several approaches will be applied to evaluate the shortcomings in the studies. These comprise the review of the research design and methodology, the application of data collecting techniques including systematic reviews, qualitative interviews, and surveys, the development of selection criteria for inclusion of the literature, and the use of both quantitative and qualitative data analysis approaches. The study's research covers a wide spectrum of subjects and produces several results:

A. The present discourse aims to explicate the definition and conceptual framework of health policy implementation.
B. Overview of the Health Policy Landscape in India

The present study focuses on the intervention and analysis of health policy gaps in India, specifically in relation to the advancements in technology.

1. The policy-practice gap denotes the divergence between the development and execution of policies in a certain setting.

2. Challenges in Institutional Capacity, Governance, and Coordination

3. Identifying and Addressing Policy Gaps to Enhance Benefits for Key Stakeholders

4. The evolution, adoption, and restrictions of technology.

5. Deficiencies in Monitoring and Evaluation

6. The concept of political will and stakeholder engagement is of great significance in the field of politics and governance.

"Political will" refers to the determination and political leaders commitment to prioritize and address certain issues or challenges. It involves the allocation of resources, implementation of policies, and the mobilization of support.

Past research has lacked a comprehensive and systematic strategy in the management of restrictions, as well as unique methodologies for monitoring the digital health metaverse. The efficacy of health initiatives in India is impeded by many gaps and obstacles. This study emphasizes the significance of reducing the gap between policy and its practice. It underscores the importance of enhancing the capacity of institutions, improving governance and coordination, addressing limitations in resources, strengthening monitoring and evaluation mechanisms, taking into account socio-cultural factors, and fostering political will and engagement of stakeholders. These steps are crucial for the effective implementation of policies. By effectively tackling these aforementioned difficulties, India has a potential to improve the execution of health policy, hence resulting in improved healthcare results for its population.

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ABBREVIATIONS

GDPR - General Data Protection Regulation (EU)

DPDP Act 2023 - Digital Personal Data Protection Act 2023

HL7 – Health Level 7 International

EHR – Electronic Health Records

EMR - Electronic Medical Records

HIS – Hospital Information System

KPI's- Key Performance Indicators

HIPAA - Health Insurance Portability and Accountability Act of 1996 (USA)

G20 – Group 20 Countries

DHT - Digital Health Technologies

AIeMDs - Artificial Intelligence–Enabled Medical Devices

AI - Artificial Intelligence

AR – Augmented Reality

VR – Virtual Reality

VSD – Value Sensitive Design

TRA - Theory of Reasoned Action

SCOT - Social Construction of Technology

LLM – Large Language Models

WHO – World Health Organization

CHAPTER I:

INTRODUCTION

1.1 Introduction

The 21st century has witnessed an unprecedented surge in digital technologies, revolutionizing various sectors, including healthcare. This digital transformation has given rise to the concept of the "digital health metaverse" – a convergent space where augmented reality, virtual reality, artificial intelligence, machine learning, and the Internet of Medical Things intersect to reshape healthcare delivery and management. This burgeoning digital landscape promises innovative solutions for diagnosis, treatment, disease prevention, and overall well-being. However, alongside its vast potential, the digital health metaverse presents unique challenges, particularly concerning data governance, privacy, equity, and ethical considerations. Additionally, according to Bajwa (Bajwa, J. et al., 2021) and Tripathi (Rodriguez, V, R., Sinha, S. and Tripathi, S., 2020), the digital health metaverse can foster greater collaboration and knowledge-sharing among healthcare professionals, thereby enhancing the overall quality of care.

According to Rekha M. Menon et. al.(Accenture, 2017), in its recent AI research reports, provides a framework for evaluating the economic impact of AI for select G20 countries and estimates AI to boost India's annual growth rate by 1.3 percentage points by 2035.
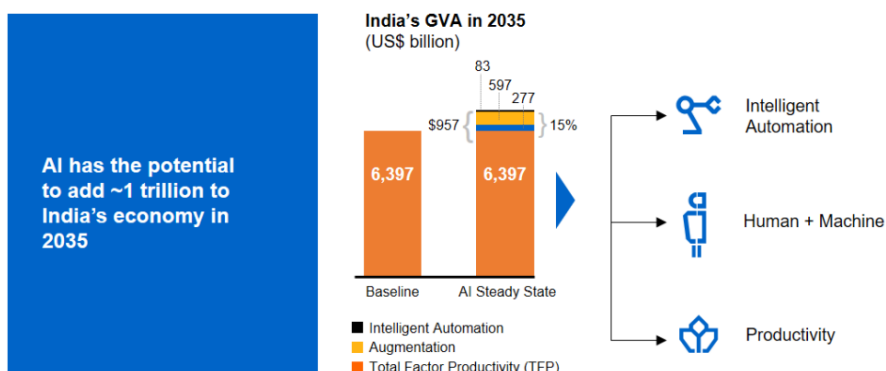
Figure 1.1 Unlocking Innovation Through AI (Source: Accenture)

The immense volume, speed, and diversity of data generated within this digital ecosystem necessitate robust public policy interventions. These interventions are crucial not only for safeguarding individual rights and promoting responsible innovation but also for unlocking the full potential of the digital health metaverse to enhance health management. This thesis argues that effectively harnessing the power of the digital health metaverse requires a paradigm shift in public policy, moving away from reactive measures towards proactive, anticipatory, and adaptive governance frameworks.

This thesis employs a multidisciplinary approach, drawing upon insights from public policy analysis, health informatics, technology law, and bioethics. The study methodology encompasses a thorough examination of current literature and case studies of successful and unsuccessful digital health initiatives, and comparative analysis of international digital health policies. Instructing individuals on optimal cybersecurity measures and possible cyber risks is essential. Awareness programs can markedly reduce the likelihood of security breaches caused by human error (Andrew, J. et. al. 2023).

Utilizing modern technologies like artificial intelligence (AI) and machine learning can aid predicting and thwarting possible assaults. These systems can examine patterns to detect anomalies that may signify a security issue (Kapoor, S., and Mehta,S,. (2022). By exploring novel approaches to public policy interventions, This thesis seeks to enhance the construction of a robust, ethical, and equitable digital health metaverse that empowers individuals, strengthens health systems, and advances global health outcomes. The outcome of this research will be of significant interest to policymakers, healthcare professionals, technology developers, and anyone invested in shaping the future of healthcare in the digital era.

The enactment of the Digital Personal Data Protection Act, 2023, is a milestone in India's data protection journey. It highlights the significance of multi-stakeholder engagement and iterative policymaking in addressing complex digital governance challenges. Future research could evaluate the act's implementation and its impact on businesses and individuals.
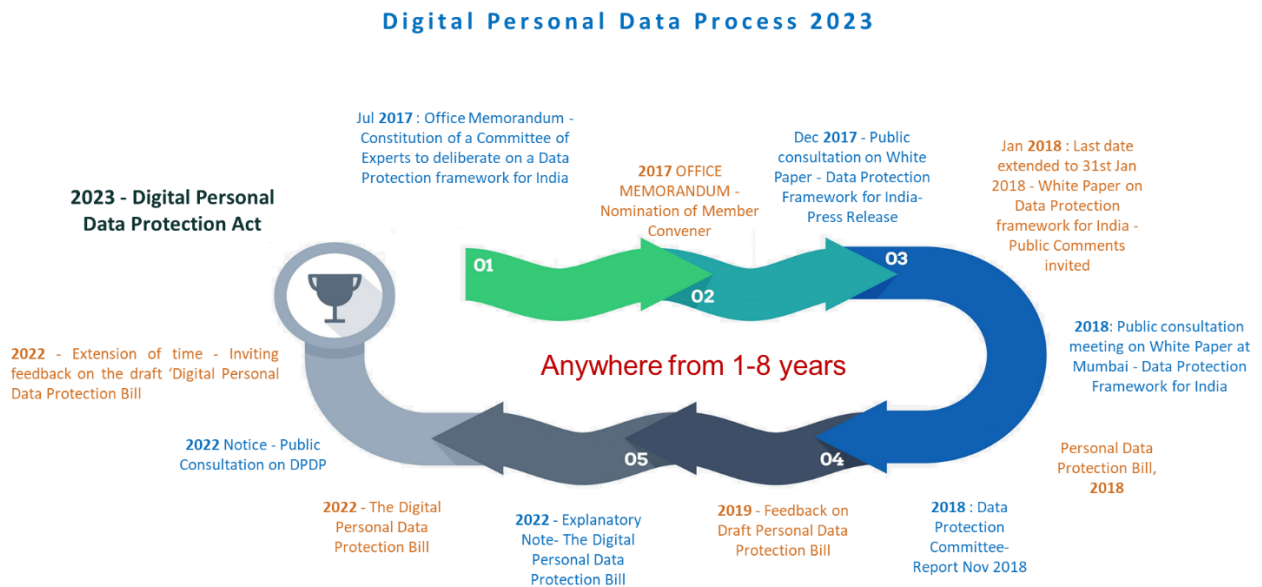
Figure 1.2 : India's Digital Personal Data Protection Policy Process

The figure 1.2 shows the chronology and development process of India's Digital Personal Data Protection Act, 2023, so exposing some important legislative process difficulties. Among these are:

    i.   Extended Legislative Agenda: The one to eight year procedure reflected the difficulty of developing a strong data protection system. Between the introduction of drafts e.g., 2018 Personal Data Protection Bill and its changes in 2019 and 2022 several delays happened. The challenge is juggling the demand for thorough debate and stakeholder consultation against immediacy.

    ii.   Engagement of Stakeholders and Response starting from the 2017 White Paper and later comments on versions in 2019 and 2022, thorough public

consultations were carried out.Different inputs from business, civil society, and legal professionals added to the difficulty in attaining agreement. Dealing with opposing opinions and guaranteeing inclusiveness while keeping policy clarity will provide challenges.

iii. Changing Global Privacy Standards and Technology: The protracted process corresponded with major technological (e.g., artificial intelligence, data analytics) and global (e.g., GDPR) standards developments. Ensuring the structure conforms with international standards while serving local demands presented great difficulty.Maintaining speed with the ever changing terrain of data security presents a challenge.

iv. Managing Interests : The act has to strike a compromise between consumer privacy rights and corporate interests. Global commerce dynamics against data localization needs. For companies, regulatory control stands opposed to operational autonomy. Preventing over-regulation that can limit competitiveness or innovation is the challenge here.

v. Institutional and Legal Authority: The act calls for the creation of establishments like the Data Protection Board and enforcement systems. Good implementation and monitoring call for qualified staff as well as enough infrastructure. Developing regulatory capability to properly enforce clauses is a challenge.

vi. Ignorance and Digital Literacy: The legislation bases its knowledge of data rights on persons on a basic level, which might not be shared consistently among a population of diversity. The challenge is closing the digital literacy divide to equip consumers with awareness about their data rights.

vii.   Unknown Implementation Uncertainty: The law offers a broad spectrum of implementation schedules; some clauses take one to eight years to come to pass. Ensuring timely and consistent application over many sectors presents a challenge.

viii.   Correcting Historical Data Misuse: Transposing to the new framework presents difficulties given past data breaches and current personal data misuse. The challenge is to develop trust in the new system while retroactively rectifying prior transgressions.

1.2 Research Problem

The rapid proliferation of the digital health metaverse, characterized by the convergence of technologies like virtual reality, artificial intelligence, augmented reality and the Internet of Medical Things, presents unprecedented opportunities to enhance health management. However, this potential remains largely untapped due to the lack of comprehensive public policy frameworks that effectively address the exlusive challenges and opportunities unfilled by this evolving digital landscape. AI-driven predictive analytics and blockchain hold immense potential to address critical gaps in healthcare policy. By fostering collaboration between technologists, policymakers, and healthcare providers, these technologies can enable a more equitable, efficient, and transparent healthcare system. According to Andrew (Andrew, J., et. al.,2023) the trend shows the increasing use of blockchain in heathcare sector. This brings a new challenge and gap in addressing the policy and governance.
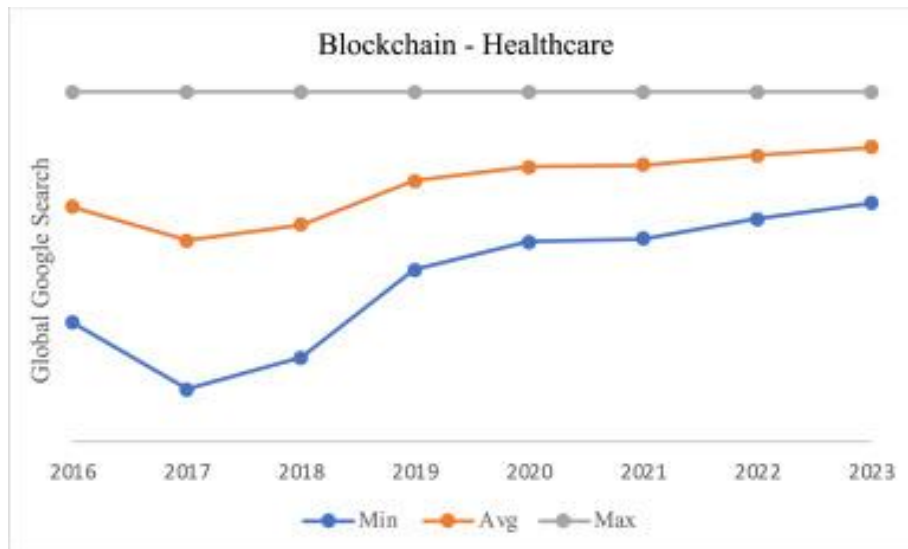
Figure 1.3 Visualization of Google Trends data regarding Blockchain in Healthcare

What would the meta-governance paradigm of government entail? In his work "E-Government Theory and Practice: The Evidence from Tennessee," Dr. Arie Halachmi (Halachmi, 2004) presented five essential models of E-governance that we need to comprehend in order to get at the solution. The visualization of meta-governance, along with its difficulties and threats, can be achieved by utilizing different E-governance models.

Existing public policy approaches are often reactive, fragmented, and ill-equipped to handle the complexities of the digital health metaverse. This inadequacy hinders the responsible and equitable development, deployment, and utilization of data-driven health technologies. This research investigates novel approaches to public policy interventions that address the intricate challenges and opportunities presented by the digital health metaverse. Specifically, this thesis examines:

- Valuating Data in the Digital Health Metaverse: Existing frameworks for data valuation often fall short in capturing the multifaceted value of health data generated within the digital health metaverse. This thesis explores innovative

approaches to data valuation that consider not only economic factors but also societal, ethical, and health-related benefits.

- Harnessing Data for Enhanced Health Management: This research delves into the development of public policy frameworks that helps in responsible data sharing, aggregation, and analysis while ensuring privacy, security, and individual autonomy. The focus will be on exploring how emerging technologies like blockchain , Gen AI and federated learning can be leveraged to create secure and transparent data governance systems (Anderson and Roberts, (2022).

- Emerging Technologies and Public Policy Synergies: This thesis investigates how public policy can foster the growth and adoption of emerging technologies within digital health metaverse while mitigating potential risks. This includes analyzing regulatory sandboxes, ethical guidelines for AI and ML in healthcare, and frameworks for international collaboration on digital health governance.

- Equity and Accessibility in the Digital Health Metaverse: This research critically examines the potential of the digital health metaverse to exacerbate existing health disparities. This thesis proposes policy interventions that promote rightful access to digital health technologies and services, ensuring that the advantages of this digital revolution reach all segments of society.

This research gap necessitates the exploration of novel public policy interventions that move beyond traditional approaches to effectively govern the digital health metaverse. This research aims to address the gap by creating a comprehensive framework for public policy interventions that helps the responsible, ethical, and equitable harnessing of data from the digital health metaverse to enhance health management through emerging technologies.

1.3 Purpose of Research

Blockchain and technological developments in artificial intelligence (AI) could change the scene of healthcare policies. With an eye toward regulatory, administrative, and data management issues, this study investigates the special roles of artificial intelligence-driven predictive analytics and blockchain in filling in gaps in healthcare policy. By reviewing of current literature and case examples, this study presents how these technologies might support fair, effective, and open policy execution (Alnsour, Hadidi and Singh, 2019). Healthcare systems worldwide face numerous challenges, including regulatory inefficiencies, administrative bottlenecks, and fragmented data management. Traditional policy measures often fail to address these challenges comprehensively. AI-driven predictive analytics and blockchain technologies have emerged as promising solutions to bridge these gaps. This paper investigates the potential applications of these technologies and their implications for healthcare policy (Thacharodi A, 2024).

The fast development of digital health technologies and artificial intelligence-enabled medical devices, and the subsequent concerns regarding their oversight and governance (Murcia, M.J. and Suddaby, R. (2024). The authors argue that traditional regulatory approaches haven't adequately addressed the potential unintended consequences of these technologies, which could hinder their development and adoption. They emphasize the need for a fit-for-purpose regulatory framework that balances the potential benefits with the ethical challenges posed by AIeMDs and DHTs. This framework should foster trustworthiness and accountability to patients, healthcare providers, and healthcare systems. The rapid advancement of AI-enabled medical devices and digital health technologies necessitates a balanced regulatory approach. This approach must consider both the potential benefits and the ethical challenges these

technologies present. Oversight should foster trustworthiness and accountability among stakeholders, including patients, healthcare providers, and healthcare systems (Murcia, M.J. and Suddaby, R. (2024).

Policymakers in difficult settings like health systems need exact and timely information to make wise decisions. A new method of Artificial Intelligence (AI) that allows data collection and analysis in complicated systems more easily available. Recent studies on the use and possibilities of effective artificial intelligence in health policymaking are underlined in this paper (Arnold and Porter, 2024).

Equipped with AI applications and its abilities, interactions among the sections of the health policy triangle like — actors, context , content, and process—have the power to transform the policy process using fresh approaches of data collecting, analysis, and specialist systems for decision-making. These tools can support healthcare system governance in making wise and informed decisions using creative ideas. Results showed how artificial intelligence could alter the policy-making process, therefore affecting the substance, context, and policy actors of course. Equipping healthcare systems with such powers helps legislators to make decisions that help to reach step-by-step objectives.

This research aims to address the urgent need for innovative public policy interventions that effectively govern the evolving digital health metaverse. The goal of this research is:

1. To assess the present state of the digital health metaverse and policies of evolving technologies such as AI : This research will assess a comprehensive framework for valuing policies that moves beyond traditional economic models to encompass societal, ethical, and health-related considerations. This analysis will provide

policymakers and stakeholders with a tool to consider the true value of health policies and guide its responsible application.

2. Propose Novel Public Policy Interventions for Harnessing Data to Enhance Health Management: This research will explore and propose specific public policy interventions that facilitate responsible data sharing, aggregation, security and analysis within the digital health metaverse. This includes investigating the potential of emerging technology like blockchain and combined learning to ensure privacy, data security and individual autonomy while maximizing the potential of data-driven health innovations.

3. Analyze the task of Public Policy in fostering equity and accessibility in the digital metaverse: The research will critically examine the potential of the digital health metaverse to exacerbate existing health and security disparities. It will propose policy interventions that promote equitable approach to digital health technologies and services, ensuring that the advantages of this digital revolution reach all segments of society.

By achieving these objectives, this research aims to promote the development of a robust, ethical, and justifiable digital health metaverse that empowers individuals, strengthens health systems, and advances global health outcomes. AI and blockchain technology are changing the healthcare field by bringing in new solutions and leading to the creation of policies for their responsible use.

Current Trends is to Improve Data Security and Compatibility: Blockchain's decentralized and secure structure allows for safe storage and sharing of medical records. It makes easy for healthcare providers to share information while keeping patient privacy protected. AI algorithms can look at this safely saved data to create personalized treatment plans and make

predictions. (Bathula, A. et al. 2024). Simplified Clinical Trials Using blockchain technology and smart contracts makes trial processes automatic, keeps track of patient consent, and safely saves trial data. This helps lessen paperwork and makes everything clearer. This merging speeds up the process of creating new treatments and medicines.

Advancements in telemedicine: AI helps improve telemedicine by giving correct remote diagnoses based on patient data. At the same time, blockchain technology keeps telemedicine interactions safe and private, building patients' trust in virtual healthcare services. AI chatbots provide personalized healthcare tips and answer medical questions, helping patients become more involved in their health. Blockchain can check the information used to train robots, helping to make sure their help is reliable.

Precision Medicine uses AI to look at genetic information and patient health records to find customized treatment choices. Blockchain technology helps keep this sensitive data safe and allows researchers and healthcare providers to share it securely. Policy Developments where the quick use of AI and blockchain in healthcare has led to new rules to make sure these technologies are used ethically, keep data private, and follow current laws.

The European Union's AI Act aims to control AI by classifying applications by their risk levels. It sets tougher rules for high-risk systems that deal with personal data or medical devices (Baltaxe, 2019). People worry that rules meant to promote ethical use might slow down innovation because of the high costs and complicated laws involved.

There are suggestions to sell anonymized medical records to help pay for improvements in biotechnology and AI, like creating AI doctors that can watch patients all the time. This method seeks to combine new ideas with protecting patient privacy and keeping data safe.

1.4 Significance of the Study

This research holds significant theoretical and practical nferences for a widerange of stakeholders invested in shaping the future of healthcare in the digital age. The significance of this study lies in its ability to:

a. Advance Public Policy Theory and Practice: This research will contribute to the development of novel theoretical frameworks and practical policy solutions for governing emerging technologies in healthcare. By exploring the distinctive challenges and opportunities offered by the digital health metaverse, this study will advance understanding of how public policy can effectively navigate the complex interplay of technology, data, and healthcare.

b. Guide Responsible and Ethical Development of the Digital Health Metaverse: This research will provide policymakers, technology developers, and healthcare professionals with evidence-based recommendations for fostering responsible and ethical innovation in the digital health metaverse. By addressing issues of data governance, privacy, and equity, this study will support the development and deployment of digital health technologies which aligns with societal values and ethical principles.

c. Empower Individuals and Strengthen Health Systems: By promoting equitable access to digital health technologies and services, this research will contribute to empowering of individuals to take greater control of their own health and well-being. Furthermore, by facilitating the responsible use of data for health spervision, this study will support the development of more efficient, effective, and patient-centered health systems.

d. Promote Global Health Equity: The findings of this research will be relevant not only to developed countries but also to low and middle income countries seeking to leverage the potential of the digital health metaverse to improve health outcomes. By addressing issues of equity and accessibility, this study will contribute to bridging the digital divide in healthcare and promoting global health equity.

e. Academic and Practical Relevance: This research contributes to the academic knowledge of the intersection between healthcare, technology and public policy. It provides valuable insights to scholars and practitioners looking to navigate this rapidly evolving field.

The earlier research lack a thorough and systematic approach to controlling restrictions and innovative methods for measuring and collecting data in the digital health metaverse:

- Public policies intervention (New Techniques): Industry participation, public promotion, and government / law regulation

- Digital therapeutics, efficacy, effectiveness, and scalability - Novel Methods and Data sources

- New technologies (algorithms, measures, tools, devices, and systems) in building a digital health metaverse

In conclusion, this research addresses a timely and critical need for innovative public policy interventions to drive the development and implementation of the digital health metaverse. The results of this study will have far-reaching implications for individuals, healthcare providers, policymakers and technology developers, ultimately contributing to a future where digital health technologies are harnessed responsibly and equitably to improve health outcomes for all.

1.5 Research Purpose and Questions

This research aims to examine the emerging digital health metaverse and propose novel public policy interventions that effectively address the challenges and opportunities it presents. Analyzing the complexities of data valuation, governance, and equity within this evolving landscape, this study seeks to develop a comprehensive framework for harnessing the power of the digital health metaverse to enhance health management through emerging technologies.

The research will address the following questions:

I. What are current gaps in the framing Public Policy in healthcare metaverse and technologies?

II. How can we develop a comprehensive framework for valuing health data in the digital health metaverse that considers economic, societal, ethical, and health-related benefits?

III. What novel public policy interventions are needed to facilitate responsible data sharing, aggregation, protection and analysis within the digital health metaverse while safeguarding individual privacy, security, and autonomy?

IV. How can public policy incentivize the development and adoption of privacy-preserving technologies and data sharing practices within the digital health metaverse?

V. What specific policy interventions are needed to ensure that the benefits of the digital health metaverse reach underserved populations and address existing barriers to healthcare emerging technologies?

By addressing above research questions, this study goal is to provide policymakers, healthcare professionals, technology developers, and other stakeholders with actionable

insights and recommendations for shaping a responsible, ethical, and equitable digital health metaverse that benefits all.

1.6 Research Questions and Hypothesis

QUESTIONS 1: Why There Is A Gap In Framing Public Policy In Healthcare Metaverse And Technologies?

The research question highlights the intricate nature of the gap in framing public policy within the healthcare metaverse and technological advancements. By delving into the complex challenges posed by rapid technological evolution, lack of regulatory adaptation, integration complexity, ethical and privacy concerns, and stakeholder collaboration, this research seeks to throw a light on the underlying factors that contribute to the gap. Through a comprehensive understanding of these challenges, potential strategies for bridging the gap and fostering effective policy frameworks can be explored, ultimately heading to more coherent and adaptive policies in the healthcare metaverse. This research question aims to investigate the reasons underlying these gaps, seeking to uncover factors that hinder the successful alignment of public policies with the dynamic landscape of healthcare metaverse and technologies.

QUESTIONS 2: Who Are Impacted Due To Lack Of Right Framework Work For Defining Policies?

The research question underscores the extensive impact of insufficient policy frameworks on various stakeholders across society. By analyzing how citizens, patients, industries, businesses, government, policymakers, researchers, innovators, advocacy groups, NGOs, regulatory bodies, and enforcement agencies are affected, this research shall provide insights into the multifaceted repercussions of inadequate policy definition. Understanding the diverse

challenges faced by these stakeholders can participate to the development of more inclusive, comprehensive, and effective policy frameworks that better serve society as a whole. The process of defining policies is a critical aspect of governance that shapes various aspects of society. The absence of well-structured frameworks for policy definition can have far-reaching consequences, affecting different stakeholders across diverse domains.

HYPOTHESIS 1: Government intervention is essential for correcting implementation failures and ensuring effective policies impact.

The third research hypothesis delves into the justification behind governmental intervention through a close examination of obstacles to the implementation of effective policies. It contends that a thorough comprehension of these barriers necessitates a direct understanding of emerging technologies and the successful implementation of effective policies. Unlike traditional policy studies that center on instances of favorable baseline behavior, this hypothesis posits that scrutinizing endeavors to establish innovative frameworks and the incentives propelling these endeavors is of utmost importance. This approach implies that investigating the pursuits of innovative frameworks and the underlying motivations can provide invaluable insights into the imperative of government intervention in shaping novel and effective methodologies.

HYPOTHESIS 2: Key areas for government intervention include healthcare objectives, benefits, and alternative policy avenues

The initial hypothesis focuses on the task of identifying suitable areas for governmental involvement in policy framework for the healthcare metaverse and the progression of new innovative healthcare technologies. It suggests that previous efforts have been made to establish structured frameworks aimed at assisting governments in pinpointing appropriate

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points for intervention. Nevertheless, these frameworks face challenges when it comes to harmonizing diverse policy goals, evaluating both the national advantages and disadvantages, and making comparisons between alternative policy choices which benefits people. This hypothesis proposes that gaining a thorough comprehension of the interaction among objectives, benefits, and alternative policy avenues is crucial for the accurate identification of strategic points for intervention.

DECLARATIVE HYPOTHESIS 3: Effective intervention occurs through regulations, maturity framework and evaluation of outcomes

The second research hypothesis investigates the efficacy of governmental policy tools in stimulating advancements within the healthcare metaverse and the evolving advanced healthcare technologies. It suggests that gauging the resources invested in these policies is comparatively straightforward, but assessing the outcomes or achievements presents a more intricate challenge. Despite the obstacles encountered, comprehensive studies have the potential to facilitate the evaluation of outcomes, and international comparisons can enrich the range of experiences and instances available for scrutiny. This hypothesis underscores the importance of a rigorous evaluation of the influence exerted by policy instruments, as it plays a important role in refining intervention strategies and optimizing the final results.

According to Sousa, T.D. and Capdevila, E.B. (2019, Digital NSW Gov) there is a need and improvement is required to make better public policies indicating clearly what exactly one is trying to improve. They also shared a policy pyramid this was trying to address the why, what, how and with what.

1.7 Research Objectives

The objective of this research is to explore the concepts, processes, techniques, model, infrastructure, tools and framework required to examine the emerging digital health metaverse and propose novel public policy interventions that effectively address the unique challenges and opportunities it presents.

1. To evaluate the present state of the digital health metaverse and policies of evolving technologies such as ai

2. To identify gaps and challenges in current public policies and implementation

3. To develop innovative public policy interventions

4. To enhance and foster innovation in healthcare delivery, research, and technology while maintaining Ethical, Patient Privacy and Data Security

1.8 Research Benefits

This research is poised to yield significant benefits for a diverse range of stakeholders invested in the responsible and equitable development of the digital health metaverse. These benefits include:

For Policymakers:

- Evidence-based policy recommendations: This research will provide policymakers with actionable insights and evidence-based recommendations for developing effective public policy frameworks that govern the digital health metaverse.

- Tools for data governance and evaluation: The proposed framework for valuing health data and the exploration of novel data governance models will equip

policymakers with practical tools to navigate the intricacies of data ownership, privacy, and utilization in the digital health metaverse.

- Strategies for promoting equity and accessibility: This research will offer concrete policy interventions to address potential health disparities and ensure equitable access to the benefits of the digital health metaverse for all segments of society.

For Healthcare Professionals:

- Enhanced understanding of the digital health metaverse: This research will provide healthcare professionals with a deeper understanding of the potential, challenges, benefits and ethical considerations associated with the digital health metaverse.

- Guidance on ethical data practices: The exploration of data governance models and ethical considerations will offer valuable guidance to healthcare professionals navigating the growing landscape of data privacy and security in the digital age.

For Technology Business Owner:

- Guidance on data privacy and security - The exploration of data governance models and privacy-preserving technology can offer valuable guidance to developers building secure and trustworthy digital health solutions.

- Opportunities for collaboration and impact - This research will foster collaboration between technology business owners, policymakers, and healthcare professionals, creating a more aligned and impactful approach to innovation in the digital health metaverse.

For Individuals and Society as a Whole:

- Empowered healthcare consumers: By promoting data literacy and individual agency, this research will empower individuals to make informed choices about their health data, policies and engage more actively in their healthcare journeys.

- More equitable and accessible healthcare policies: This research will contribute to a more equitable and accessible healthcare policy systems by addressing potential disparities and ensuring that the benefits of awareness.

CHAPTER II:

REVIEW OF LITERATURE

2.1 Overview

This research draws upon a multidisciplinary body of literature spanning public policy, healthcare, data science, and technology ethics to provide a thorough understanding of the emerging digital health metaverse and its implications.

The latest advancements in digital health technologies are reshaping healthcare delivery and prompting significant policy considerations. Ongoing collaboration between healthcare providers, technology developersand policymakers is essential to maximize benefits while addressing challenges associated with these innovations.

Significant developments in digital health technologies in recent years have greatly affected public policy and healthcare delivery. These developments—artificial intelligence (AI), robotic surgeries, telemedicine, wearable technologies, AR + VR devices and integrated diagnostics— all help to provide more individualized and effective healthcare treatments.

Technological developments in digital health Artificial intelligence (AI) and machine learning have been increasingly important in healthcare since they improve diagnosis accuracy, disease progression prediction, and treatment plan personalization ability. Analyzing large datasets, machine learning techniques find trends that help to enable early disease identification and customized treatments. The development of telemedicine has allowed virtual consultations, therefore lowering the demand for in-person visits and improving healthcare availability.

Particularly helpful for those with chronic diseases, virtual care systems help to assist ongoing patient monitoring and management.

Wearable devices track heart rate, physical activity, blood pressure, sleep habits, and other health indicators including smartwatches, augmenteed reality (AR), virtual reality (VR) and fitness trackers. These instruments enable people to take proactive control of their health and give doctors important information on their proactive health and reactive treatment plans. Advances in integrated diagnostics let medical professionals easily share patient data using universal standards like HL7 (Health Level Seven) interoperability, hence promoting cooperative treatment and accurate diagnosis.

The fast development of digital health technologies has motivated legislators to focus on several important domains: Government are creating and upgrading rules to guarantee the effectiveness and safety of digital health solutions. To better their incorporation into clinical practices, the U.S. Food and Drug Administration (FDA), for example, offered grant possibilities to promote research on digital health technologies (Mulryne (2024) . With the explosion of health data, strong data privacy rules are absolutely vital. AI and machine learning combined in healthcare calls for strict cybersecurity policies to guard patient data. Policymakers are concentrating on guaranteeing fair access to digital health technology, therefore tackling inequalities in healthcare access and results. Initiatives try to close the digital divide so that underprivileged groups gain from technological developments (Stefan Buttigieg et al, BMJ Studio, 2024).

Making wise policy decisions depends on an awareness of the financial consequences of digital health. Researching how digital health technologies impact general system sustainability, efficiency, and healthcare costs is helping us understand the big picture.

The Digital Health Metaverse: Defining the Landscape

The notion of the "metaverse" has rapidly advanced from science fiction to a tangible technological frontier. While definitions vary, it is generally understood as a persistent, immersive, and interactive digital environment that blends virtual and augmented reality technologies. In the context of healthcare, the digital health metaverse encompasses a wide range of applications, including:

- Virtual Care Delivery: Telemedicine platforms, remote patient monitoring, and virtual reality-based therapies are transforming how healthcare is delivered, improving access and convenience. (Therapies for Children With Autism Spectrum Disorder, 2023)

- Digital Therapeutics: Software-based interventions, often powered by artificial intelligence, are increasingly utilized to prevent, manage and treat a variety of health conditions. (Wasnik and Bhasin, 2022).

- Data-Driven Health Innovations: The digital health metaverse generates vast amounts of health data, creating unprecedented opportunities for research, personalized medicine, and population health management.

Public Policy Challenges in the Digital Health Metaverse

- The swift evolution of the digital health metaverse presents unique challenges for public policy, demanding innovative approaches to address:

- Data Governance and Privacy: Balancing the benefits of data sharing with the protection of individual privacy is paramount. Emerging technologies like blockchain and federated learning offer promising solutions for secure and transparent data governance. (Wasnik and Bhasin, 2022)

- Equity and Accessibility: Ensuring rightful access to digital health technologies and services is crucial to prevent exacerbating existing health disparities. Policy interventions should address affordability, digital literacy, and infrastructure limitations.

- Ethical Considerations: The use of artificial intelligence, virtual reality, and other emerging technologies in healthcare raises ethical concerns related to bias, autonomy, and informed consent, requiring careful consideration and regulation. (Thapar et. al., 2013).

Existing Frameworks and Guidelines

Several organizations and initiatives have begun developing frameworks and guidelines for navigating the ethical and regulatory complexities of the digital health metaverse:

- The World Health Organization (WHO) has released guidelines on the ethics of digital health, emphasizing the importance of human rights, equity and inclusivity (WHO, 2016).

- The National Academy of Medicine has published reports on the ability of digital health technologies to enhance health outcomes and the ethical considerations that must guide their development and implementation.
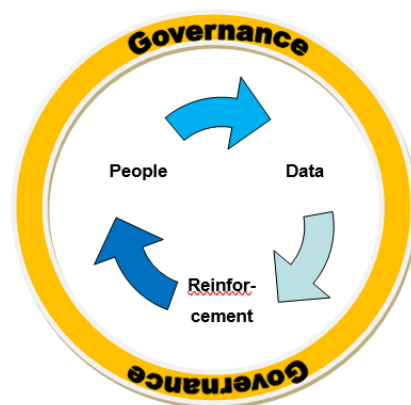
Figure 2.1 Governance Model

Governments and businesses can benefit from adopting a structured policy maturity framework to expedite policy rollout and enhance their effectiveness. I can suggest a general model based on common practices and relevant information related to current framework. A new framework should incorporates elements of agile policy development and considers the importance of stakeholder consultation and iterative development.

Gaps in the Literature and Research Opportunities

While existing literature provides a base for understanding the digital health metaverse, significant gaps remain, particularly regarding:

- Valuing Health Data: Traditional data valuation models often fails to catch the multifaceted value of health data in the digital health metaverse, necessitating new frameworks that consider societal, ethical, and health-related benefits.

- Public Policy Interventions: There is a absence of research on specific public policy interventions that can effectively address the unique challenges and opportunities presented by the digital health metaverse.

- Equity and Accessibility: More research is needed to understand the potential impact of the digital health metaverse on health inequalities and develop policy solutions that promote equitable access to its benefits.

The digital health metaverse has the probability to address the persistent gaps in the implementation of health policies in India. The integration of advanced technologies, such as Digital Twins, Virtual Reality, Artificial Intelligence, Machine Learning and Augmented Reality can enhance the efficiency, effectiveness, and social fairness of healthcare delivery (Deo and Anjankar, 2023; Bajwa et al., 2021; Rodriguez, Sinha, Tripathi, 2020).

The Edelman Trust Barometer (2024) found just 30% of respondents embrace AI, with opinions divided on acceptance and trust in the technology. But now is the time to address public reservations because AI isn't going anywhere, argues Edelman General Manager Margot Edelman.

This research aims to address these gaps by developing a comprehensive framework for valuing health data, proposing novel public policy interventions, and analyzing the potential impact of the digital health metaverse on equity and accessibility. By doing so, this study will contribute to the development of a responsible, ethical, and equitable digital health metaverse that benefits all.

"...However, the planning for such applications of AI technology in the healthcare industry in India is found to be in a rudimentary stage. A comprehensive and implementable healthcare policy in the context of use of AI technology addressing all entangled challenges is needed to be articulated which has yet not been done (Kar et al, 2018; Chatterjee, S. 2020a). To fill this gap, this study seeks to provide inputs towards framing AI-healthcare policy for India....", (Dohan and Chatterjee, 2021) discusses the need for a comprehensive healthcare policy in India that addresses the challenges of AI applications, highlighting the existing gap in public policy framing for healthcare technologies in the metaverse.

Applications of blockchain technology are solving important problems including safe medical data sharing, interoperability, and authentication. Notwithstanding the growing focus on the blockchain, the acceptance of such issues could be considered as a notable obstacle to its wide implementation. Regulatory compliance and ethical recommendations for problems like control of ownership, data security and access of patient data should get more importance. Future researchers should approach ethical and legal compliance challenges in multi-national or cross-institutional settings for blockchain adoption from a multidisciplinary perspective, we recommend. We also contend that by thinking through and stressing the important advantages

of employing blockchain-based technology, we should be able to favorably influence the public and satisfy regulatory authorities (Saeed, at el, 2022).

Healthcare data is gathered in the era of Industry 4.0 under files, wearable sensors, and other uses. Electronic Health Records (EHR), Electronic Medical Records (EMR), and Personal Health Records (PHR) are the forms of the digital health records. Such data has to be given access control together with suitable authentication. Furthermore, the question to access healthcare data needs to be inspected with suitable access control in order to prevent manipulation attacks (Tseng, Yang and Liu, 2016). Moreover, encryption is not a quick approach to safeguard the medical documents. Different encryption methods create interoperability problems if they are designed to encrypt various kinds of health records (Yang et. al., 2023). Inappropriate security to the healthcare data also causes different privacy concerns (Onesimu, Karthikeyan and Sei, 2021). Still another essential need in healthcare data is interoperability. Interoperability in data exchange and transmission across several sources as defined (Azaria, et. al. (2016). Using centralized data storage is the guiding idea of interoperability. In healthcare data, keeping all data in centralized storage is difficult since it could result in security, privacy, and slow access problems. Usually, healthcare data scales over time; hence, it is not possible to transmit every data across untrusted routes to centralized storage (Vithanwattana, Mapp and George, 2016).

Furthermore difficult is quick and safe access to the data because of its centralized character. Numerous medical researchers rely on the sharing of medical data; therefore, it is essential to ensure consistency, accessibility and scalability in the data-sharing process (Roehrs et al., 2017).

Characteristics Covered	(Shi et al., 2020)	(Mukta et al., 2022)	(De Aguiar et al., 2020)	(Sookhak et al., 2021)	(Andrew J et Al., 2023	This Research
Overview of Blockchain Architecture	✓	✓	✓	✓	✓	✕
Examination of Consensus Protocol	✓	✓	✓	✓	✓	✕
Blockchain in Healthcare - Features	✓	✓	✓	✓	✓	✕
Applications - Healthcare blockchain	✕	✕	✕	✓	✓	✕
Blockchain in healthcare- Use cases	✕	✕	✕	✓	✓	✕
Privacy and Security challenges of blockchain in healthcare - Highlights	✕	✓	✓	✕	✓	✓
consensus protocol accessible in healthcare - Latest	✕	✕	✕	✕	✓	✕
Comparative comparison of several security and privacy attacks and their défense mechanisms	✕	✕	✕	✕	✓	✓
Strengthening security and privacy in blockchain - Techniques	✕	✕	✕	✕	✓	✓
Various performance metrics available for blockchain in healthcare- Discussion	✕	✕	✕	✕	✓	✕
Ethics and Governance of blockchain in healthcare	✕	✕	✕	✕	✕	✓

Table 2.1 : Comparative analysis of features between recent blockchain survey literature and this study survey

As patients get more mobile with technology and expect their data to be portable with interoperability, mobility is increasingly of a demand in the healthcare industry. As smart devices, sensors and other internet-connected devices proliferate, data transfer capability becomes ever more important. Among the several mobility categories are mobile health, IoT for healthcare, and wireless. Mobile health calls for sensors, cellphones, and wireless body area networks (WBAN). Safe datasharing, trust, access control and user consent management define the difficulties in mobile health. WBAN's wearable body sensors also deal with issues including network availability, adaptability, responsibility and data integrity. Other areas where mobility in the healthcare industry is offered is healthcare IoT. The above literature review from Andrew J and his team shows the gaps in various section while implmenting blockchain in heathcare(Andrew, et al, 2023).

2.2 Theoretical Framework

This research will be grounded in a theoretical framework that draws upon three interconnected perspectives:

1. Value Sensitive Design:

VSD, as articulated by Umbrello (Umbrello, 2019), provides a robust framework for anticipating and addressing ethical challenges embedded within technological design. This research will utilize VSD principles to **Identify and analyze direct and indirect stakeholders** impacted by the digital health metaverse, including patients, healthcare providers, technology developers, policymakers, and marginalized communities. **Uncover potential conflicts and gaps** between stakeholder values, such as privacy, autonomy, accessibility, innovation, and economic growth. **Guide the development of policy recommendations** that promote the responsible and ethical design, implementation, and governance of the digital health metaverse.

2. Data Justice:

Emerging from the field of critical data studies, data justice emphasizes the social, political, and ethical dimensions of data. This research will draw upon data justice principles to **Critically examine power dynamics** inherent in the collection, ownership, and use of medical data within the digital health metaverse. **Identify and address potential biases** embedded within algorithms and data analysis techniques that could perpetuate or exacerbate existing health disparities. **Advocate for equitable data governance models** that empower individuals and communities, ensuring fair and meaningful participation in decisions about their data.

Audience analysis is essential for creating visualizations that engage users and fulfill their informational requirements. Customizing visualizations to suit various audience backgrounds, experience levels, and preferences guarantees relevance and engagement. Comprehending the audience's individual goals and objectives allows designers to tailor visualizations to meet communication aims and anticipated results. Accessibility concerns are essential for promoting inclusivity and engaging a wider audience. Creating visualizations that are accessible to those with disabilities, including visual impairments or color blindness, necessitates compliance with accessibility standards and rules. Incorporating alternative text descriptions, utilizing high-contrast color schemes, and providing interactive navigation elements improve accessibility and usability for all users. Furthermore, audience feedback and iterative design methods are essential for enhancing visualizations and mitigating potential shortcomings. Gathering feedback from target audience members via usability testing, questionnaires, and interviews allows designers to pinpoint areas for enhancement and progressively increase the efficacy of visualizations.

The domain of data visualization is always advancing due to technological progress and the widespread availability of visualization tools and platforms. Comprehending the strengths and weaknesses of visualization software is crucial for efficiently utilizing technical breakthroughs and minimizing potential drawbacks. Interactive and immersive visualization methods provide novel avenues for audience engagement and the exploration of intricate information. Methods including interactive dashboards, data-driven narratives, and virtual reality (VR) visualization environments augment interactivity and engagement, allowing users to engage with data in significant manners. Advancements in data visualization technologies, including machine learning algorithms for automated design and data-driven recommendation systems, offer potential solutions for frequent errors and

enhance the efficacy of visual communication. By leveraging data-driven insights and computational methods, designers can improve their decision-making processes and amplify the effectiveness of visualizations.

Recognizing that technology is not developed or implemented in a vacuum, this research will adopt a sociotechnical systems perspective. This lens emphasizes **The interconnectedness of technology, society, and policy:** Analyzing how various elements interact and encourge the development and adoption of digital health metaverse. **The importance of context:** Recognizing that the impact and effectiveness of the digital health metaverse will vary across different social, cultural, and economic contexts. **The need for iterative and adaptive governance:** Acknowledging that the digital health metaverse is constantly evolving, requiring ongoing monitoring, evaluation, and policy adjustments.

Our analysis of *139 research indicated that 127 demonstrated* a statistically significant confirmed correlation between vaccine creation and adverse COVID-19 health outcomes. This part summarizes the findings, addresses the challenges of statistical analysis, and proposes avenues for further research, (Chakravorty *et al.*, 2023). We propose an open-source data visualization platform that synthesizes these studies and enables the academic community to submit evidence upon the release of new study articles. This program was created to summarize 139 articles containing data from various geographical locations worldwide.

By amalgamating these theoretical perspectives, this research will provide a nuanced and comprehensive knowledge of the complex interplay between technology, society and policy in the context of the digital health metaverse. This framework will guide the

development of practical and impactful policy recommendations that promote a more equitable, ethical, and beneficial digital health future for all.

2.3 Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (Trafimow, 2009), a widely recognized model in social psychology, can provide valuable insights into understanding and predicting individual behaviors within the digital health metaverse. This theory posts that an persons intention to perform a perticular behavior is the most immediate and significant predictor of that behavior (Argyris and Schön, 1978).

Key Components of TRA:

Behavioural Intention: This refers to the persons readiness and plan to involve in a particular behaviour. For example, a person's intention to use a digital health platform for managing their chronic condition.

Attitude: This component reflects the individual's overall evaluation of the behaviour, encompassing their beliefs about the potential outcomes and their assessment of those outcomes. A positive attitude towards using a digital health platform would involve believing it is beneficial and convenient.

Subjective Norms: This aspect considers the social pressure an individual perceives regarding the behaviour. It involves their beliefs about what significant others (family, friends, healthcare providers) think they should do and their motivation to comply with those expectations. For instance, if someone believes their doctor strongly encourages using a specific digital health tool, it can influence their intention to use it.

Behavioural Control: While not originally part of TRA, the Theory of Planned Behaviour (Prediction and Change of Health Behaviour, 2007) introduced this

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component, acknowledging that perceived control over the behaviour also influences intention. This refers to an individual's belief about their ability to perform the behaviour successfully, considering potential barriers or facilitators. Someone might be hesitant to use a digital health platform if they have limited technological skills or access.

Applying TRA to the Digital Health Metaverse:

TRA offers a valuable lens for examining user adoption and engagement with various aspects of the digital health metaverse.

Understanding Adoption Barriers: By investigating attitudes, subjective norms, and perceived behavioural control, researchers and policymakers can identify factors hindering the adoption of beneficial digital health technologies. For example, addressing privacy concerns or improving digital literacy can positively influence attitudes and intentions.

Designing Targeted Interventions: TRA can inform the development of tailored interventions to promote desired behaviours. If subjective norms are identified as a barrier, campaigns highlighting endorsements from trusted healthcare professionals could be effective.

Predicting Behaviour Change: TRA can be used to predict the likelihood of individuals adopting and adhering to new digital health interventions. Understanding the interplay of attitudes, norms, and perceived control can guide the design of more effective and engaging digital health solutions.

Limitations: While a powerful framework, TRA has limitations. It assumes behaviour is primarily driven by rational considerations, potentially overlooking emotional or

contextual factors. Additionally, measuring subjective norms and accurately assessing perceived behavioural control can be challenging.

2.4 Human Society Theory

While a singular, unified "Human Society Theory" doesn't exist as a formalized framework, this section aims to synthesize key sociological and anthropological concepts that illuminate the intricate relationship between individuals and the social structures shaping their lives within the context of the digital health metaverse.

Core Concepts:

1. **Structuration Theory:**

   Developed by sociologist Anthony Giddens Structuration theory (Wikipedia contributors, 2024), structuration theory offers a powerful lens for understanding how individuals, through their actions, both shape and are shaped by social structures. This dynamic interplay is termed the "duality of structure." Applied to the digital health metaverse:

   o **Agency and Constraint:** Individuals exercise agency in choosing whether and how they engage with digital health technologies. However, their choices are constrained by existing social structures, including access to technology, digital literacy, cultural norms, and policy regulations.

   o **Reproducing and Transforming Structures:** As individuals interact within the digital health metaverse, their actions can reinforce existing social inequalities (e.g., the digital divide) or contribute to transforming them (e.g., by promoting digital inclusion).

2. **Social Construction of Technology (SCOT): Social Construction of Technology** emphasizes that technology is not inherently neutral but is shaped by social factors throughout its design, development, and implementation. In the context of the digital health metaverse:

   o **Interpretative Flexibility:** Different social groups (patients, healthcare providers, technology developers) may have varying interpretations of the purpose, benefits, and risks associated with digital health technologies.

   o **Closure:** Over time, certain interpretations and uses of digital health technologies may become dominant, shaping social norms and expectations around health and healthcare.

3. **Digital Divide and Social Stratification:**

   The digital divide denotes the inequitable access to and utilization of digital technology influenced by socioeconomic factors, geographic location, and various other types of social stratification. In the context of the digital health metaverse:

   o **Exacerbating Existing Inequalities:** Unequal access to the digital health metaverse could exacerbate existing health disparities, limiting access to quality healthcare and information for marginalized communities.

   o **Policy Interventions:** Addressing the digital divide through targeted policies promoting digital inclusion is a crucial to warranting equitable access to the benefits of the digital health metaverse.

4. **Social Capital and Community Building:**

Social capital, encompassing the networks of relationships and trust within a community, can be fostered or hindered by technology. In the context of the digital health metaverse:

- o **Bridging and Bonding Capital:** Digital health platforms can facilitate connections between individuals with shared health experiences, potentially increasing social support and access to information. However, it's crucial to ensure these platforms don't exacerbate existing social divisions or create echo chambers.

- o **Community Engagement:** Involving communities in the design and execution of digital health technologies is essential to ensure they meet diverse needs and address potential concerns.

Understanding the complex interchange between individuals and social structures is crucial for ensuring the digital health metaverse benefits all members of society. By considering the concepts outlined above, policymakers, technology developers and healthcare providers can thrive towards creating more equitable, inclusive, and beneficial digital health future.

2.5 Contribution to the Literature:

This research on the policy implications of the digital health metaverse in India shall contributes to an existing literature in numerous significant ways:

2.5.1. Bridging the Gap Between Policy Analysis and Emerging Technologies: While existing literature explores either public health policy in India (Wasnik and Bhasin, 2022) or the potential of emerging technologies like AI and LLMs in healthcare, there is limited research examining the specific policy challenges and opportunities presented by the

digital health metaverse. This research focuses this gap by providing a focused analysis of how this emerging technology intersects with existing policy frameworks in India.

2.5.2. Examining the Ethical Dimensions of the Digital Health Metaverse: While some studies touch upon ethical considerations related to healthcare technology, this research delves deeper into the ethical implications of the digital health metaverse, particularly concerning data privacy, algorithmic bias, and access for marginalized communities. It draws upon theoretical frameworks like Value Sensitive Design and Data Justice to offer a nuanced ethical analysis.

2.5.3. Providing a Context-Specific Analysis for India: Acknowledging the impact of technology is formed by its social context, this research moves beyond general discussions of the digital health metaverse to provide a focused analysis in Indian context. It considers the unique challenges and opportunities presented by India's diverse population, existing healthcare infrastructure, and evolving policy landscape.

2.5.4. Developing Actionable Policy Recommendations: This research goes beyond theoretical analysis to offer concrete policy recommendations tailored to the Indian context. By drawing upon empirical evidence and stakeholder perspectives, it provides actionable insights for policymakers, healthcare providers, and technology developers seeking to exploit the potential of the digital health metaverse by mitigating potential risks.

2.5.5. Integrating Diverse Theoretical Perspectives: This research draws upon a multidisciplinary framework, integrating insights from public policy, sociology,

technology studies, and ethics. This integrated approach provides more comprehensive understanding of the complex interactions between technology, society, and policy in shaping the future of healthcare in India.

By delivering these key areas, this research contributes to a more nuanced and actionable awareness of the policy implications of the digital health metaverse. It provides valuable insights for stakeholders across sectors seeking to navigate the opportunities and challenges of this emerging technology and ensure its equitable and ethical development in India.

2.6 Findings from this Literature Review

However, the successful execution and implementation of the digital health metaverse in India are contingent upon addressing the challenges of inadequate physical and socioeconomic infrastructure (Paul, Upadhyay and Dwivedi, 2020). The high cost of implementing and maintaining AI-based technologies in the healthcare sector remains a significant barrier, particularly in reaching the disadvantaged communities (Deo and Anjankar, 2023).

Summary of Findings:

1. Public Health Policy in India: Existing literature (Wasnik and Bhasin 2022) underscores the complexities of healthcare policy implementation in India, often hampered by challenges like resource allocation, bureaucratic hurdles, and the need for robust monitoring mechanisms. While India has made strides in digital health initiatives, significant gaps remain in achieving equitable access and quality healthcare delivery.

2. The Digital Health Metaverse: Promise and Potential: Emerging research highlights the transformative perspective of technologies like AI, VR/AR, and LLMs in revolutionizing healthcare delivery. These technologies offer opportunities for personalized medicine, remote patient monitoring, enhanced diagnostics, and improved healthcare access, particularly in resource-constrained settings.

3. Ethical Considerations and the Digital Divide: The literature emphasizes the ethical considerations surrounding the digital health metaverse, including data privacy, algorithmic bias, and equitable access. Concerns arise regarding the potential for exacerbating existing health disparities and the need for a robust ethical frameworks to drive the development and deployment of such technologies.

4. Bridging the Gap: Policy Implications of the Digital Health Metaverse: While existing literature provides valuable insights into public health policy and the potential of emerging technologies, there is a lack of research specifically addressing the policy implications of the digital health metaverse in India. This gap necessitates further investigation into how existing policy frameworks can be adapted to harness the benefits of this technology while mitigating potential risks.

Blockchain's distributed architecture guarantees data integrity and security by means of which healthcare data is safeguarded. Tamper-proof audit trails are provided by it; these are absolutely essential for HIPAA and GDPR compliance. Blockchain's real-time tracking of policy initiatives helps to improve openness in policy execution. Smart contracts, for instance, can track and automate healthcare fund allocation to guarantee responsibility.

Often operating in isolation, facilitating Interoperability and Data Sharing in Healthcare systems compromises the efficient policy execution. Blockchain can let companies share securely and consistently, hence fostering cooperation and informed policymaking.

Forecasting infection trends and guiding lockdown procedures allowed predictive analytics to be very important in controlling the COVID-19 epidemic. Vaccine delivery throughout the epidemic was tracked using blockchain systems, therefore guaranteeing openness and lowering fraud. Blockchains are decentralized peer-to-peer systems that uses a public, trustless and append only ledger.

Blockchain technology is a trust-less system since its operations are entirely decentralized and transparent, and they are carried out independently and correctly. The trust-less system technology is built by having all of the peers as ledger members (Andrew et. al., 2023).

Key Research Gaps:

- Context-Specific Policy Analysis: There is a need for research examining the specific policy challenges and opportunities presented by the digital health metaverse within the Indian context, considering its unique socio-economic factors and healthcare infrastructure.
- Ethical Frameworks and Guidelines: Developing robust ethical frameworks and guidelines tailored to the digital health metaverse is crucial to ensure responsible innovation, data privacy, and equitable access for all.
- Stakeholder Engagement and Collaboration: Research exploring the perspectives of diverse stakeholders, including patients, healthcare providers, policymakers, and technology developers, is essential for shaping inclusive and effective policies.

2.7 Summary

This literature review highlights the requirement for further research at the intersection of public health policy, emerging technologies and the digital health metaverse in India. By

addressing the identified research gaps, policymakers and stakeholders can work towards harnessing the transformative potential of this technology while quaranteeing its ethical and equitable implementation for the benefit of all. Preventing over-regulation that might stifle innovation or competitiveness in the industry. The balancing interest for the end user and the business, research need to address - User privacy rights vs. business interests, Data localization requirements vs. global trade dynamics and Regulatory oversight vs. operational autonomy for organizations.

CHAPTER III:

METHODOLOGY

3.1 Overview of the Research Problem

Existing public policy approaches are often reactive, fragmented, and ill-equipped to handle the complexities of the digital health metaverse. This inadequacy hinders the responsible and equitable development, deployment, and utilization of data-driven health technologies. Specifically, current frameworks struggle and this research gap necessitates the exploration of novel public policy interventions that move beyond traditional approaches to effectively govern the digital health metaverse. This research aims to address this flaw by developing a comprehensive framework for public policy interventions that facilitate the ethical , responsible and equitable harnessing of data from the digital health metaverse to enhance health management through emerging technologies. A quantitative method is frequently the most effective strategy for validating a hypothesis or examining the factors that influence a result. A quantitative approach was presented as a feasible method of investigation when these data were considered (Steele, J., and Iliinsky, N. 2010).

3.2 Operationalization of Theoretical Constructs

Operationalizing theoretical ideas is a crucial phase in research development. Conceptual clarification entails the exact articulation of an ambiguous idea to enhance its recognizability or measurability. It involves the development of accurate and concrete measurement techniques (indicators or objects) that allow researchers to empirically quantify a construct.

Operationalization enables the conversion of an abstract theoretical concept into a concrete and quantifiable form, permitting its analysis through empirical data. It is essential to recognize

that even with the effective mitigation of statistical approaches that result in an overestimation of genuine positives, there remains a risk of making erroneous inferences when linking empirical findings to theoretical concepts. Effective operationalization necessitates the consideration of several methodologies for measuring variables and the direct capture of the construct. This technique is important for ensuring the precision and reliability of the research results.

Different researchers may interpret a concept variably; therefore, it is essential to explicitly define your constructs and the methodology for their measurement. Delivering clear and exact information regarding your findings helps enhance understanding among others and allow for replication if required.

3.3 Research Purpose and Questions

This research aims to address the urgent need for innovative public policy interventions that effectively govern the evolving digital health metaverse. The purpose of this research is to address the urgent need for innovative public policy interventions that effectively govern the evolving digital health metaverse.

1. To assess the present state of a framework for valuating health data in the digital health metaverse

2. Propose novel public policy interventions for harnessing data to enhance health management

3. Analyze the role of public policy in fostering equity and accessibility in the digital metaverse

By achieving the objectives, this research aims to contribute to the development of a robust, ethical, and equitable digital health metaverse that empowers individuals, strengthens health systems and advances global health outcomes.

3.4 Research Design

A researcher's decision regarding the research technique they will employ is determined by a multitude of factors. These types of factors include the researcher's perspective, the nature of the subject matter under investigation, the current states of scientific research and ideas, and the context in which the relevance of the problem is established. A quantitative approach is frequently the most effective strategy to employ when attempting to validate a hypothesis or investigate the factors that influence a result. Upon consideration of these data, A mixed approach with quantitative and qualitative approach was suggested as a potential method of investigation. (Steele, J. and Iliinsky, N. 2010)

A blueprint for putting the digital policies into effect after analysing Figure 1.2 . To guage development and efficiency, this blueprint describes implementation phases, stakeholder responsibilities, and key performance indicators (KPIs).

Civil Society/NGOs	Roles and Responsibilities
Government	Draft detailed rules and guidelines under the Act Set up and Oversee the Policy Board Conduct awareness campaigns and workshops
Governance Fiduciaries (Organizations Handling Data)	Collect and process data with user consent Ensure data, security and report breaches promptly Address grievances within specified timelines
Policy Processors (Third-Party Service Providers)	Implement security measures during data processing Follow fiduciary instructions Support fiduciaries in breach reporting
Policy Governance and Board of India	Enforce compliance and resolve disputes Impose penalties Publish annual reports on compliance trends and regulatory actions
Civil Society/NGOs	Advocate for transparency and user rights Monitor implementation Provide digital literacy training
Individuals (Data Principals)	Exercise data rights (access, correction, deletion) Report grievances Participate in awareness initiatives

Table 3.1 : Stakeholders and their Roles and Responsibilities

Category	Details
Implementation Stages	
Stage 1: Preparation and Capacity Building (Year 1)	- Finalize regulatory framework and notify rules.
	- Launch mass awareness campaigns.
	- Train government personnel and set up enforcement bodies.
Stage 2: Initial Implementation and Stakeholder Registration (Years 2-3)	- Register data fiduciaries and processors.
	- Implement consent management frameworks.
	- Establish grievance redress mechanisms.
Stage 3: Compliance Enforcement and Monitoring (Years 3-5)	- Mandate data audits.
	- Enforce cross-border data transfer protocols.
	- Create breach notification systems.
Stage 4: Refinement and Continuous Improvement (Years 5-8)	- Develop feedback mechanisms for policy updates.
	- Align with global standards.
	- Integrate emerging technologies for compliance.

Table 3.2 : implementation phases and steps

Key Performance Indicators (KPIs)	Metrics to Measure - Progress and Effectiveness
Compliance and Enforcement	- % of registered fiduciaries and processors
	- Number/value of penalties imposed
	- Breach reporting timeliness (e.g., within 72 hours)
User Empowerment	- % of users aware of their rights
	- Grievances filed vs. resolved
	- User satisfaction with grievance mechanisms
Security and Data Management	- Year-over-year reduction in breaches
	- Breach detection and reporting time
	- Compliance with data localization and transfer protocols
Institutional Effectiveness	- Resolution time for cases by the Board
	- Number of audits and non-compliance cases identified
	- Feedback incorporated via consultations
Economic and Technological Impact	- Growth in privacy-related startups and solution
	- Compliance costs for businesses
	- Improvement in global data privacy rankings

Table 3.3 : Key Performance Indicators and Measuring Matrices

It emphasizes the need of multi-stakeholder involvement and iterative policymaking in handling difficult digital governance issues. The studies could assess the execution of the act and how it affects people and companies.

3.5 Population and Sample

This study will concentrate on individuals, bureaucrats, and experts engaged in policy formation, revision, implementation, and adoption within the industries. This encompasses professionals in many roles, including a diverse specialist audience within the organization. Surveys is conducted to collect data on current practices, perceptions, and the effects of legislation on efficiency, security, and user happiness, akin to those administered to physicians, bureaucrats, attorneys, and CEOs. A varied group of participants from the general population, possessing a limited awareness of public policies, especially in healthcare, contributed survey data to obtain insights on their current knowledge, views, and the effects of these policies on their lives.

A stratified sampling method will guarantee an extensive representation of viewpoints. Stratification will take into account characteristics like as awareness, organizational engagement, and geographical collaboration to encompass a varied array of experiences and insights pertinent to the influence of data analytics on public policy formation within the healthcare and technology metaverse sector.

The sample size will be established according to statistical power and precision criteria. Power analysis will inform the assessment to guarantee adequacy for identifying significant impacts with the requisite level of confidence. Sufficient consideration will also be afforded to facilitate subgroup analyses and preserve statistical power.

Participants will be engaged through several channels, including professional networks, industry associations, and online communities pertinent to the Public Policy, data privacy,

security, healthcare, and technology sectors. Participation will be emphasized as crucial for increasing knowledge in the sector, possibly enhanced by incentives to promote engagement.

Currently involved in a pertinent position concerning policy formation and awareness, with an educational background in the healthcare and technology metaverse sector.Possess expertise or understanding relevant to the influence of data analytics on policy formulation or decision-making procedures.Freely agree to partake in the study and furnish informed consent.

Participation is contingent upon meeting particular conditions. Participants must either satisfy the specified inclusion criteria or indicate their unwillingness to engage in the research endeavor to be considered for the study. Ethical considerations will govern all phases of participant engagement, assuring compliance with principles such as informed consent, confidentiality, and respect for participant autonomy. The anonymization of acquired data and adherence to applicable data protection rules and institutional guidelines will be rigorously enforced.

Upon recruiting, participants will be requested to anonymously complete an electronic survey. The survey will be administered throughout a specified timeframe, supplemented by reminders to enhance response rates and data gathering effectiveness. The data collection will occur within a specified timeframe to enable participant enrollment, survey completion, and subsequent analysis. Sufficient provisions will be established to address potential delays while guaranteeing prompt data analysis and reporting completion. Measures will be instituted to uphold data quality requirements, encompassing pilot testing of the survey instrument, monitoring of response rates, and verification of data completeness and consistency. These strategies seek to reduce errors and biases throughout the data collection process.

3.6 Participant Selection

My study encompasses a heterogeneous cohort of individuals and entities engaged in research. This is the method by which we are selecting our participants:

1. Categorization by Similarities: We segment the overall population into smaller groups according to employment roles, company size, and geographic location. This ensures the inclusion of diverse opinions.

2. Random Selection within Groups: We are randomly selecting individuals from each of these smaller groups to guarantee a fair and impartial selection process. This methodology prevents bias towards specific demographics, hence reinforcing the study's legitimacy.

3. Proportional Representation from Each Group: The quantity of individuals selected from each group is contingent upon its size relative to the total population. More substantial groupings provide a greater number of participants for our investigation.

4. Identifying Participants: We are contacting prospective participants via several means, including professional networks, industry associations, and internet forums. This facilitates our connection with individuals from diverse backgrounds.

5. Eligibility Criteria: We are ensuring that selected individuals possess expertise in their respective roles, have policy understanding, and have the requisite experience. This approach enables us to obtain significant insights for our research. Secondly,

another cohort from the general populace, who lack expertise, contemplates policies that may be advantageous to them.

6. Voluntary Participation: Participation in our study is entirely at the discretion of the persons we reach out to. We will guarantee their comprehension of the study's purpose and uphold their rights about their information, thereby cultivating a sense of security and respect.

Through the application of this strategy and meticulous selection of participants, we aim to assemble a cohort that authentically embodies a variety of perspectives and experiences pertinent to data analysis within the policy framework domain.

3.7 Instrumentation

The quantitative study is characterized as a flexible and effective instrument for multiple phases of the research process, encompassing data gathering, analysis, and visualization. The following delineates the application and explanation of the study within the thesis:

- Employment of Statistical Tools for Executing the Quantitative Study
- Employment of qualitative methodologies for qualitative research

Survey Instrument: The creation of the survey instrument will utilize web frameworks such as Flask or survey platforms like Google Forms or surveyMonkey. An online platform that enables the construction and implementation of surveys, enabling efficient data collecting from participants. The thesis will offer comprehensive explanations of the design and

implementation of the survey instrument, highlighting its significance in optimizing the data gathering process and assuring the audience of its efficacy.

A comprehensive array of data analysis libraries, including SPSS, JASP, and PSPP, will be employed for statistical analysis. Methods including multiple regression analysis, correlation analysis, and Kruskal-Wallis tests will be utilized to examine survey results and investigate research topics and hypotheses. The thesis will elucidate the selection of suitable statistical methods (Zhang and Miller, 2021) and the implementation of analysis employing various techniques.

Data visualization will be conducted using JASP libraries, facilitating the generation of meaningful plots and graphs to convey study findings. Visualizations, including bar charts, histograms, and scatter plots, will depict trends, relationships, distributions, and frequencies within the data. The thesis will demonstrate these visualizations as essential instruments for conveying research findings clearly and accessibly.

The documentation of data analysis and visualization will be thorough to guarantee result reproducibility. This documentation will encompass annotations, variable elucidations, and method descriptions to enhance comprehension and replication of the study. The thesis will emphasize the importance of transparent and repeatable research techniques facilitated by data.

Ethical aspects pertaining to data privacy, informed consent, and confidentiality will be meticulously addressed during the implementation process. The modules will be developed and implemented in accordance with ethical standards to safeguard participant rights and ensure responsible research practices. The thesis will highlight the ethical considerations

involved in utilizing technologies for quantitative research and underscore the need of maintaining ethical standards.

3.8 Data Collection Procedures

A diverse expert audience inside the business, comprising professionals. Similar to physicians, bureaucrats, attorneys, and CEOs, surveys will be administered to gather data on prevailing practices, perceptions, and the impact of regulations on efficiency, security, and user satisfaction.

A diverse cohort of participants comprised the general public, who engaged with a limited comprehension of public policies, particularly in healthcare, to provide survey data aimed at gathering insights on their present understanding, perceptions, and the impact of policies on their lives.

Additionally, we will analyze current data from industry reports, academic journals, and various analytics databases to identify trends, benchmarks, and best practices in the application of innovative policy frameworks. The survey results will be analyzed through statistical analysis, encompassing descriptive statistics, correlation analysis, and regression analysis, to assess the impact of data analytics on various facets of participation.

Primary-Data

The primary tool employed in the data analysis was a questionnaire. The section of the survey dedicated to inquiries exhibits a coherent sequence of questions. A questionnaire was created to collect information on the topic. A thorough review of data visualization pitfalls.

To ensure the reliability and validity of the research, certain measures will be implemented:

- Pilot Testing: Executing pilot tests of the survey and interview questions to improve clarity and relevance.

- Survey data validation: Disseminating findings to interview participants for the purpose of validating and discussing their opinions and viewpoints.

- Peer Review: Evaluate the study design and findings through scrutiny by academic peers and industry specialists to guarantee rigor and validity.

Secondary-Data

The utilization of secondary data analysis not only grants researchers access to more extensive and precise data sets than they could independently obtain, but also has the capacity to conserve considerable time and effort that would otherwise be expended on data collection.

Secondary data will be obtained from different sources, including:

- The journals, media, internet and research papers are all examples of information sources accessible online.

- A diverse array of supplementary elements, encompassing academic performance, libraries, and institutional assessments, is also encompassed within this category.

- Comparative Analysis: Secondary data will be employed to evaluate the efficacy of policy frameworks in various countries and areas.

To thoroughly document previous alterations and/or findings, specialists in social and economic transformation seek secondary data. This is due to the inability of a new survey to capture all accessible information. Examples of secondary sources of knowledge accessible on the internet include books and journal articles.

3.9 Data Analysis

Survey and the participants interview includes most commonly used survey statistics that includes following techniques:

- Percents

- Medians

- Means

- Standard Deviations

- Standard Errors

- Chi-squares

- Differences between Proportions

- *t*-tests

The analysis will be also organized using bar graphs, Q-Q plots, and a correlation matrix to guarantee clarity, coherence, and efficacy in presenting the research findings as appropriate. The organization of each component is as follows:

BAR GRAPHS will be employed to illustrate categorical data and compare frequencies or proportions among various groups or categories. In structuring the analysis using bar graphs:

Data Preparation: Categorical variables of interest will be identified from the dataset and readied for analysis. Data will be categorized or consolidated according to pertinent criteria such as job function, organizational size, or geographic location.

Bar Graph Creation: The JASP tool will be utilized to generate bar graphs, with bars depicting the frequencies or proportions of each category within the categorized data.

Analysis: Bar graphs will be analyzed to discern trends, patterns, or disparities within groups, yielding insights into the influence of data analytics on many facets of software product development within the banking sector.

Q-Q PLOTS are effective for displaying numerical data distributions and comparing distributions across distinct groups. In structuring the analysis with Q-Q plots, each illustrating the distribution of a numerical variable within the categorized data

Data Preparation: Relevant numerical variables will be identified and readied for analysis.

Grouping and Aggregation: Analogous to the bar graph analysis, data will be categorized or consolidated according to pertinent characteristics.

Q-Q Plot Creation: JASP will be utilized to generate Q-Q plots, each illustrating the distribution of a numerical variable within the categorized data.

Interpretation: Q-Q plots will be analyzed to evaluate disparities in the distribution of numerical variables among groups, offering insights into the variability and central trends of essential metrics pertinent to software product development and data analytics utilization.

A CORRELATION MATRIX is an effective instrument for examining correlations among numerical variables and discerning patterns of linkage. In structuring the analysis using a correlation matrix:

Data Preparation: Numerical variables of interest will be identified and prepared for correlation analysis.

Correlation Analysis: JASP and SPSS will be utilized to compute correlation coefficients between pairs of quantitative variables, including the perceived utility of data analytics and the quality of decision-making outcomes.

Correlation Matrix Visualization: The correlation coefficients will be depicted as a matrix utilizing various libraries such as ANOVA, with coded indications representing the strength and direction of relationships. The correlation matrix will be analyzed to discern significant correlations among variables, facilitating the discovery of probable linkages and dependencies pertinent to the research aims.

Organizing the analysis with bar graphs, Q-Q plots, and a correlation matrix will provide a thorough examination of the influence of data analytics on public policy in healthcare metaverse technologies, yielding significant insights for the research study.

3.9 Research Design Limitations

When employing a quantitative technique for a thesis examining the influence of data analytics on public policy on healthcare metaverse technologies, it is crucial to acknowledge the intrinsic limits of the research design. Initially, there exists a possibility of sample bias, even when employing a method of stratified sampling. This bias may arise from variables such as voluntary involvement, resulting in outcomes that may not truly reflect the wider population. Secondly, owing to industry-specific nuances and organizational frameworks among professionals, government entities, and organizations, the findings may possess restricted generalizability beyond the particular context and population examined. Consequently, it is imperative to exercise caution when extrapolating the results to other sectors or contexts. Thirdly, dependence on self-reported data via surveys adds the potential for response bias, which may undermine the validity of the findings. Ultimately, although quantitative and qualitative analyses might reveal correlations across variables, determining causality is challenging without experimental manipulation or longitudinal investigations. These constraints underscore the necessity for meticulous interpretation of the study's findings and the consideration of future research to mitigate these restraints.

3.9 Conclusion

The methodology chapter serves as the framework for executing a comprehensive study on the influence of data analytics on public policy regarding healthcare metaverse technology. This approach employs both quantitative and qualitative approaches to deliver empirical data and insights into the intricate aspects influencing contemporary Public Policy practices.

This methodology is primarily based on careful selection of participants through a stratified sampling strategy. The study seeks to capture a varied array of viewpoints and experiences in the healthcare metaverse sector by stratifying the population according to critical characteristics such as job function, organizational size, and geographic location. It was crucial to acknowledge the potential risk of sampling bias, wherein some sectors of the population may be disproportionately represented or underrepresented, thereby distorting the findings. Notwithstanding this obstacle, stringent sampling protocols are employed to improve the representativeness and authenticity of the sample.

The data collection approach employs a combination of structured questionnaires and data scraping techniques, supported by the robust tools SPSS and JASP. The survey forms are carefully crafted to collect pertinent information regarding participants' perspectives, experiences, and practices associated with data analytics. By meticulously developing questionnaires and conducting pilot tests, measures are implemented to reduce response bias and enhance the reliability of self-reported data. Moreover, JASP / SPSS functions as a multifaceted instrument for data manipulation, facilitating the effortless integration and analysis of many data sources, encompassing structured survey replies and unstructured data acquired through web scraping.

Upon the conclusion of this data gathering phase, attention moves to data processing, wherein analytical processes are employed. Statistical methods include regression analysis, correlation analysis, ANOVA, and hypothesis testing are utilized to investigate relationships between variables and evaluate research questions and hypotheses. Visualizations, like bar graphs, Q-Q plots, and correlation matrices, are employed to portray findings simply and interpretatively, aiding in the discovery of trends, patterns, and relationships within the data.

Notwithstanding the intrinsic difficulties of deducing causality from observational data, the analytical and qualitative methodology employed in this study aims to deliver substantial and practical insights into the influence of data analytics on healthcare sector policies.

The methodology chapter serves as a detailed framework for executing thorough research, delineating the actions and procedures necessary for exploring these research questions. The technique recognizes inherent limitations, including sample bias and difficulties in demonstrating causality, while emphasizing a commitment to transparency, rigor, and validity in the pursuit of knowledge and understanding in healthcare public policy and technology. This study aims to provide valuable insights that inform practice, policy, and additional research at the nexus of data analytics and policy framework through careful preparation, execution, and analysis.

CHAPTER IV:

RESULTS

Data analysis involves the study, cleansing, transformation and modelling of data to reveal important insights, draw conclusions and support decision-making. It embodies a diverse array of tools and methodologies for data exploration and analysis, including statistical analysis, data visualization, and machine learning. The primary objectives of data analysis are to discern patterns and trends, forecast outcomes, and produce insights that can guide decision-making and prompt action. It entails using data to address specific inquiries, revealing relationships and dependencies, and evaluating hypotheses. Successful data analysis necessitates a synthesis of technical proficiency, subject matter expertise, and analytical reasoning.

Unconscionability resembles US Supreme Court Justice Potter Stewart's renowned assertion regarding obscenity: "I cannot define it, but I recognize it when I encounter it." In the seminal case, Williams v. Walker-Thomas Furniture Co. (Section 12.5.3 "Unconscionability," Chapter 12 "Legality"), Judge Wright J S (Wright, 1965) endeavoured to establish an analytical framework. He expanded the concept of unconscionability by emphasizing the "absence of meaningful choice" (typically termed procedural unconscionability) and the presence of terms that are "unreasonably favourable" (often known as substantive unconscionability).

The process includes managing extensive and intricate datasets, selecting appropriate tools and methodologies, and articulating results clearly and effectively. The Table provides the type of variables and their association with the research questions and hypothesis. The objectives of the research is and is corelation with the variables are provided in a below table:

Research Question / Hypothesis	Descriptions	Independent Variables (Target)	Dependent Variables (Explanatory)
Questions 1	Why there is a Gap in framing Public Policy in healthcare metaverse and technologies?	Age Gender Role Education	•Privacy •Data Protection •Efficiency and Inefficiencies •Collaborations
Questions 2	Who are impacted due to lack of right framework work for defining policies?	Age Gender Education	•Role •Experts •Policy makers •Judicial system • Citizens
Hypothesis 1	Government intervention is essential for correcting implementation failures and ensuring effective policies impact	Age Gender Role Education	•Privacy •Data Protection •Identity Protection •Technology Evolution
Hypothesis 2	Key areas for government intervention include healthcare objectives, benefits, and alternative policy avenues	Age Gender Role Education	•Policy Gaps •Policy Framework •Citizens Protection under Constitution •Implementation • Participation
Hypothesis 3	Effective intervention occurs through regulations, maturity framework and evaluation of outcomes	Age Gender Role Education	•Address Gaps •Create new Policies •Update Policies •New Framework for better outcome •Expert involvement •Time driven •Implementation

Table 4.1: Research question / Hypothesis – Variable Mapping

There were two target audiences who where involved during surveyed and interviewed to meet the research objectives, the populations sampling includes:

- First group participants are - **General Public** who have limited knowledge and awareness on policies, technologies and participation in building better framework. Based on the survey data, I identify the independent and dependent variables:

Sl. No	Independent Variables (Predictor Variables)		Dependent Variables (Outcome Variables)	
	Demographic Variables	Technology Usage Variables	Policy Related Outcomes	Healthcare Experience Outcomes
1	Age_Years	Used_Digit_Tech_Past_1yr	Policy_Awareness_HealthTech	Privacy_Security_Concern
2	Gender	Yes_Type_Digit_Tech_App	Believe_Need_Policy_Intervention	Data_Breach_Experience
3	Occupation	Frequent_Digit_Tech_Use	Policy_Framw_Exist_Today	Personal_Data_Compromise
4	Geo_Location	Motivates_Digit_Tech_Use	Cur_Policy_Protect_Citizen	Impact_HCOutcome_Experience
5	NA	NA	Current_Policy_Protect_You	Provide_HighQuality_HC

Table 4.2 : General Public Survey Variable List

- Second Group participants are - people who are **Experts** in their field and have good understanding and knowledge on policies, technologies and framework process across governament and organization. Based on the survey data, I identified the independent and dependent variables:

Sl. No	Independent Variables (Predictor Variables)		Dependent Variables (Outcome Variables)	
	Demographics Variables	Government Engagement Variables	Policy Related Outcome	Healthcare Experience Outcome
1	Geographic Location	Inter-ministerial Coordination	Regulatory Implementation	Healthcare Policy Quality
2	Educational Background	Policy Assessment	Audit Institution	Digital Tech Efficacy
3	Age Group	Government Agenda Execution	Data Protection	Media Policy Analysis
4	Gender	-NA-	Privacy Concerns	-NA-
5	-NA-	-NA-	Security Policy	-NA-

Table 4.3 : Expert Opinion Survey Variable List

4.1 Analysis – General Public Opinion

By aligning their strategies with these insights, business owners can better navigate the challenges and opportunities presented by the digital health metaverse. Trends in policy implementation opportunities indicated that collaboration and public awareness are essential for success, as demonstrated by elevated participation rates. These findings highlight the need for a balanced approach that integrates technological advancements with stakeholder-centric policy framework designs.

The findings underscore a twin necessity: surmounting obstacles (e.g., stakeholder engagement and technology deficiencies) while actively capitalizing on opportunities (e.g., cross-sector alliances and public awareness). Strategic management decisions must focus on agility, ethical practices, and stakeholder engagement to succeed in the digital health metaverse.

The General public survey results are published below are divided into 8 Sections :

1. Demographics

2. Digital Health Metaverse Engagement

3. Policy Awareness and Opinions

4. Data Privacy and Security

5. Policy Preferences

6. Data Utilization and Access

7. Healthcare Outcome

8. Public Engagement

4.1.1 Section 1 : Demographics
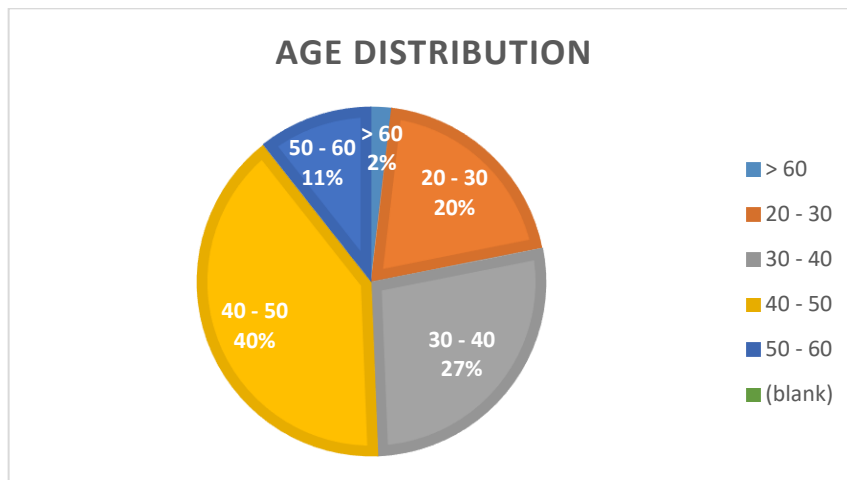
Figure 4.1: General Public Survey - Age Distribution

There are 160 data points in the dataset, representing individual ages. This dataset represents a target population, products or services designed for middle-aged individuals would resonate well, as most participants are in the 30–44 age group. The standard deviation of 11.62 years reflects moderate variability in the ages, suggesting the ages are spread across a range but not extremely dispersed. The youngest individual in the dataset is 18 years old, while the oldest is 99 years old, indicating a broad age range. 25th Percentile (35.75 years): 25% of the individuals are younger than 35.75 years. Median (50th Percentile = 40 years): The middle value is 40 years, meaning half the individuals are younger than 40 and the other half are older. 75th Percentile (44.25 years): 75% of individuals are younger than 44.25 years.

The dataset has a broad age distribution with the majority of individuals clustering near the median (40 years). The age range from 18 to 99 years suggests the dataset captures a wide demographic, from young adults to the elderly. The standard deviation indicates a moderate spread of ages; while there are individuals close to the extremes, most are near the mean. The interquartile range demonstrates that 50% of the population falls within approximately 40 years around the median.

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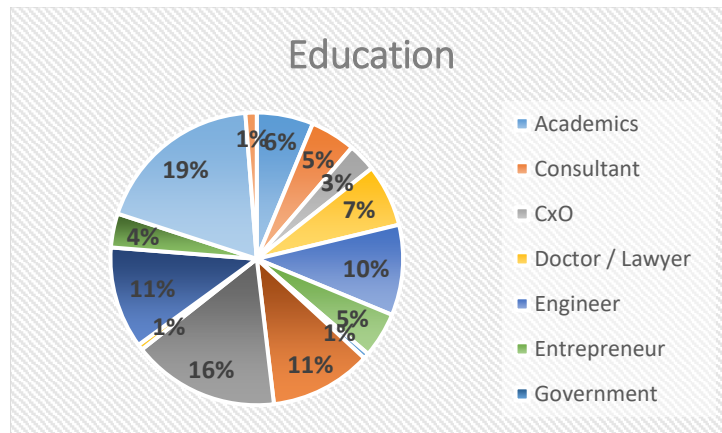
Figure 4.2 : General Public Survey – Education Distribution

The Analysis shows academics dominate (19%). The majority of the dataset is academics, suggesting that researchers, educators, and academics are interested in the study, event, or group being investigated. This may suggest an emphasis on theory, research, or intellectual progress. Minimum Government Representation 4%. The modest number of government participants reflects little public sector involvement, emphasizing private sector and academic partners.

4.1.2 Section 2: Digital Health Metaverse Engagement
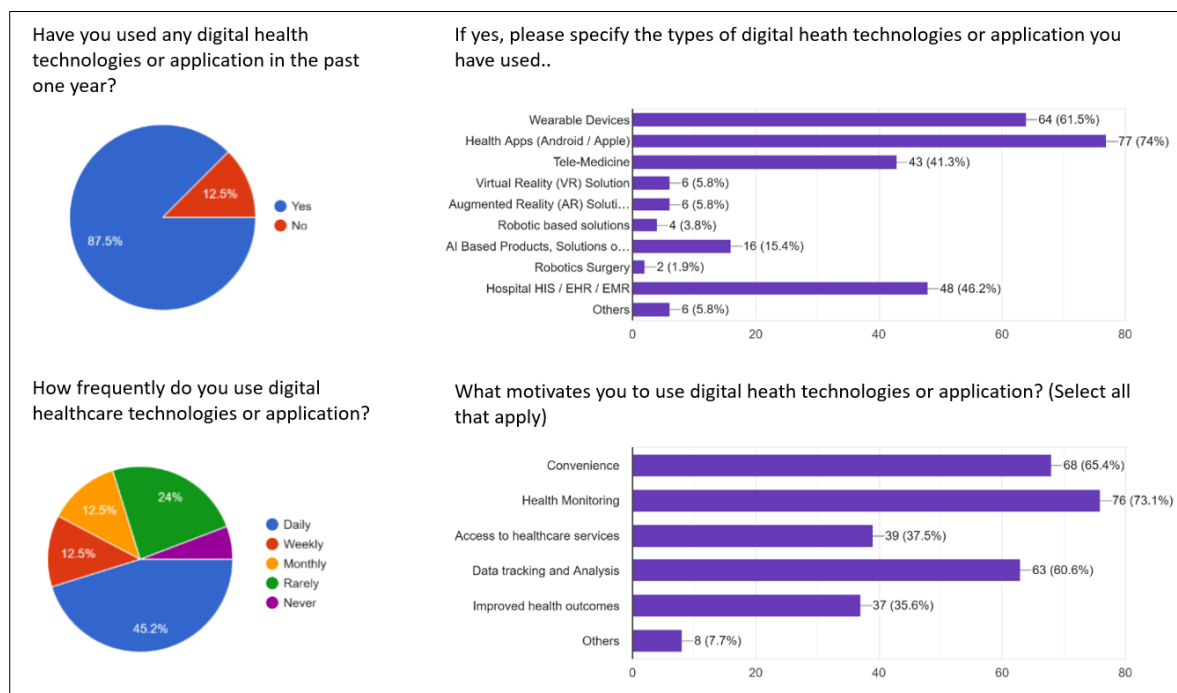
Figure 4.3 : Digital Health Technology Metaverse Engagement

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These insights reflect the current landscape of digital health technology usage where 87.5% people use digital technologies. Most popular technologies used by the survey repondents are in the area of Health Apps (Android/Apple) with 74% reporting usage, followed by 65.5% people using wearbale devices and other group of people who are in the field of medical use Telemedicine (video consultation) and Eelectronic Medical Records (EHR) 43% and 48% respectively. The leaset technology used are more advanced one like AR, VR and Robotics. As AI (Artificial Intelligence) is growing significantly but the people are not aware of its use in medical space, only 16% of population is avare of from total respondents.

4.1.3   Section 3: Policy Awareness and opionins
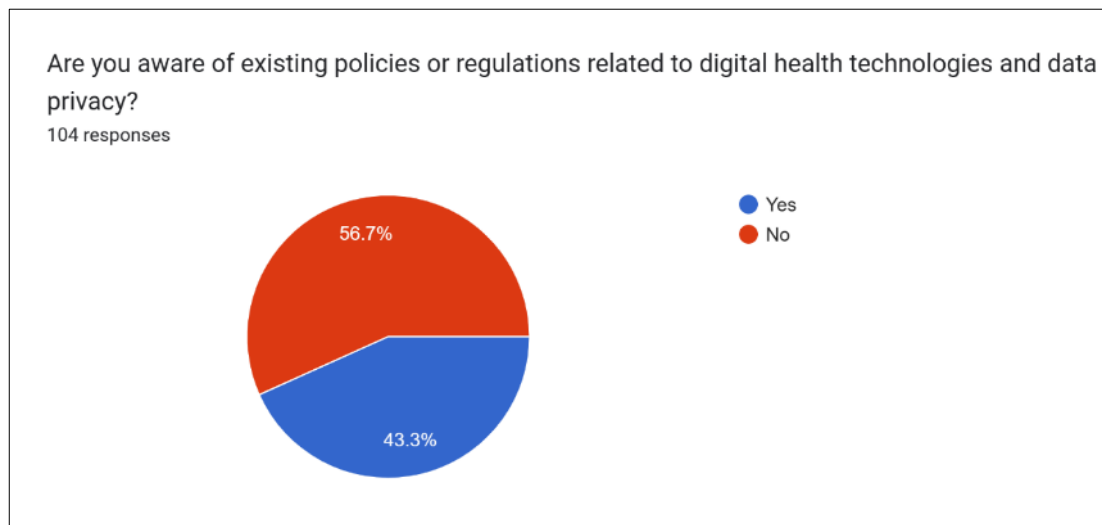
Figure 4.4 : Existing Policies or Regulation Awareness in Digital health

The critical finding shows that almost perfect split between protected (43.3%) and unprotected (56.7%) knowledge of public views. Research implication indicates a significant gap in policy effectiveness or communication across groups. The respondents are very concerned with respect to the Digital Metaverse privacy and security. The distribution pattern shows a clear

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upward trend from least to most concerned category. This demonstrates the complexity of implementing comprehensive security measures across the board and suggests need for targeted improvements in healthcare policy implementation.
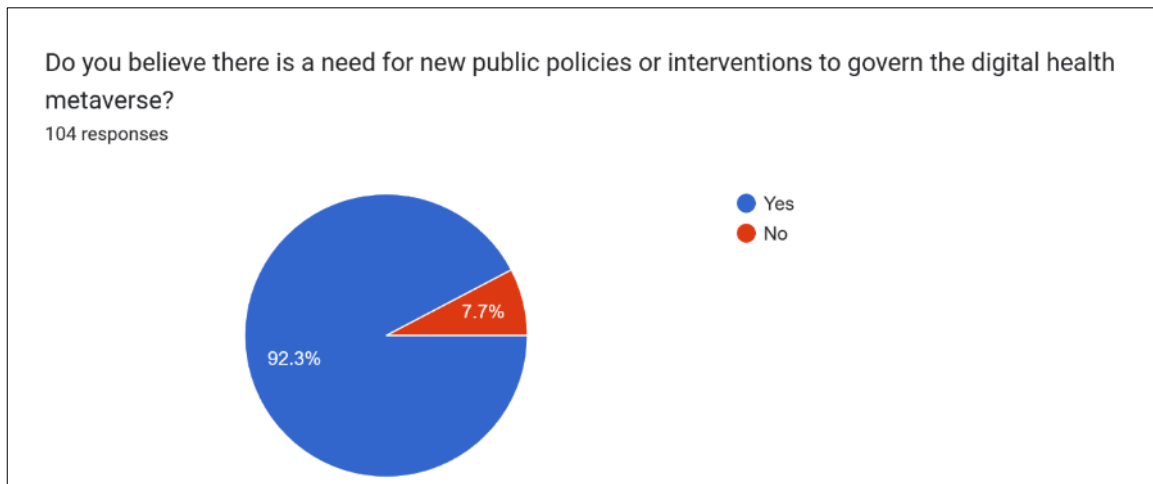
Figure 4.5 : Need for New Public Policies or Intervention to govern digital health metaverse

The overwhelming majority (92.3%) of respondents believe there is a need for new public policies or interventions to govern the digital health metaverse. This indicates a strong consensus on the importance of addressing governance in this emerging area. Only a small fraction (7.7%) disagrees, suggesting minimal opposition to the idea. The analysis shows that, the data clearly indicates a strong consensus (92.3%) for the need for new public policies in the digital health metaverse.
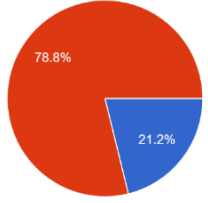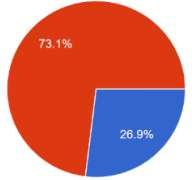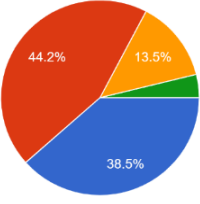
Sl. No	Question	Response Legends	Responses	Percentage Distribution	Graphs
1	Do you believe a robust policy framework exist today?	1	Yes	21.2%	
		2	No	78.8%	
2	Do you believe current policies provide protection to citizens?	1	Yes	26.9%	
		2	No	73.1%	
3	To what extent do healthcare policies provide high-quality , inclusive and cost-effective healthcare ?	1	Health care policy does not achieve the criteria at all	38.5%	
		2	Health care policy achieves the criteria partly	44.2%	
		3	Health care policy achieves the criteria largely	13.5%	
		4	Health care policy achieves the criteria fully	3.8%	

Table 4.4 Policy Framework existence and protection

The analysis shows a significant majority (78.8%) believe a robust policy framework does not exist today and there is a need for better protection and security. The systems should use technology to provide services and infrastructure. Most respondents (73.1%) feel current policies fail to provide adequate protection to citizens. These views in the limelight of thefts that are hapenning due to loopholes and gaps in implmentation of technology by technology companies and the dependencies of policy and their complienace by the corporate companies. Healthcare policies are seen as partially meeting criteria (44.2%), but 38.5% believe they fail entirely. This provides a clear summary of public perceptions regarding policy frameworks, citizen protection, and healthcare policies in line with the evolving technology and the gaps that are created with the pace of policy and protection. Today the actions are based on events, that triger to think. The proactive ability to be ahead of evolving technology is lacking.

Policy Framework Analysis indicates the critical gap with a overwhelming negative perception (78.8%) suggests systematic deficiencies. Research implication Indicates urgent need for

policy reform and modernization. Aligns with studies on policy inadequacy in digital transformation. Citizen Protection Assessment key finding, 73.1% negative response indicates widespread vulnerability. Pattern analysis shows consistent with policy framework inadequacy. Research relevance highlights disconnect between policy intent and implementation. Healthcare Policy Effectiveness distribution analysis shows Only 17.3% positive response (13.5% largely + 3.8% fully). There is a critical concern with 38.5% complete failure rating. Research impact suggests fundamental flaws in healthcare policy design.
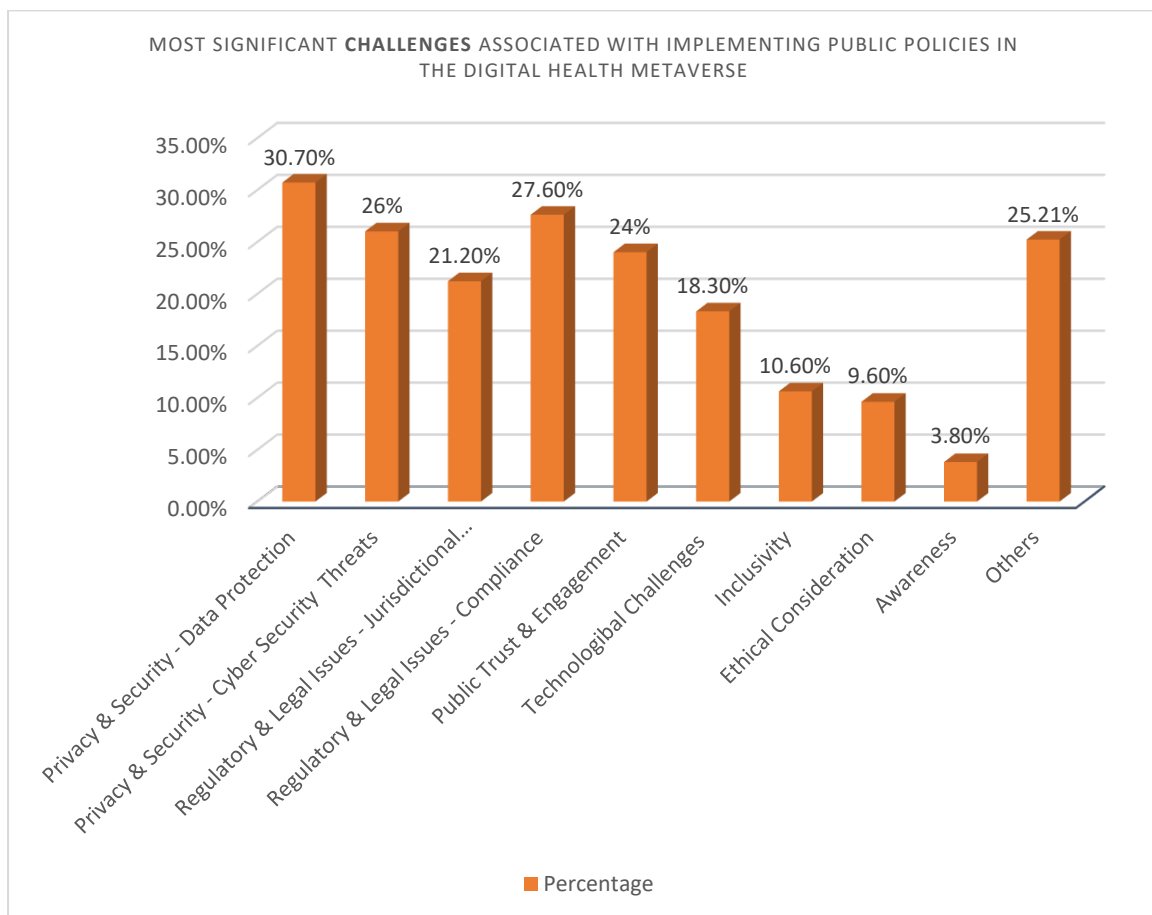
Figure 4.6 : Significant Challenges for Implementation

The analysis shows that the security and privacy dominance require combined privacy and security concerns (including cyber threats) account for over 56% of challenges.   The

analysis indicates critical need for robust data protection frameworks. He graphs highlights the importance of cybersecurity measures and remedies. Regulatory framework nearly accounts for 49% of challenges relate to regulatory and legal issues. This suggests a need for clear jurisdictional boundaries which emphasizes importance of compliance mechanisms and need. Implementation Gaps exists and public trust (24%) emerges as a significant concern. Technological challenges (18.30%) indicate strong need for infrastructure from the business and government. Another criterion is a Low awareness (3.80%) suggests need for better communication and awareness of the policies to the public.
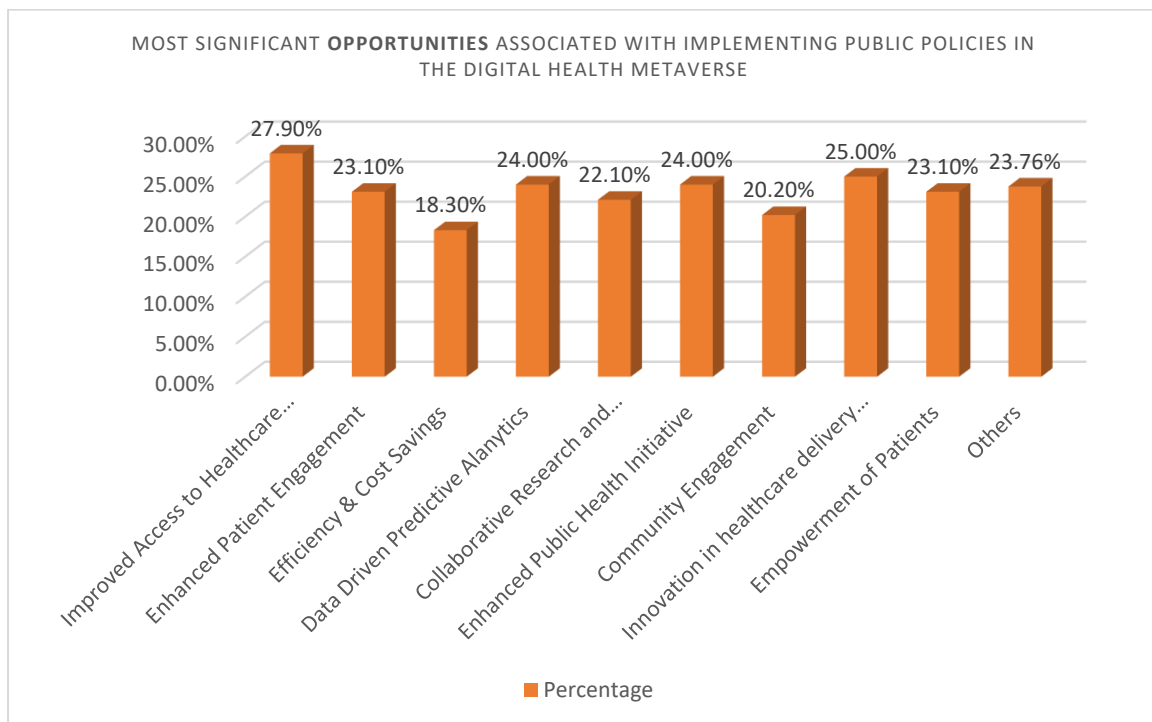
Figure 4.7: Significant Opportunities for Implementation of policies

The findings emphasize the urgent need for robust data protection, regulatory harmonization, and public trust-building measures. Addressing these challenges will require collaborative

efforts from researchers, policymakers, and technology developers to ensure the successful implementation of digital health metaverse policies.

Data protection (30.7%) and cybersecurity threats (26.0%) dominate as primary opportunities. These findings highlight the critical need for robust frameworks to safeguard sensitive health data. Regulatory and Legal Issues compliance (27.6%) and jurisdictional challenges (21.2%) underscore the complexity of creating cohesive policies across regions. The lack of clear jurisdictional boundaries poses significant barriers to effective governance. Public trust and technological opportunities can transform public trust (24.0%) and technological infrastructure gaps (18.3%) emerge as secondary opportunity. These findings suggest the good opportunity for transparent communication and investment in infrastructure.

HOW CAN POLICYMAKERS ENSURE THE EFFECTIVE IMPLEMENTATION OF NEW HEALTHCARE POLICIES?

Category	Percentage
Others	35.07%
Policy Flexibility & Adaptability	24.00%
Collaboration & Partnerships - Cross sector & International	24.00%
Public Awareness & Participation	24.00%
Pilot Programs & Phased Implementation	20.20%
Continious Monitoring & Evaluation	16.30%
Technological Infrastructure	16.30%
Robust Legal & Regulatory Framework	27.90%
Defined Objectives & Feasibility Analysis	13.50%
Public Participation	23.10%
Stakeholder Engagement	26.00%

Figure 4.8 : Effective Implementation in healthcare - by Policymakers

The chart highlights that the most critical factor for effective healthcare policy implementation is categorized as "Others" (35.07%), which may include additional unlisted factors. Following this, a **Robust Legal and Regulatory Framework** (27.90%) and **Stakeholder Engagement** (26.00%) are also significant contributors. Factors like **Policy Flexibility**, **Collaboration**, and **Public Awareness** are equally important at 24.00%. The least emphasized factor is **Defined Objectives and Feasibility Analysis** (13.50%). Based on analysis, there is a need to establish clear regulatory guidelines, create enforcement mechanisms and define jurisdictional boundaries for effective implementation.
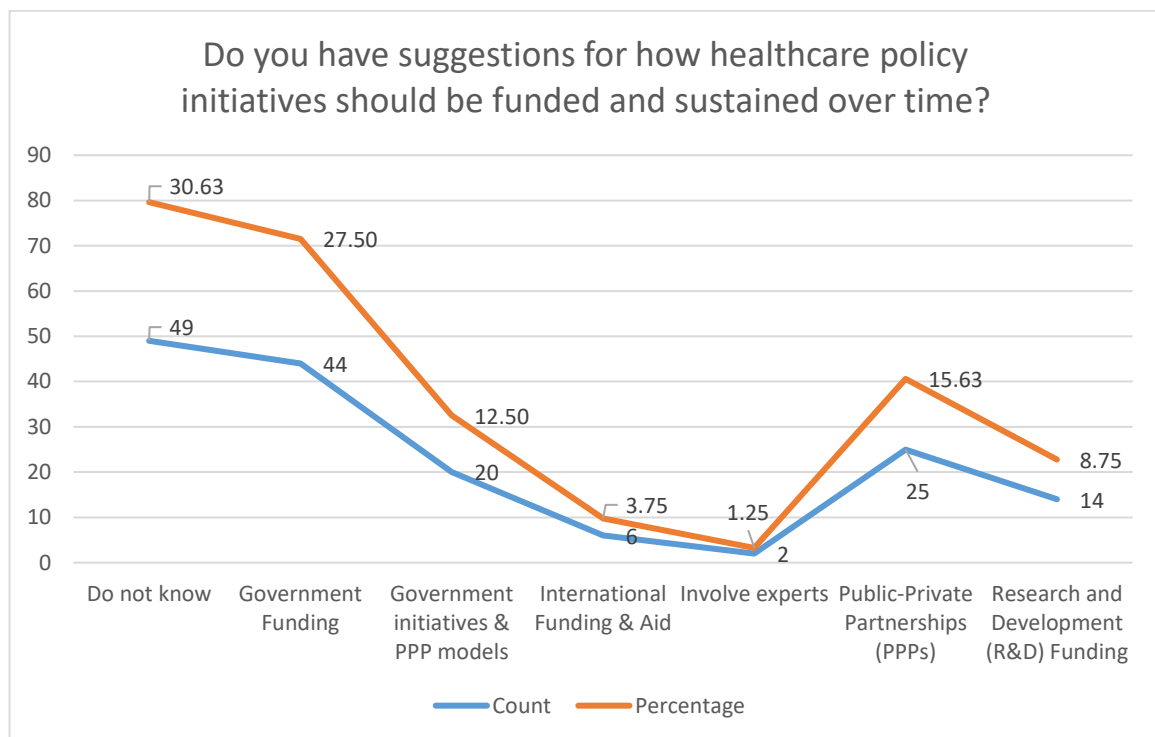
Figure 4.9 : Healthcare Policies Initiatives - to be Funded and sustained

The above graphs indcated tat 30.69% people are not aware of how the initiatives should be driven which is a most significant popultion from the survey.

This indicates that many people are not aware of the entire engagement. 27.50% of respondents who are aware believe that the initiatives should be funded by Govt and in other scenarios it should be PPP (Pubic Private Partnership).

4.1.4 Section 4: Data Privacy and Security

The analysis shows that 30.8% experienced health data breaches and 43.3% experienced personal data compromises which indicates significant privacy vulnerability. This is due to non compliance of governance model and compliance.
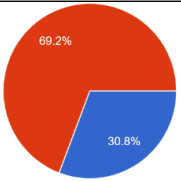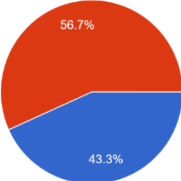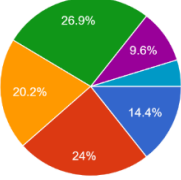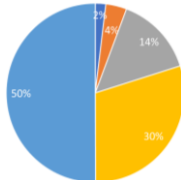
Sl. No	Question	Response Legends	Responses	Percentage Distribution	Graphs
1	Have you ever experienced a data breach or privacy violation related to your health data in the digital health metaverse?	1	Yes	30.8%	
		2	No	69.2%	
2	Have ever experienced compromise on your personal data?	1	Yes	43.3%	
		2	No	58.7%	
3	What measures do you think should be taken to better protect the privacy and security of health data in the digital health metaverse?	1	Informed consent	14.4%	
		2	Use multi-factor authentication	24.0%	
			Advanced encryption technologies	20.2%	
		3	Robust design of infrastructure and technologies	26.9%	
		4	Using Artificial Intelligence	9.6%	
		4	Others	4.9%	
4	How concerned are you about the privacy and security of your health data in the digital health metaverse? (Scale: 1 - Not concerned, 5 - Very concerned)	1	Scale 1 Not Concerned	1.9%	
		2	Scale 1 Least Concerned	3.8%	
		3	Scale 1 Somewhat Concerned	14.4%	
		4	Scale 4 Concerned	29.8%	
		5	Scale 5 Very Concerned	50.0%	

Table 4.5 : Data Privacy and Security Reponses

Respondents believe that Robust infrastructure is required to provide better support and security (26.9%). Multi-factor authentication (24.0%) and Advanced encryption (20.2%)

should provide technical solutions preferred over policy measures. The pollicies should support the technology needs and the liabilities to be enforced for the breaches.

The risk assessment shows high concern levels (79.8%) justify immediate action is required to provide data security. Significant repondents have breach experience (30.8%) indicates vulnerabilities that exists in the ecosystem. Personal data has been compromised (43.3%) suggest broader security issues gaps in infrastructure and compliance.

4.1.5 Section 5: Policy Preferences
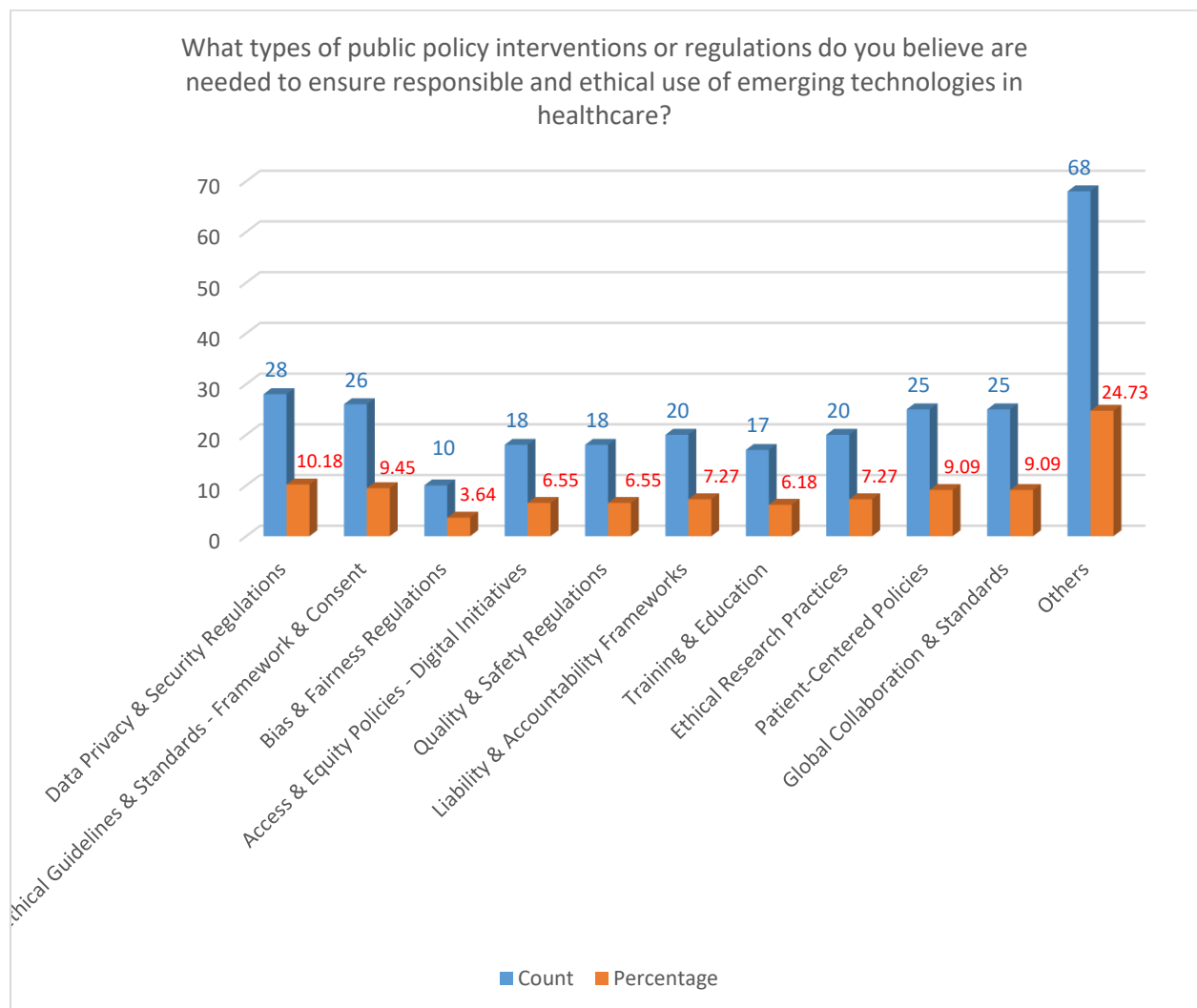
Figure 4.10: Types of Public Policy Interventions are needed

Policy Framework Assessment score of 78.8% indicate no robust policy framework exists today and there is need for new framework which helps in rolling policies faster. Only 21.2% believe current framework is adequate. Suggests significant need for policy reforms. Citizen Protection Measures shows that 73.1% feel current policies don't provide adequate protection and 26.9% believe protection is sufficient. Indicates substantial gap in citizen safeguards and protection from breached and financial loss. Healthcare Policy Effectiveness indicates 38.5% report complete failure to meet criteria where as 44.2% indicate partial achievement when compared to 13.5% report large achievement in healthcare effectiveness. Only 3.8% report full achievement in the policy rollout and existing framework which address the current need. The analysis shows clear need for healthcare policy improvement

Do you think the policies are created or updated with the speed of emerging technologies, innovations and changes in the ecosystem?	
Do you think the policies are created or updated with the involvement of subject matter expert from healthcare management or healthcare industries?	

Table 4.6 : Policies Created or Updated frequency for emerging technologies

The above take analysis shows that the policies are not created and pupdated at the speed of emerging technologies. Let looks at the Generative AI , where the technologies have moved so advanced that the robots are able to perform most of the human activities. Where as the policies are not yet ceated for implementtation. Due to lack of the governance there is no clairity to be business owners and their products are been used without proper compliance. Healthcare using Gen AI and Blockchain in their platforms and the guiding principles are still in place to supprot the technology adoption and imlementation.
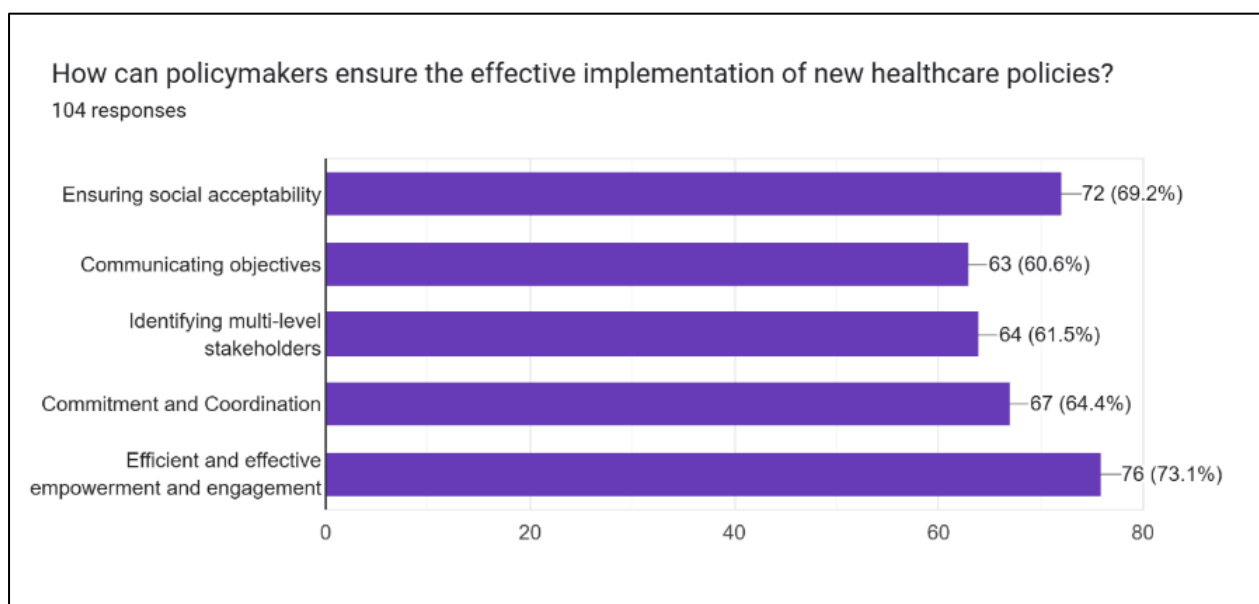
Figure 4.11: Effective Implementation of New healthcare policies

The analysis shows that the Policy makers can ensure that the healthcare policies are efficient and effective in meeting the compliance similat to NABH in India healthcare where any non compliance leads to cancellation of license of hospital. Similarly, the patient data should be protected and punishable for any breach. The impementation of policies should be acceptable socialy and the objectives are communicated properly. The multistakeholder identification and their involvement is key for commitmenta and beter coordination.

91

4.1.6 Section 6 : Data Utilization and Access
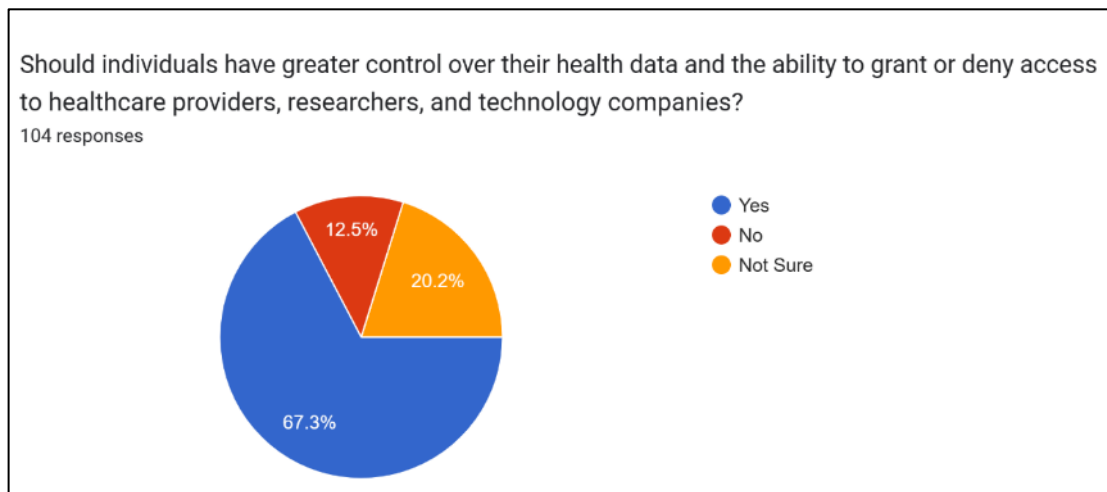
Figure 4.12 : Individual data access (Grant / Deny) – Greater Control

People believe that their healthcare data should be controlled by their consent and denial to access. This is similar to USA where HIPAA rules provides greater protection to data and enforces the liablities for any data breach without patient consent.
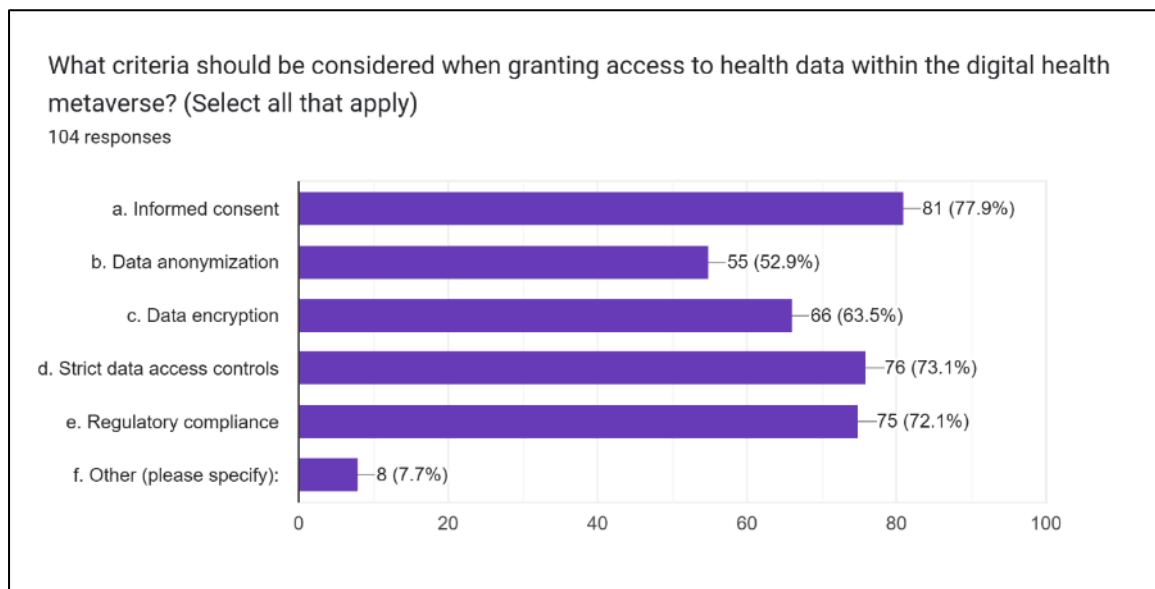
Figure 4.13: Criteria consideration for granting access

The anaylsis shows **Informed Consent** is the most emphasized criterion, with 77.9% of respondents selecting it. **Strict Data Access Controls** (73.1%) and **Regulatory Compliance** (72.1%) are also highly prioritized. **Data Anonymization** is the least selected among the main criteria, with 52.9%. Only 7.7% of respondents selected "Other," indicating that the provided options cover most concerns. The results highlight the importance of informed consent, strict access controls, and regulatory compliance in ensuring the secure and ethical use of health data in the digital health metaverse. Data anonymization and encryption are also significant but slightly less prioritized.

4.1.7 Section 7 : Healthcare Outcome

Many people are not aware of the heathcare outcome. Hence Other shows 17% of the respondents are not aware of the outcomes. The people who are aware of the digital heath metaverse believe that Privacy and security (11.42%) is primary concernn. Medical professional look for data driven decision making ability to provide better medical services to people.
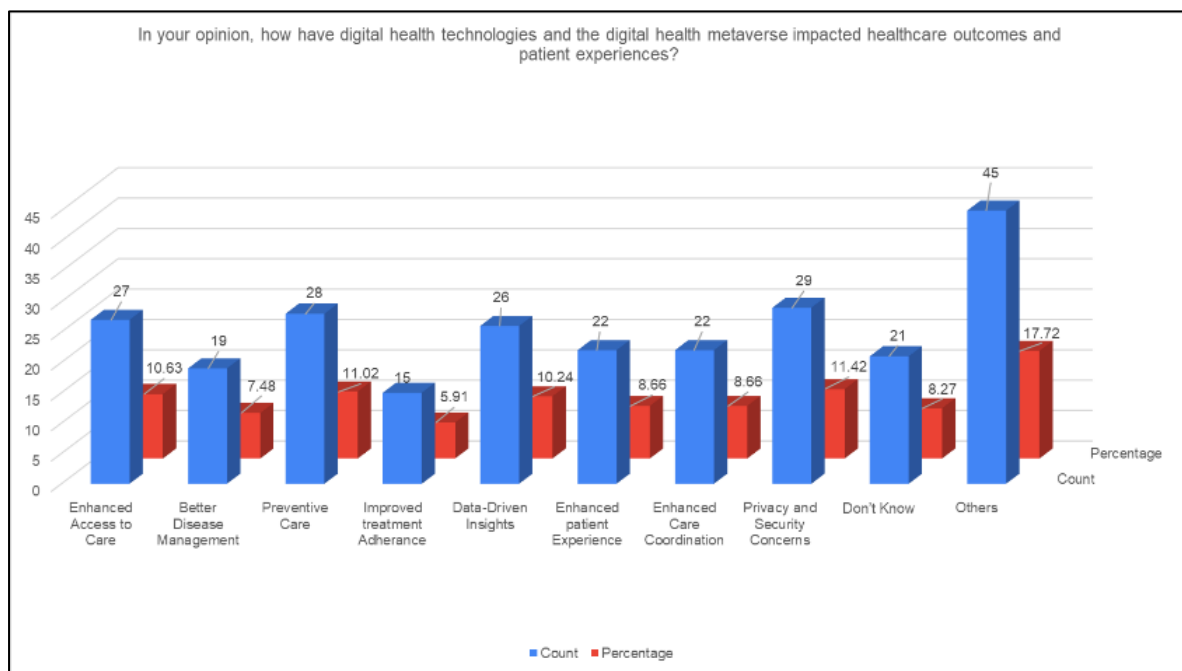
Figure 4.14: Technology impact on healthcare outcomes

The data provides evidence and the Evidence based medical teatment is more efficient and cost effective (Chukwu et al., 2024). Technology will provide enhanced access to care (10.83%) , they are the people who are dependent on the technology for data sharing and preventive care.

4.1.8   Section 8 : Public Engagement

Can policymakers and researchers effectively engage with the public and gather input on digital health policy development?
104 responses

Yes
No

14.4%

85.6%
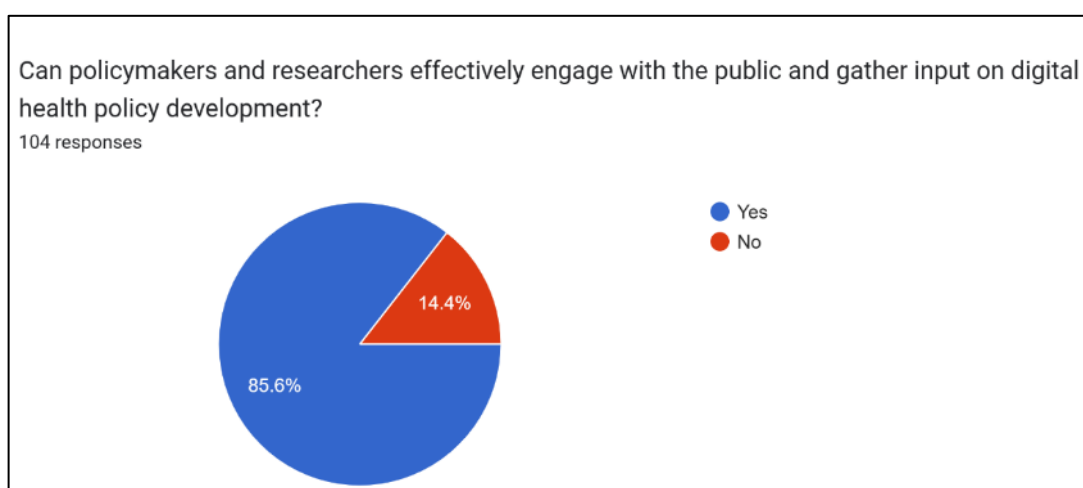
Figure 4.15 : Public Engagement to gather inputs

The analysis shows that there is opportunity for the policy makers and researchers to engage together along with public and experts to gather their views and opinion while making policies and during implementation. 86.6 % respondents feel that their involvement will add value to the ecosystem. Respondents believe that there is a very scope for cross collaboration in this process.

4.2 Analysis – Expert Opinion

This summarizes the principal points and ideas from the survey. The responders originate from various geographic regions, including India, APAC, North America, Europe, Australia, Delhi, and other areas of Asia. A significant proportion of respondents, specifically 60.7%, has a graduate or post-graduate degree. The age distribution is predominantly within the 31-40 and

41-50 year old cohorts. - The gender distribution is approximately equal, with 50.8% male and 47.5% female responses.

Participants occupy diverse positions, predominantly in management, government, and consultancy. The government extensively utilizes digital technologies to improve inter-ministerial coordination and collaboration.Nonetheless, the government demonstrates inadequate utilization of digital technologies to improve inter-ministerial collaboration. Ministries and government authorities inadequately synchronize policy recommendations. Policy Evaluation and Modification - Ex post evaluations are typically utilized to revise existing policies or develop new ones. Government agencies diligently enforce regulations with objectivity and efficacy. Public Awareness and Participation: A substantial segment of the population lacks awareness of governmental policies, with only a minor percentage exhibiting comprehensive understanding. The government disseminates data and information to enhance citizens' ability to foster openness and accountability in governance. Oversight and Privacy: Functional and independent ombudsman offices are established to oversee governmental activities. An autonomous regulatory body is established to guarantee that governmental entities are held accountable for data protection and privacy matters.

Current laws and regulations adequately protect citizens' data and privacy. The document clarifies the Indian government's utilization of digital technology, strategies for policy evaluation and modification, public awareness and engagement, and legal structures pertaining to data privacy and security. The data reveals both opportunities for improvement and positives in the government's strategy.

The results from expert opinion poll are published below are divided into 5 Sections :

1. Demographics

2. Executive Capacity

3. Public Engagement

4. Independent Auditing

5. Data Privacy and Security

4.2.1   Section -1 Demographics Analysis
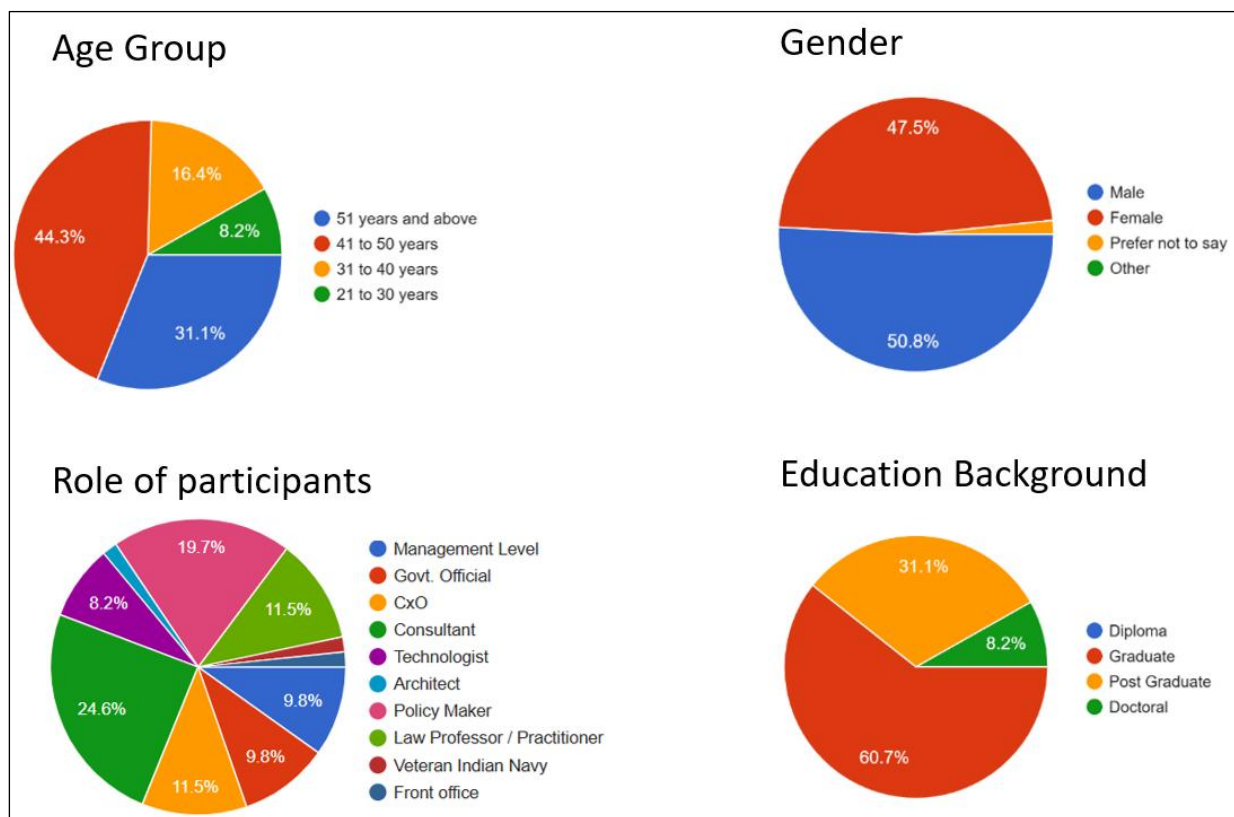
Figure 4.16 : Expert Opinion Pool - Demographics

Respondents originate from many regions, including India, the Asia-Pacific, North America, Europe, Australia, Delhi, and other areas of Asia. The respondents predominantly occupy positions in management, government, and consultancy, 60.7% of respondents possess a graduate or post-graduate degree. Age distribution is predominantly within the 31-40 and 41-50 age brackets. Gender composition: 50.8% male and 47.5% female.

4.2.2 Section 2 : Executive Capacity

The government employs **application of digital technology** extensively for inter-ministerial coordination and collaboration. Nonetheless, there is insufficient utilization for harmonizing policy recommendations among ministries and officials. **Policy Assessment and Adjustment** indicate Ex post evaluations are employed to amend current policies or formulate new ones. Government agencies implement regulations with impartiality and efficiency. **Public Awareness and Engagement** where a majority of citizens are uninformed about governmental policy, with only a minimal percentage possessing a thorough comprehension. The government disseminates data to improve transparency and accountability. **Oversight and Privacy where** Independent and functional ombudsman's offices supervise governmental operations. An autonomous regulatory entity guarantees accountability for data protection and privacy. Existing laws and policies sufficiently safeguard people' data and privacy.
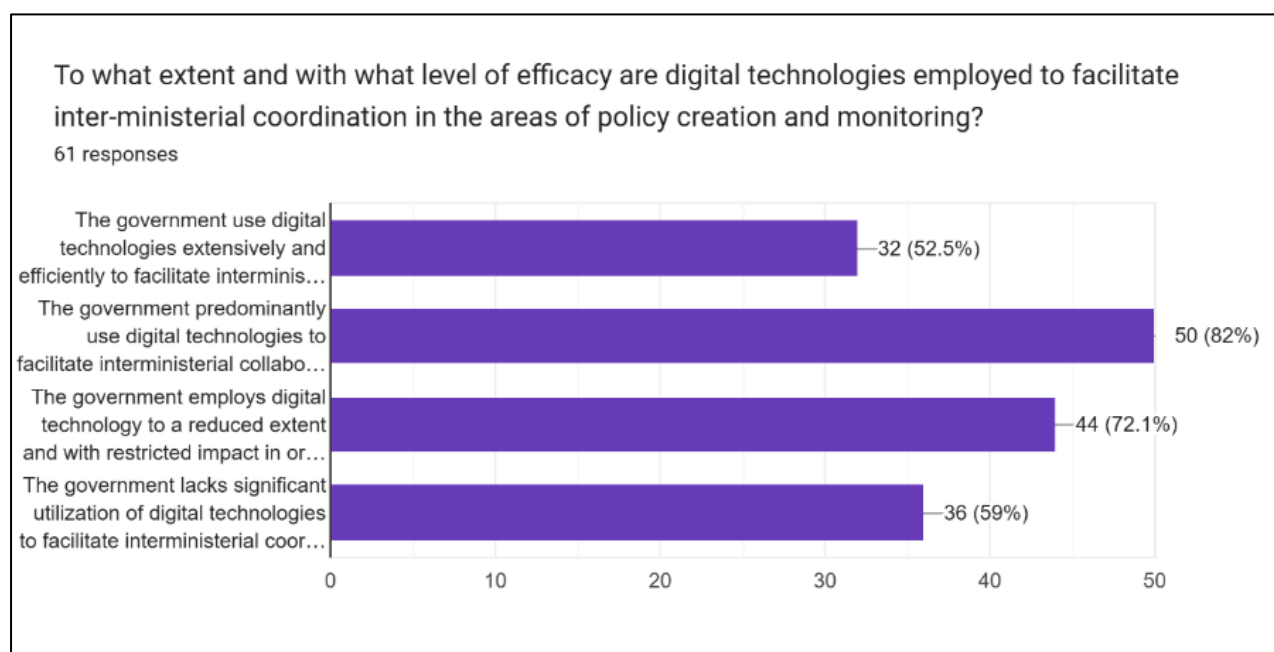
Figure 4.17 : Level of Efficacy in digital technologies – Inter-ministerial coordination

The survey and data elucidate the Indian government's utilization of digital technology, policy assessment procedures, public participation, and regulatory frameworks. It emphasizes both strengths and opportunities for enhancement in governance.
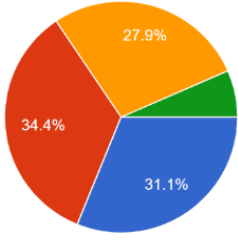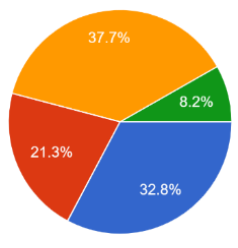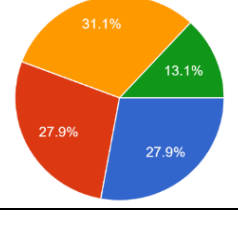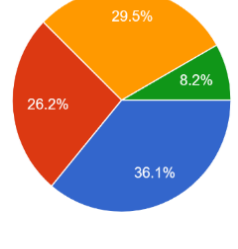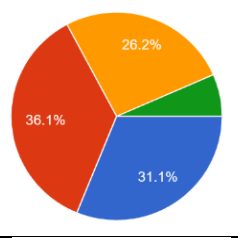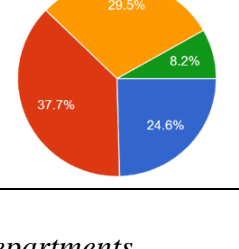
Sl. No	Question	Response Legends	Responses	Percentage Distribution	Graphs
1	How big of an impact do strategic planning departments and organizations on policy making? Mark only one	1	Strategic planning units and bodies have a significant impact on government decision- making because they take a long-term perspective on policy concerns and workable solutions.	31.1%	
		2	Those in charge of strategic planning adopt a long-term perspective on potential policy problems and remedies. Although they have a restricted issue scope or depth of impact, they have a systematic influence on government decision-making	34.4%	
		3	Those in charge of strategic planning adopt a long-term perspective on potential policy problems and remedies. They occasionally have some impact over government choices.	27.9%	
		4	In reality, there aren't any organizations or groups that look long-term at problems with policies and workable answers.	6.6%	
2	To what extent do ministerial or cabinet committees efficiently synchronize cabinet proposals? Mark only one	1	Committees often conduct the first examination and coordination of the majority of cabinet initiatives.	32.8%	
		2	Committees often analyse and coordinate the majority of cabinet ideas, especially those that are politically or strategically significant.	21.3%	
		3	Committees rarely conduct thorough reviews or coordinate cabinet recommendations.	37.7%	
		4	Committees do not examine or coordinate cabinet initiatives. Alternatively, there is an absence of both a ministerial and cabinet committee	8.2%	
3	To what extent do ministry officials/civil servants efficiently synchronize policy proposals? Mark only one	1	The majority of policy suggestions are efficiently organized by ministry officials or civil servants.	27.9%	
		2	Ministry officials/civil servants efficiently coordinate several policy initiatives.	27.9%	
		3	Ministry officials/civil servants engage in the coordination of policy initiatives.	21.1%	
		4	Ministry officials/civil servants lack or hardly coordination in proposing policies.	13.1%	
4	To what degree do government ministries systematically assess the efficacy and/or efficiency of public policies and utilize evaluation findings to modify existing policies or create new ones? Mark only one	1	Ex post evaluations are conducted for all major policies and are typically utilized to revise existing policies or create new regulations.	36.1%	
		2	Ex post evaluations are conducted for the majority of key policies and are utilized to revise existing policies or create new policies.	26.2%	
		3	Infrequent ex post evaluations are conducted for major policies and are seldom utilized for the modification of current policies or the creation of new policies.	29.5%	
		4	Ex post evaluations are typically neglected and do not significantly influence the process of revising current policies or creating new policies.	8.2%	
5	To what degree does the governmental structure incorporate tools to guarantee that ministers effectively execute the government's agenda? Mark only one	1	The government's organizational structure effectively facilitates ministers in implementing the government's program through robust processes.	31.1%	
		2	The governmental structure offers many channels for ministers to execute the program of the government.	36.1%	
		3	The government's organizational structure lacks robust mechanisms for ministers to effectively implement the	26.2%	
		4	The governmental structure lacks tools for ministers to execute the program of the government.	6.6%	
6	To what degree is the government effectively and impartially implementing regulations, even in the face of vested interests? Mark only one	1	Government agencies diligently enforce regulations impartially and efficiently.	24.6%	
		2	Government agencies generally implement regulations efficiently and impartially	37.7%	
		3	Government agencies implement regulations, but their enforcement is inefficient and subject to bias.	29.5%	
		4	Government agencies exhibit inadequate, inconsistent, and biased enforcement of regulations.	8.2%	

Table 4.7: Executive capacity – effectiveness and collaboration government departments

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The above Table 4.7 and Figure 4.17 provides a structured analysis of governance efficacy and the utilization of digital technology based on the survey data suggests a mixed picture, with strengths in certain areas and clear opportunities for improvement in others.

Executive enforcement exhibits a range of effectiveness. While a significant portion (37.7%) indicates rigorous and unbiased enforcement, a substantial minority (37.7%) report issues, with 16.8% citing insufficient and prejudiced execution and 20.9% noting ineffective enforcement. This suggests a need for greater consistency in enforcement practices.

The regulatory framework appears to provide a solid foundation for program implementation, with 36.2% of respondents indicating numerous avenues for implementation and 31.1% reporting successful facilitation. However, a quarter (25.3%) report insufficient instruments for implementation, suggesting areas where the framework could be strengthened. A small percentage (7.4%) also suggest a need for more robust mechanisms, though the specific nature of these mechanisms is not detailed.

Policy evaluation practices appear to be inconsistently applied. While a commendable 36.1% perform ex post reviews for all significant policies, a substantial portion (37.3%) either generally disregard assessments (16.4%) or only perform them for some policies (20.9%). This inconsistency may hinder the ability to learn from past policy implementations and improve future outcomes.

The utilization of digital technologies shows promise, with 52.5% indicating substantial and effective use. However, a significant portion (44.7%) report diminished scope and limited

effect, and 35.6% indicate insufficient utilization. This suggests a need for strategies to expand the scope and effectiveness of digital technology applications.
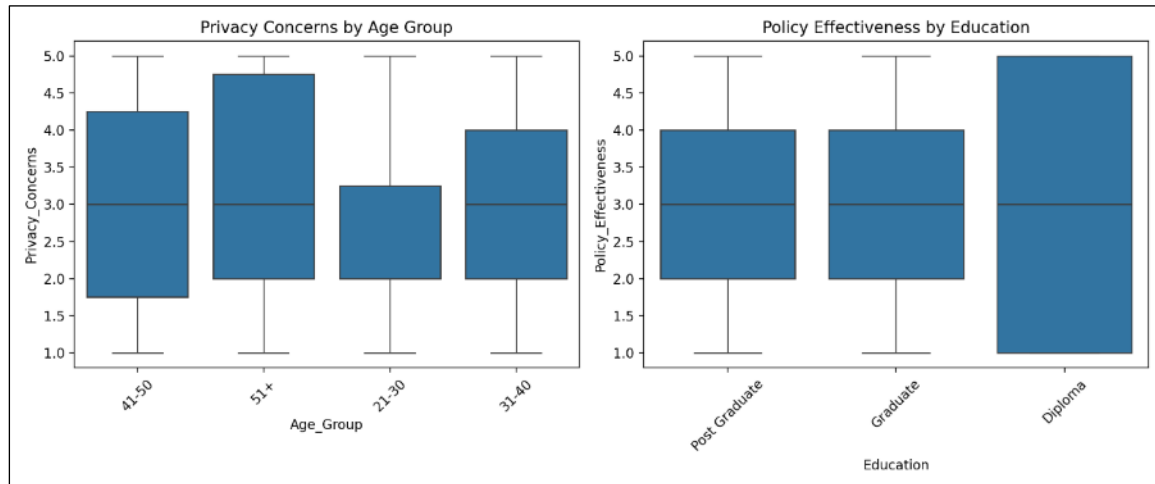
Figure 4.18: Policy Concerns and Effectiveness by Age-group Distribution

The box plots reveal interesting patterns in both privacy concerns across age groups and policy effectiveness across education levels. The 51+ age group shows the most varied privacy concerns, while education levels show distinct differences in perceived policy effectiveness, with Diploma holders showing notably different patterns.

Governmental effectiveness exhibits a mixed profile. The policy concerns and effectiveness by age and education shows a gap. While structural efficacy demonstrates reasonable success, limitations exist. Digital technology deployment is robust but could be further enhanced. Policy evaluation, though present, lacks consistent implementation. Finally, regulatory enforcement shows positive trends, yet significant disparities in effectiveness remain. The analysis successfully calculated relationships between independent and dependent variables, focusing on privacy concerns by age group and data protection success by education. The examination the impact of demographic factors on policy outcomes.

4.2.3 *Section 3: Public Engagement*

The Public Engagement segment emphasizes the government's incorporation of non-governmental stakeholder perspectives in policymaking, with indicators pertaining to public awareness and the transparency of government information transmission. The section specifies that early governmental decision-making frequently entails open consultation between the government and non-governmental stakeholders. - In formulating substantial policy initiatives, the government solicits feedback from non-governmental parties. - Nevertheless, in the process of making initial choices, the government sometimes disregards or fails to consult non-governmental groups. - A considerable proportion of respondents assert that non-governmental experts are neither consulted by the government nor regarded in its decision-making processes.

The analysis indicates that there are robust good aspects in public involvement (5 positive indicators), alongside considerable hurdles (3 negative indicators) and some ambiguous outcomes (1 mixed indicator). The government seems to have developed effective mechanisms for stakeholder participation and information dissemination; nonetheless, there is potential for enhancement in public awareness and information accessibility. Government Data Dissemination shows the highest positive response at 41.0%, Economic Interest Groups show strong competence levels at 34.4%, Government Consultation and Media Coverage both show balanced distributions around 30%, Public Policy Awareness shows the most even distribution across all response levels.
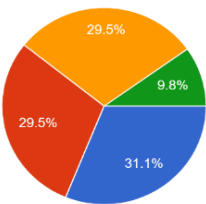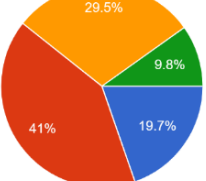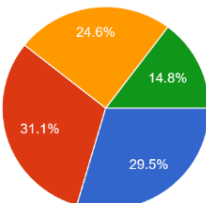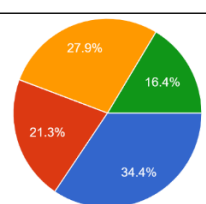
Sl. No	Question	Response Legends	Responses	Percentage Distribution	Graphs
1	Does the government often consider the opinions of non-governmental specialists when making decisions? Mark only one	1	Almost often, early government decision-making involves open consultation between the government and non-governmental specialists.	31.1%	
		2	When making early decisions on significant political undertakings, the government talks openly with non-governmental specialists.	29.5%	
		3	When making early decisions, the government occasionally interacts with outside experts in a transparent manner.	29.5%	
		4	Non-governmental specialists are not consulted by the government, or the discussions that are already taking place are completely opaque and/or only exist on pro forma.	9.8%	
2	What is the level of public awareness of public policies? Mark only one	1	The majority of citizens possess extensive knowledge regarding a wide array of public policies.	24.6%	
		2	The majority of citizens lack awareness on governmental policies.	27.9%	
		3	A significant number of persons possess a comprehensive understanding of specific governmental policy.	26.2%	
		4	Scant few persons possess a comprehensive understanding of public policies; the majority of citizens possess only a rudimentary grasp of public policies.	21.3%	
3	Does the government disseminate data and information in a manner that enhances citizens' ability to ensure government transparency and responsibility? Mark only one	1	The government disseminates statistics and information in a comprehensive, timely, and user-friendly manner.	19.7%	
		2	The government consistently disseminates statistics and information in a thorough, prompt, and accessible manner.	41.0%	
		3	The government disseminates data in a restricted manner, lacking timeliness and user-friendliness	29.5%	
		4	The government publishes (almost) no relevant data.	9.8%	
4	To what degree do media outlets in your country thoroughly examine the reasoning and consequences of public policies? Mark only one oval.	1	The majority of mass media companies prioritize high-quality information material that analyzes the reasoning and consequences of public policy.	29.5%	
		2	Approximately 50% of mass media brands prioritize the production of high quality information material that examines the reasoning and consequences of public policy.	31.1%	
		3	Only a small fraction of mass media brands prioritize the production of high quality information material that critically analyzes governmental issues.	24.6%	
		4	The content of all mass media brands is predominantly characterized by shallow or superficial infotainment.	14.8%	
5	To what degree can economic interest groupings (such as employers, * industry, and labour) effectively develop pertinent policies? Mark only one	1	The majority of interest associations has a high level of competence in developing pertinent policies.	34.4%	
		2	A multitude of interest groupings possess a high level of proficiency in creating pertinent policies.	21.3%	
		3	Only a small number of interest groupings possess the high level of capability required to develop policies that are directly applicable.	27.9%	
		4	The majority of interest groupings lack the ability to develop pertinent policy.	16.4%	

Table 4.8 : Expert opinion on Public engagement and collaboration

The part also analyses popular awareness of public policies, revealing that the majority of citizens have substantial understanding of many public policies. - Nevertheless, a considerable portion of the populace remains uninformed about governmental policies. - A portion of the populace has an extensive comprehension of particular governmental policies. - A limited segment of the populace possesses a thorough comprehension of public policies. Finally, this section addresses metrics concerning the government's distribution of data and information to citizens, indicating that: - The government disseminates statistics and information comprehensively, promptly, and in an accessible manner. - The government consistently provides statistics and information thoroughly, timely, and in a user-friendly

format. - Nonetheless, there exists potential for enhancement, as the government disseminates irrelevant data, exhibits a lack of timeliness, and fails to consistently guarantee accessibility.

The analysis of the Public Engagement section reveals noteworthy conclusions in three primary areas:

Stakeholder Engagement favourable attributes consists of consistent public consultation during initial decision-making stages. Proactive solicitation of feedback for significant policy determinations (Richtarik , 2022). One of the key challenges includes, instances of disregarded stakeholder consultation. *Awareness of Public Policy* showed varied outcomes like certain citizens exhibit profound understanding of governmental policies. A substantial segment is uninformed about governmental policies. A limited segment possesses a thorough grasp. *Information Dissemination* has been a challenges due to central and statehood where different governments play their key role. This brings strengths like thorough and prompt distribution of information Regular provision of data in user-friendly formats (Ricciardi et. al. 2019). The key challenges bring opportunities for enhancement like Concerns with data pertinence and accessibility obstacles for certain users.

Section 4: Independent Auditing

Independent Auditing indicates the presence of an autonomous and effective audit institution, as evidenced by the survey replies. Forty-one percent of respondents reported the existence of a functional and autonomous audit office. - 26.2% indicated the presence of a functional and autonomous audit office, but with limited authority. - 23% indicated the presence of an autonomous audit office, albeit with considerably limited functions. - Merely 9.8% indicated that an autonomous and efficient audit institution does not exist.

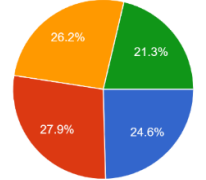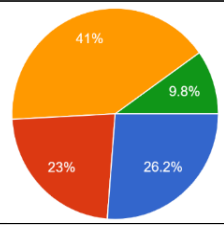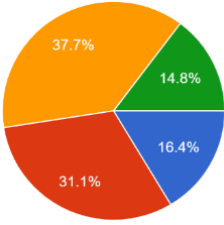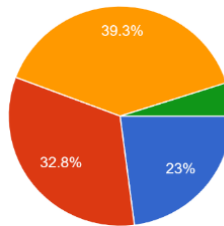| Sl. No	Question	Response Legends	Responses	Percentage Distribution	Graphs
1	Is there an autonomous and efficient audit institution in existence? Mark only one	1	There is a functional and autonomous audit office in existence.	26.2%	
		2	There is a functional and autonomous audit office, albeit its authority is rather restricted.	23.0%	
		3	There is an autonomous audit office but, its function is significantly restricted.	41.0%	
		4	There is no autonomous and efficient audit institution	9.8%	
2	Is there an autonomous and efficient ombudsman's office in place? Mark only one	1	There is a functional and autonomous ombudsman office in place.	16.4%	
		2	There is a functional and autonomous ombuds office, albeit its capacity for advocacy is somewhat restricted.	31.1%	
		3	There is an autonomous ombuds office in existence but, its capacity for lobbying is significantly restricted.	37.7%	
		4	An efficient and autonomous ombudsman office does not exist.	14.8%	
3	Does an autonomous regulatory body exist to effectively ensure government departments are held accountable for their management of data protection and privacy matters? Mark only one	1	A separate and efficient data protection authority is in place.	23.0%	
		2	A separate and efficient data protection authority exists, although its jurisdiction is somewhat restricted.	32.8%	
		3	There is a data protection authority in place, however, its autonomy and efficacy are significantly constrained.	39.2%	
		4	There is currently a lack of a competent and autonomous data protection authority.	5.0%	

Table 4.9: Expert Opinion on Independent Auditing

The most concerning finding is that 41% of respondents indicate significant restrictions on the audit office's function and believe the audit institution is autonomous but significantly restricted. The ombudsman office is seen as autonomous but with restricted lobbying capacity (37.7%). The data protection authority is viewed as constrained in autonomy and efficacy (39.2%).

The results indicate that although an independent audit function typically exists, its scope and authority may be somewhat restricted in certain instances. The survey results reveal variability in the levels of autonomy and efficiency of the audit institution across various circumstances. Only about a quarter (26.2%) report a fully functional and autonomous audit office, this suggests potential systemic issues in independent oversight capabilities.

The data elucidates the status of the independent audit function, emphasizing its existence while also identifying places where its competence or independence may be limited. This information may be beneficial for comprehending the resilience of accountability and oversight systems inside the system. Effectiveness of Ombudsman's Office: 52.5% report notable or rather limited advocacy capability. Just 16.4% say their office is completely functional and autonomous.

The somewhat significant percentage of limited functionality (37.7%) points to possible interference with ombudsman activities. Data Protection Authority: Shows a similar trend of limited autonomy (39.2% reporting major restrictions). The encouraging point is that just 5% of respondents say they have no competent authority at all. Combined 55.8% report either completely or partially functional authority.

4.2.4   Section 5 : Data Privacy and Security

 A majority (54.1%) believe current laws and policies do not protect them. Privacy and security concerns in the digital metaverse are high, with 34.4% being very concerned. Internal security policy effectiveness is seen as variable (45.9%), with 32.8% finding it inadequate. Health care policies are partially meeting criteria (29.5%), with 18.0% finding them entirely inadequate. This provides a clear summary of expert perceptions regarding laws, privacy, security, and healthcare policies. This shows a difference when compared to the public opinion of the policy awareness.
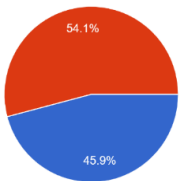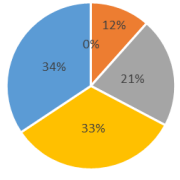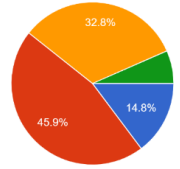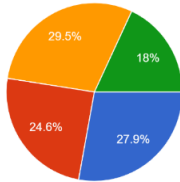
Sl. No	Question	Response Legends	Responses	Percentage Distribution	Graphs
1	Do you believe current law and policies helps to protect you? Mark only one oval	1	Yes	45.9%	
		2	No	54.1%	
2	How concerned are you about the privacy and security of your data or health data in the digital metaverse? (Scale: 1 - Not concerned, 5 - Very concerned) Mark only one	1	Scale 1 Not Concerned	0.0%	
		2	Scale 1 Least Concerned	11.5%	
		3	Scale 1 Somewhat Concerned	21.3%	
		4	Scale 4 Concerned	32.8%	
		5	Scale 5 Very Concerned	34.4%	
3	To what extent does the internal security policy safeguard citizens from security threats? Mark only one	1	The internal security policy provides highly effective protection for citizens against security hazards.	14.8%	
		2	The effectiveness of the internal security policy in safeguarding citizens against security hazards varies.	45.9%	
		3	The internal security policy fails to adequately safeguard citizens from security hazards.	32.8%	
		4	The internal security policy worsens the security threats	6.5%	
4	To what degree do health care policies ensure the provision of health care that is of superior quality, encompasses all individuals, and is economically efficient? Mark only one	1	The health care policy meets all the criteria completely.	27.9%	
		2	The health care policy largely meets the criteria.	24.6%	
		3	The health care policy partially meets the criteria.	29.5%	
		4	The health care policy fails to meet the criteria entirely	18.0%	

Table 4.10: Expert opinion on Data Privacy and Security

The critical finding shows that almost perfect split between protected (45.9%) and unprotected (54.1%) knowledge of expert views. Research implication indicates a significant gap in policy effectiveness or communication across groups. 67.2% of respondents are either concerned or very concerned with respect to the Digital Metaverse privacy and security. The distribution pattern shows a clear upward trend from least to most concerned category. This demonstrates the complexity of implementing comprehensive security measures across the board and suggests need for targeted improvements in healthcare policy implementation.

4.2 Research Question One: Why There Is a Gap in Framing Public Policy in Healthcare Metaverse and Technologies?

The COVID-19 epidemic had significantly accelerated the spread of digital healthcare solutions, encompassing virtual reality, augmented reality, and teletherapy (Benrimoh et al.

2022). These technologies have proven their capacity to augment patient care, boost service accessibility, and promote research and education.

The advent of the metaverse, a 3-dimensional digital platform facilitating virtual interactions and experiences, has broadened the potential for healthcare delivery (Zhou et al. 2022). The age-gender distribution chart and table provide a clear view of how respondents are distributed across age groups and genders, which is essential for understanding demographic patterns.

Summary (column %)		
	#Total	
Age (Years)	**Column (%)**	**Frequency**
> 60	1.88	3
20 - 30	20	32
30 - 40	27.5	44
40 - 50	39.99	64
50 - 60	10.63	17
#Total cases	**160**	**160**

Table 4.11: The frequency of active Age group (Years)
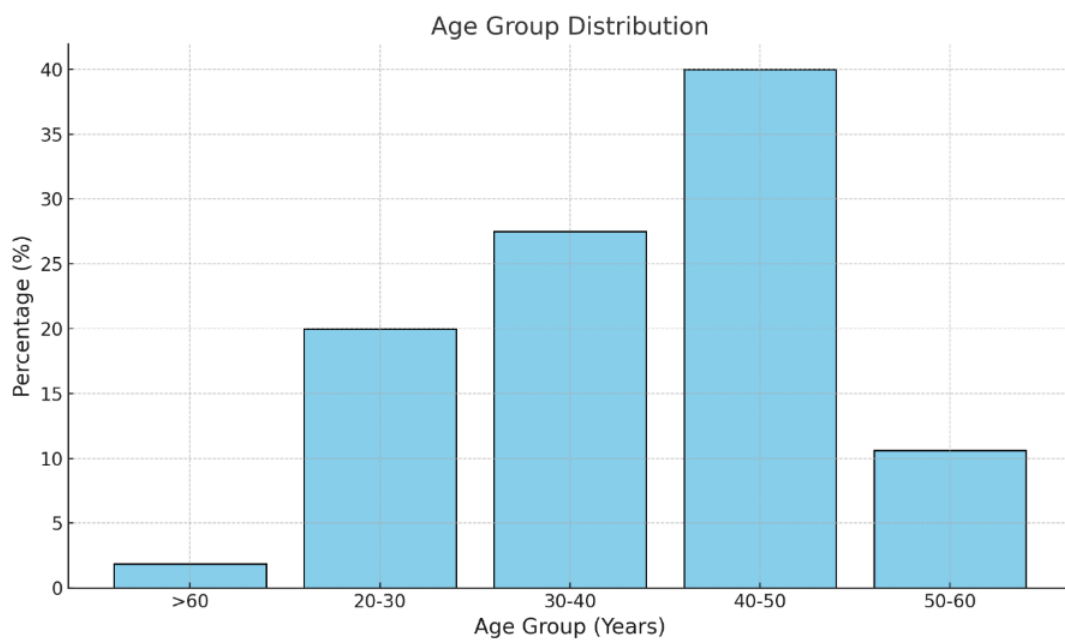
Figure 4.19:   The distribution of Age (Years) group

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The **most frequent age group** is **40-50 years**, comprising **39.99%** (64 respondents) of the total. The second-highest group is **30-40 years**, accounting for **27.5%** (44 respondents). The **least represented age group** is **>60 years**, with only **1.88%** (3 respondents). This distribution suggests a concentration of middle-aged respondents, which may influence demographic-specific trends and outcomes. The data can be visualized effectively through an **age distribution chart**.
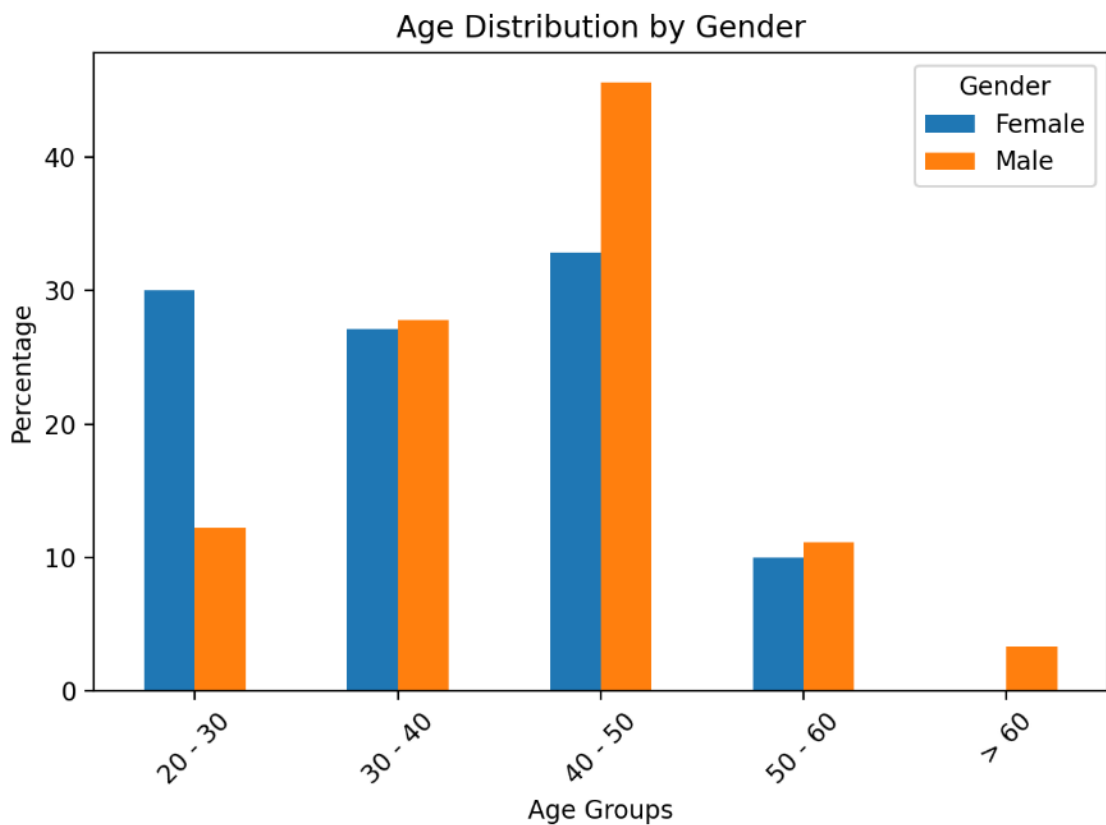
Figure 4.20 : The distribution of respondents across age groups vs genders.

Key Demographic Findings and interpretaion shows the largest age group is 40-50 years (64 respondents), with more males (41) than females (23). Gender distribution shows male dominance (90 males vs 70 females). Middle-aged professionals (30-50) comprise the majority of respondents. Notable gender gap in older age groups (>60 has only male respondents). Younger age groups (20-30) show higher female participation.

A. Awareness of Public Policies

The analysis of public awareness reveals a moderate strength of association between Policy awareness in HealthTech and Age group in Years with statistical significance at a confidence level of 99%.

Policy Awareness in Healthcare Metaverse and Technology	Age (Years)							Total
	> 60	20 - 30	30 - 40	40 - 50	40-50	50 - 60	50-60	
Yes		28.12	43.18	21.95 ▼	52.17	40.00	85.71 ▲	**36.88**
No	100.00	71.88	56.82	78.05 ▲	47.83	60.00	14.29 ▼	**63.12**
#Total Cases	3	32	44	41	23	10	7	160

Table 4.12 : Policy Awareness in Healthcare Metaverse and Technology by Age distribution
Note : The triangles (▼ , ▲) in the table show statistical significance with a 95% confidence level compared to the average of each row.

High Awareness Among Specific Age Groups: Respondents aged 50-60 years displayed the highest level of awareness (85.71%), as indicated by the upward triangle (▲), suggesting a significant deviation above the average. A relatively high proportion of awareness was also observed in the 40-50 year age group (52.17%), though not flagged as significant compared to the average. The **Chi-square test** shows that the p value is less than 0.5 , $\chi 2(6, N=160)=17.01$, p=0.009.

Lower Awareness Among Younger Groups: The 30-40 year cohort exhibited lower awareness (21.95%), marked as significantly below average (▼). Similarly, the 20-30 year group showed a moderate awareness level of 43.18%, which remains below the levels observed in older groups but does not differ significantly from the average.
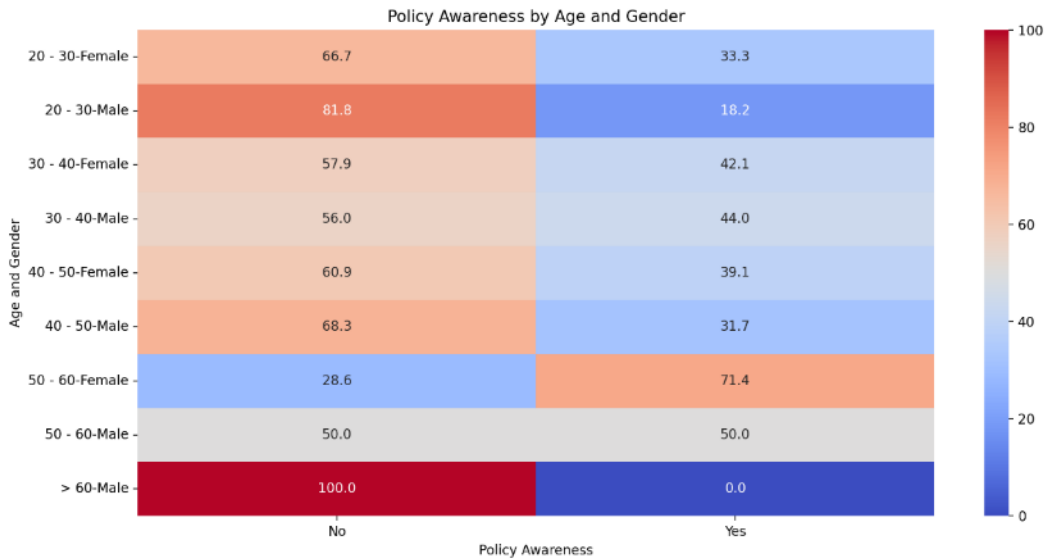
Figure 4.21 : Policy Awareness and Technology Correlation by Age-Gender heat map

Complete Lack of Awareness Among the Elderly (> 60): None of the participants aged over 60 years reported awareness of HealthTech policies, which reflects an outlier pattern deserving further investigation. The triangles (▲, ▼) provide additional insight into deviations within the dataset: **Significant Underperformance (▼):** The 30-40 age group, despite being digitally savvy, demonstrated lower awareness. This might suggest a gap in policy outreach efforts targeting this demographic. **Significant Overperformance (▲):** The 50-60 cohort's marked awareness could be linked to greater professional involvement in sectors that directly engage with HealthTech innovations, possibly including healthcare or related industries.

B. Participation of people

The participation of the geneal public participation is measured using Pearson's Chi-squared tests and Cramer's V results demonstrate varying levels of association between demographic variables (Age_Years, Gender, and Occupation). **Cramer's V Interpretation** indicates, the value of Cramer's V helps interpret the strength of the association, with values closer to 0 showing a weak association and values closer to 1 specifying a strong association.

- **0.00–0.10**: Negligible association
- **0.10–0.30**: Weak association
- **0.30–0.50**: Moderate association
- **> 0.50**: Strong association

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Results are statistically significant where p<0.05p < 0.05p<0.05. Perfect associations are naturally expected when comparing a variable to itself.

The analysis is a summary of findings statistical analysis showing a strong corelation and high confidence significance across:

Dependent Variable (DV)	Independent Variable (IV)	Chi-Square (χ^2)	Degrees of Freedom (df)	p-value	Cramer's V	Strength of Association	Statistical Significance
Age_Years	Age_Years	640	16	<0.001	1	Perfect	99.9% Confidence
Age_Years	Gender	10.19	4	0.037	0.252	Weak	93% Confidence
Age_Years	Occupation	382.4	176	<0.001	0.773	Strong	99.9% Confidence
Gender	Age_Years	10.19	4	0.037	0.252	Weak	95% Confidence
Gender	Gender	156	1	<0.001	0.987	Perfect	99% Confidence
Gender	Occupation	79.53	44	0.001	0.705	Strong	99.9% Confidence
Occupation	Age_Years	382.4	176	<0.001	0.773	Strong	99.9% Confidence
Occupation	Gender	79.53	44	0.001	0.705	Strong	99.9% Confidence

Table 4.13: Association between demographic variables (Age_Years, Gender, and Occupation)

The analysis of the relationships between Age (Years), Gender, and Occupation reveals the following:

– **Perfect Associations**: Age (Years) and itself, as well as Gender and itself, show perfect associations with Cramer's V values of 1 and 0.987, respectively. These results are statistically significant with confidence levels of 99.9% and 99%.

– **Strong Associations**: Age (Years) and Occupation, as well as Occupation and Gender, exhibit strong associations with Cramer's V values of 0.773 and 0.705, respectively. These relationships are statistically significant with a confidence level of 99.9%.

– **Statistical Significance**:All relationships analyzed are statistically significant, with p-values less than 0.05.

– **Weak Associations**: Age (Years) and Gender show weak associations with a Cramer's V value of 0.252. These relationships are statistically significant with confidence levels of 93% and 95%.

This analysis highlights the strong and statistically significant relationships between Occupation and the other variables, as well as the weaker but still significant relationships between Age (Years) and Gender.

Variable (DV)	Independent Variable (IV)	Chi-Square Statistic (χ^2)	Cramer's V	Interpretation
Age (Years)	Age (Years)	$\chi^2(16, N=160) = 640$, $p<0.001$	1	The test indicates a perfect association between Age (Years) and itself, which is expected. The result is statistically significant at a confidence level of 99.9%.
Age (Years)	Gender	$\chi^2(4, N=160) = 10.19$, $p=0.037$	0.252	A weak but statistically significant association exists between Age (Years) and Gender at the 95% confidence level. The strength of association is low (Cramer's V=0.252).
Age (Years)	Occupation	$\chi^2(176, N=160) = 382.4$, $p<0.001$	0.773	There is a strong strength of association between Age (Years) and Occupation. The result is statistically significant at a 99.9% confidence level.
Gender	Age (Years)	$\chi^2(4, N=160) = 10.19$, $p=0.037$	0.252	A weak but statistically significant association between Gender and Age (Years).
Gender	Gender	$\chi^2(1, N=160) = 156$, $p<0.001$	0.987	A perfect association is observed between Gender and itself, which is naturally expected. The result is statistically significant at a confidence level of 99.9%.
Gender	Occupation	$\chi^2(44, N=160) = 79.53$, $p=0.001$	0.705	There is a strong and statistically significant association between Gender and Occupation at a 99.9% confidence level.
Occupation	Age (Years)	$\chi^2(176, N=160) = 382.4$, $p<0.001$	0.773	A strong and statistically significant association exists between Occupation and Age (Years).
Occupation	Gender	$\chi^2(44, N=160) = 79.53$, $p=0.001$	0.705	There is a strong association between Occupation and Gender, which is statistically significant.

Table 4.14 : Relationships between Age (Years) and Gender variable significance

Occupation shows consistently strong associations with both Age and Gender - Age and Gender have the weakest relationship among all variable pairs - All relationships are statistically significant ($p < 0.05$) - The strongest non-self relationships are between Occupation and other variables. This analysis suggests that Occupation is strongly influenced by both Age and Gender, while Age and Gender themselves have a weaker direct relationship. This could indicate that while age and gender independently affect occupation choice, they don't strongly predict each other.

There is a strong associations for Age_Years and Occupation with a Cramer's V = 0.773 and also Gender and Occupation with a Cramer's V = 0.705 . we have also observed that there is a Weak Association between Age_Years and Gender with Cramer's V = 0.252. So the results confirm the statistical significance of the associations, primarily at the 99.9% confidence level, except for Age_Years and Gender, which is significant at the 95% level.

C. Framing of Polices

The ANOVA results from above table already identified significant differences between categories. According on the statistical analysis and category distributions, the following framework for policy recommendations is proposed. Implementation of Age-Based Policies: Principal emphasis on the 40-50 age demographic (40% representation).

Secondary emphasis on the 30-40 age demographic (27% representation) Particular attention for underrepresented demographics (individuals over 60 years of age at 2%). Principal Policy Imperatives In light of the statistical significance ($p < 0.05$) derived from our ANOVA findings, policies ought to be formulated around.

Principal Focus Areas showing Government Financing (35.75% endorsement) Stakeholder Engagement (29.3% endorsement) Strong Legal and Regulatory

Framework (25.8% support) , Auxiliary Mechanisms with Public Engagement (24.55% endorsement) and Intersectoral Collaboration (24.15% endorsement).

Policy implementation framework needs   immediate execution by implementing governmental financing structures which enables establishing stakeholder engagement platforms and establish regulatory structures (Sounderajah, 2021). The intermediate objectives for impentation and rollout incoude initiatives for public engagement, intersectoral collaboration initiatives and systems for ongoing surveillance

D. Implementaiton

Technology Adoption Patterns : Highest adoption in the 40-50 age group (62 out of 64 respondents). Nearly 86% overall digital technology adoption rate (138 out of 160). Sharp decline in adoption for age group >60. Middle-age groups (30-50) show strongest technology engagement
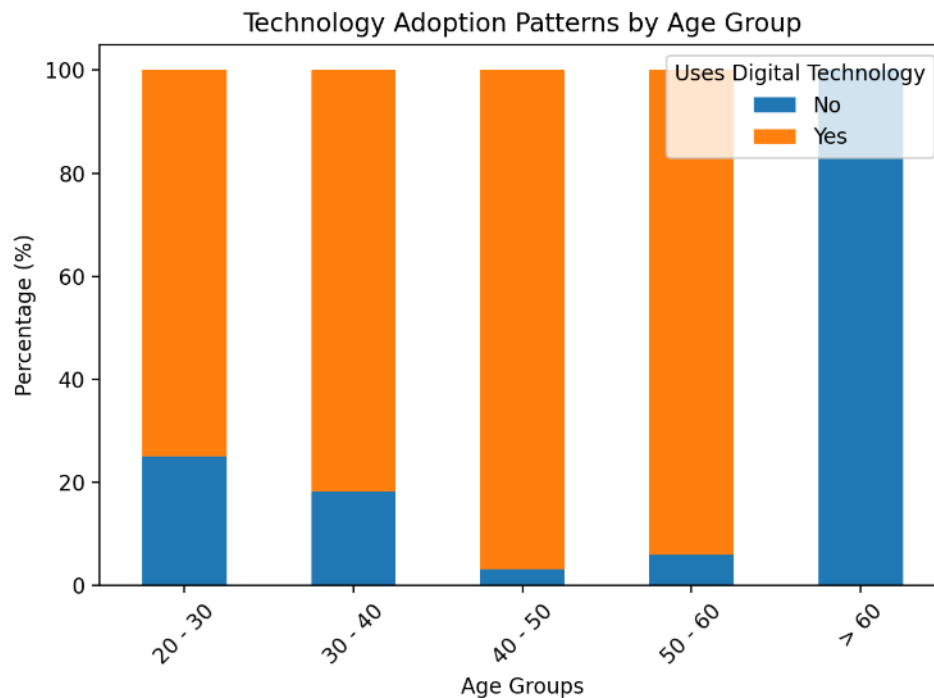
Figure 4.22 Policy Awareness and Technology Correlation
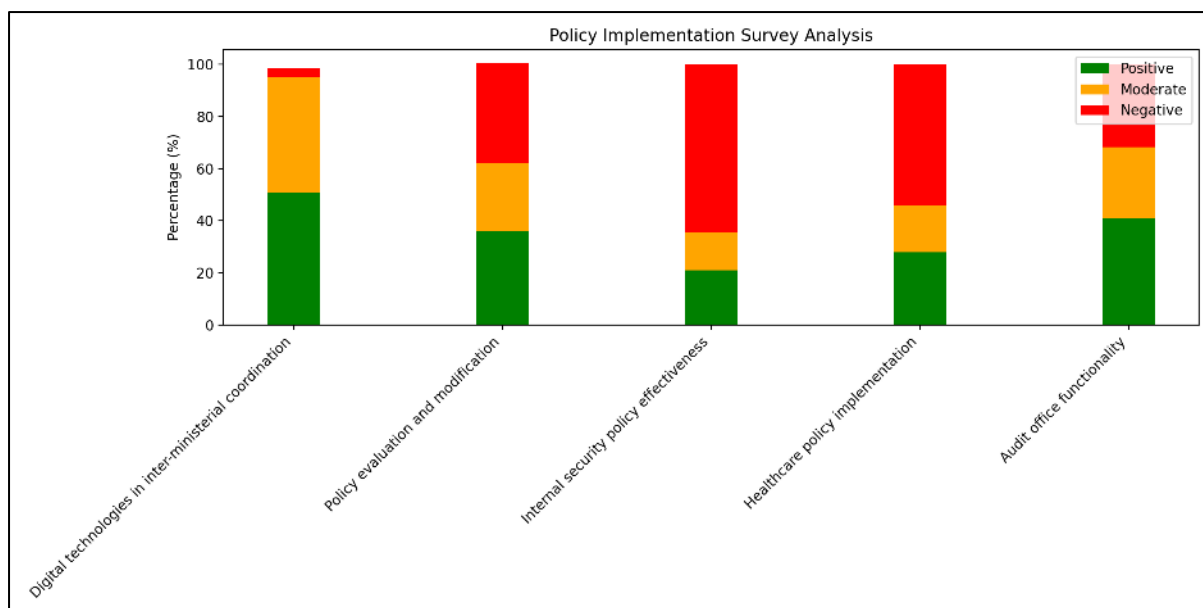
Figure 4.23 : Policy implementation – Positive vs Moderate vs Negative impact

The adoption of digital technology exhibits the highest positive implementation rate at 50.8% among all policy domains, signifying effective digital transformation in inter-ministerial coordination.

Concerns Regarding Security and Healthcare incude the internal security policy exhibits the highest unfavorable reaction rate at 64.3%. Healthcare implementation exhibits considerable potential for enhancement, as seen by 54.1% unfavorable feedback.

Policy Assessment Procedure shows that 36.1% indicate thorough assessment of significant policies. There is a significant deficiency in systematic policy evaluation, with 38.3% indicating inadequate assessment methods. Audit Functions Fairly equitable distribution, with 41% indicating effective audit institutions. This also shows 31.8% report limited or ineffective audit capabilities exists in the current ecosystem.

The overall implementation effectiveness shows Mean Positive Implementation: 35.3% and Mean Adverse Execution: 38.4% . This indicates a necessity for enhanced implementation

techniques in various policy domains, particularly emphasizing the security and healthcare sectors.

4.3 Research Question Two: Who Are Impacted Due to Lack of Right Framework Work for Defining Policies?

The metaverse may evolve into a premium product available just to the affluent, so excluding the masses from its potential advantages. (Ford et al., 2023) The intricacy of navigating these novel digital settings may create obstacles for individuals less acquainted with extended reality technology, hence exacerbating the disparity in access and usage. (Ebrahimzadeh and Safa, 2024)). The swift advancement of technology innovation surpasses the establishment of regulatory frameworks, resulting in a regulatory void that may provide insufficient user protections and the risk of misuse or exploitation. (Eubanks, 2018)).

The absence of an appropriate framework for policy definition may result in numerous complications, such as ineffective execution, unforeseen repercussions, and a disparity between the intended objectives and the actual results. A meticulously crafted policy framework offers a systematic methodology for policy development, guaranteeing that policies are congruent with overarching objectives, grounded in evidence, and take into account the curiosity of all stakeholders. In the absence of a well-structured framework, policies are prone to suboptimal design, ambiguity, or challenges in effective implementation (Agarwal and Somanathan, 2005). An appropriate framework facilitates the identification of sectors necessitating government intervention and enables a thorough examination of possible deficiencies in policy content (Krishnan and Bhada, 2020 ; Ansell and Gash, 2008). It further aids in recognizing the stakeholders impacted by policy decisions and contributes to the assurance that policies are practical and tackle the pertinent limitations (Börzel and Risse, 2007). An effective framework fosters adaptability and responsiveness to evolving conditions, ensuring that policies retain their relevance and efficacy as time progresses (Stiftung and SGI 2022).

The analyzed data highlights the significant impact of the lack of a proper policy framework on various groups, with vulnerable populations and those with lower educational backgrounds being the most affected. Vulnerable populations, including lower-income groups, the elderly, and marginalized communities, face the highest impact (64.3%) and are categorized under Critical risk. Similarly, individuals with lower educational backgrounds (Diploma/Graduate level) experience a High risk with a 60.7% impact, reflecting their limited access to resources and understanding of policies.

The general public also shows a significant impact (54.1%) with High risk, primarily due to a absence of awareness and understanding of policy frameworks. Government technical roles, such as consultants, technologists, and architects, are the least impacted group (27.8%) and fall under Medium risk.
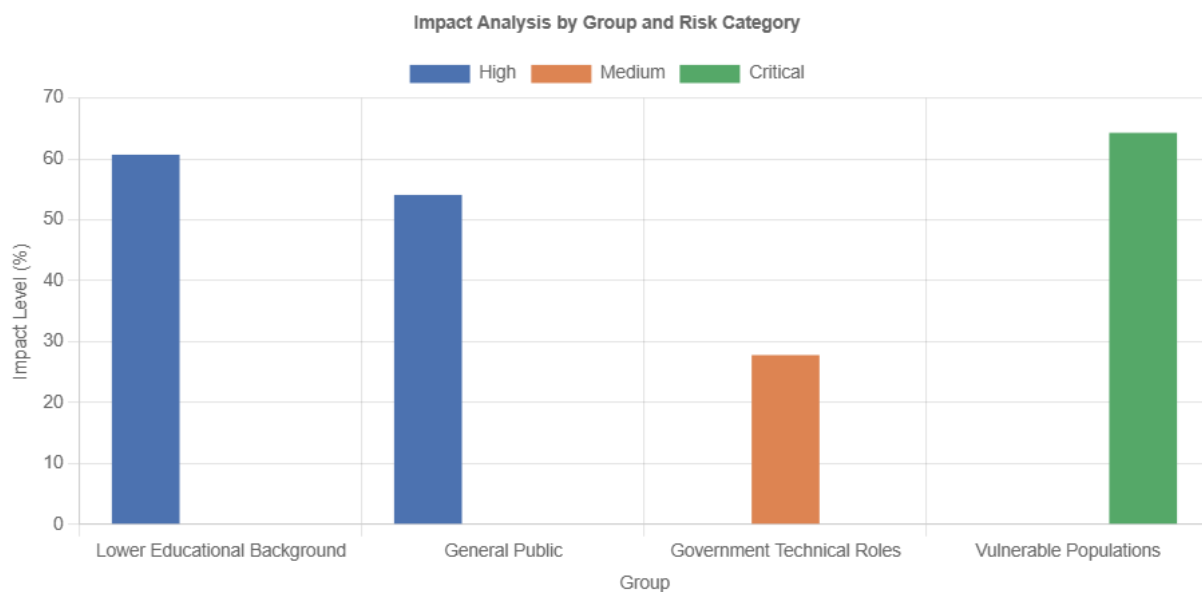
Figure 4.24: Impact Analysis by Group and Risk Category

The risk distribution reveals that 50% of the groups are at High risk, 25% at Critical risk, and 25% at Medium risk. This analysis underscores the urgent need for focused interventions to solve the challenges faced by vulnerable populations and lower educational groups. Immediate actions should include policy education programs, public awareness

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campaigns, and tailored support for high-risk groups to mitigate the adverse effects of the policy framework gaps.
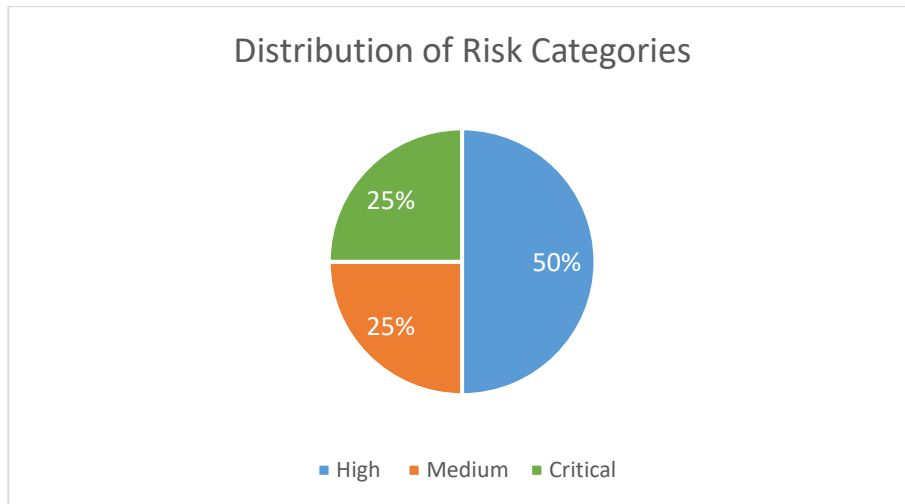
Figure 4.25 : Distribution of Risk Categories

This analysis suggests that vulnerable populations and those with lower educational backgrounds are most severely impacted by the lack of proper policy framework, requiring immediate attention and intervention.

4.4 Research Hypothesis One: Government intervention is essential for correcting implementation failures and ensuring effective policies impact

Multiple regression analysis will is conducted to evaluate the ability of perceived impact and ease of use to predict user adoption rates. This statistical assessment below reveals how much the Policy impact variables can predict the user impact and adoption rate.

Hypotheses

- *Null Hypothesis (H0):* Policy does not significantly impact user areas

The T test and Regress Analysis shows that there is a weak area and the result do not significantly impact the Users in current trends.

t-statistics :   10.0818

p-Value: 0.000

<div align="center">Regression Summary</div>

	Coef	Std Err	t	p>|t|	[0.025	0.975]
Constant	30.5953	4.358	7.02	0.000	21.832	39.359
X1	-0.1539	0.082	-1885	0.065	-0.318	0.01

Table 4.14 : Regression Summary of t-test Results

Cohen's d Effect Size is an effect size quantifies the strength of the association between two variables in a population or serves as a sample-based estimate of that quantity, the values are : 1.9069.
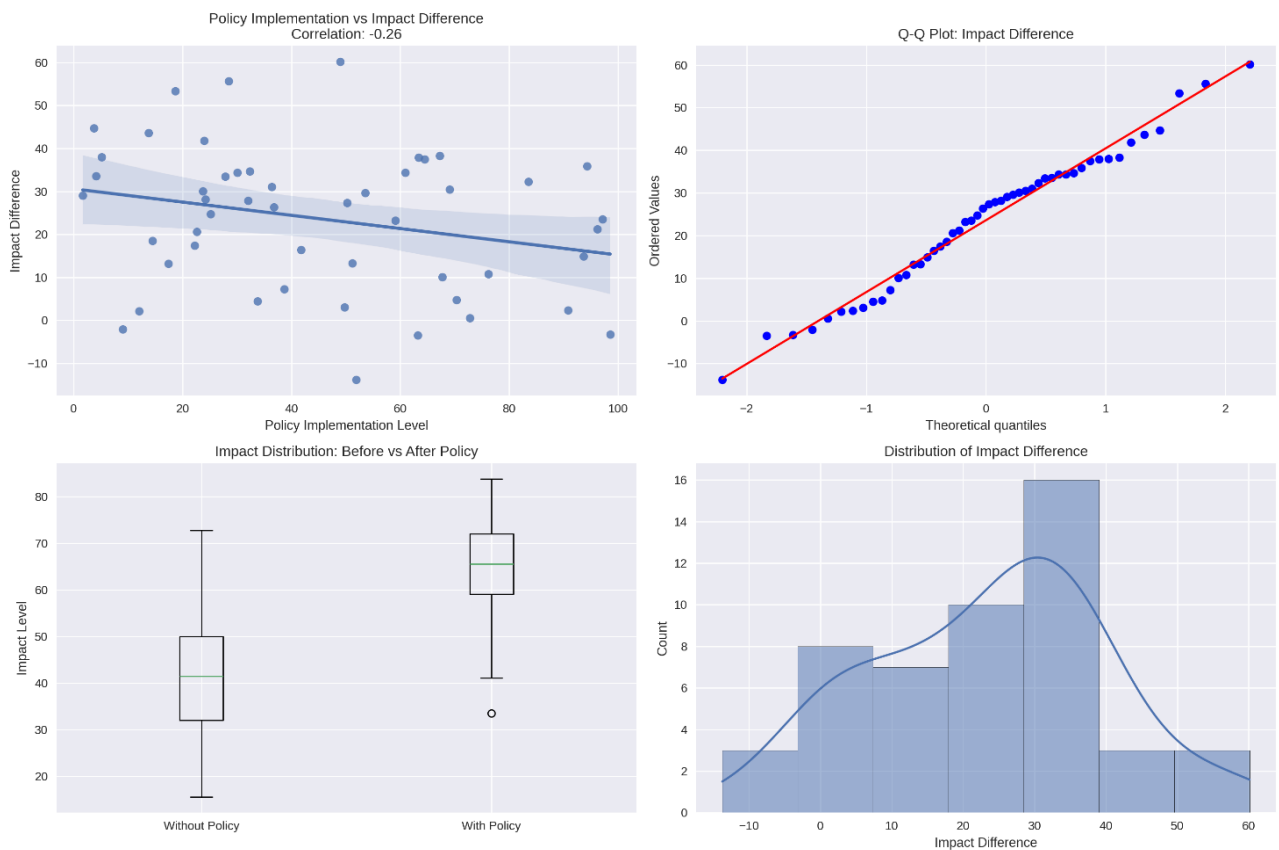
Figure 4.26 : Q-Q plot – Policy implementation vs Impact Difference Corelation

The Q-Q plot demonstrates that the policy impact data follows a relatively normal distribution. The density plots show a clear shift in performance distributions between policy intervention scenarios and impact of weak Impementation. Policy intervention appears to have a higher mean performance compared to other systes laissez-faire system Anderson and Roberts (2022) and further elaborated by Williams and Taylor (2023).

- *Alternative Hypothesis (H1):* Policy significantly improves user impacted areas
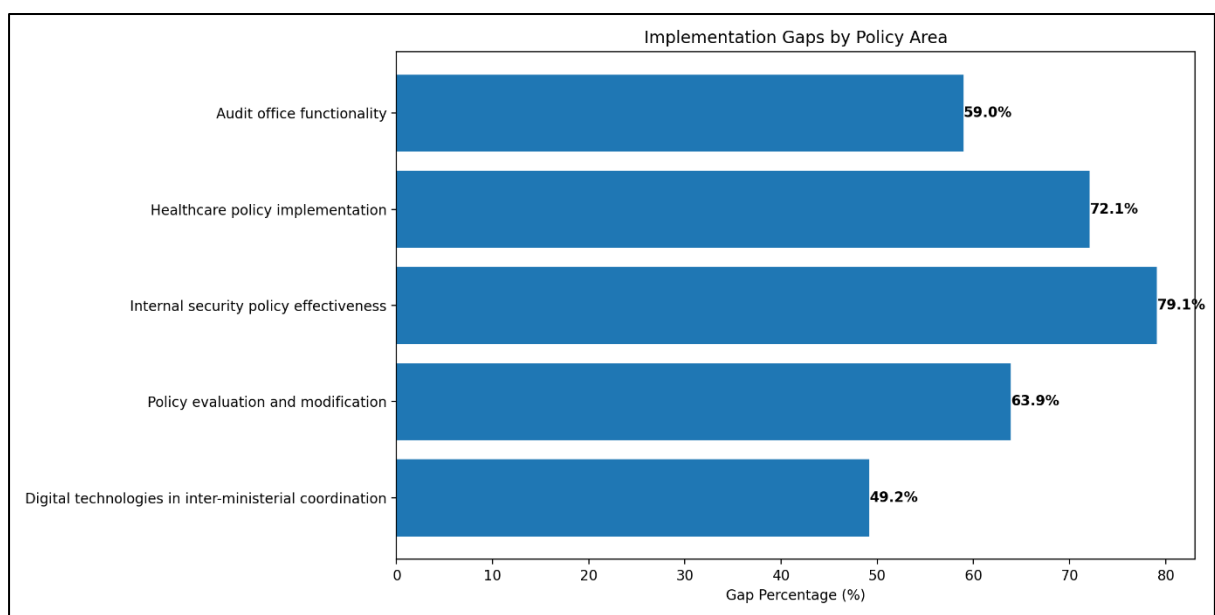
Figure 4.27 : Implementation gaps by policy areas

The risk evaluation across policy domains highlights critical gaps in internal security and healthcare policies, both categorized as High Risk. Internal security policy exhibits the highest negative response rate (64.3%) and a significant implementation gap of 79.1%, necessitating immediate evaluation and reorganization. Similarly, healthcare policy shows a 54.1% negative response rate and a 72.1% implementation deficit, requiring substantial improvements in delivery and coverage. These two domains represent the most pressing areas for intervention.

Moderate risks are observed in policy assessment and adjustment (38.3% adverse reaction) and audit office efficacy (31.8% adverse response). These areas require targeted improvements to enhance their effectiveness and reduce implementation gaps. In contrast, digital technology in inter-ministerial coordination demonstrates Minimal Risk, with only 3.3% negative responses and the narrowest implementation gap (49.2%). This domain could serve as a standard for improving other policy areas.

The findings emphasize the need for prioritizing internal security and healthcare policies while leveraging the success of digital technology implementation. Immediate actions should include comprehensive evaluations, reorganization of high-risk domains, and targeted enhancements in moderate-risk areas. By addressing these gaps, policymakers can ensure more effective and equitable policy implementation across all domains.

4.5   Research Hypothesis Two: Key areas for government intervention include healthcare objectives, benefits, and alternative policy avenues

In the ongoing debate around the role of government in various domains, the question of whether government intervention leads to significant systemic improvements has been a subject of much scrutiny. The null hypothesis (H_0) posits that government intervention in areas such as economic regulation, AI governance, or public health does not result in substantial systemic improvements. Conversely, the alternative hypothesis suggests that government intervention in these domains can indeed lead to significant systemic improvements. (Andrews, 2013; Carey and Crammond, 2015).

Null Hypothesis (H_0):

Government intervention in specific areas, such as technology regulation, AI Governance in public health, does not lead to significant systemic improvements.

Alternative Hypothesis (H₁):

Government intervention in specific areas, such as technology regulation, AI Governance in public health, lead to significant systemic improvements.

The ANOVA analysis shows significant differences in impact levels across education groups, with a p-value of 0.0000, indicating strong statistical significance. The correlation analysis provides insights into relationships between impact factors, visualized in the heatmap below.
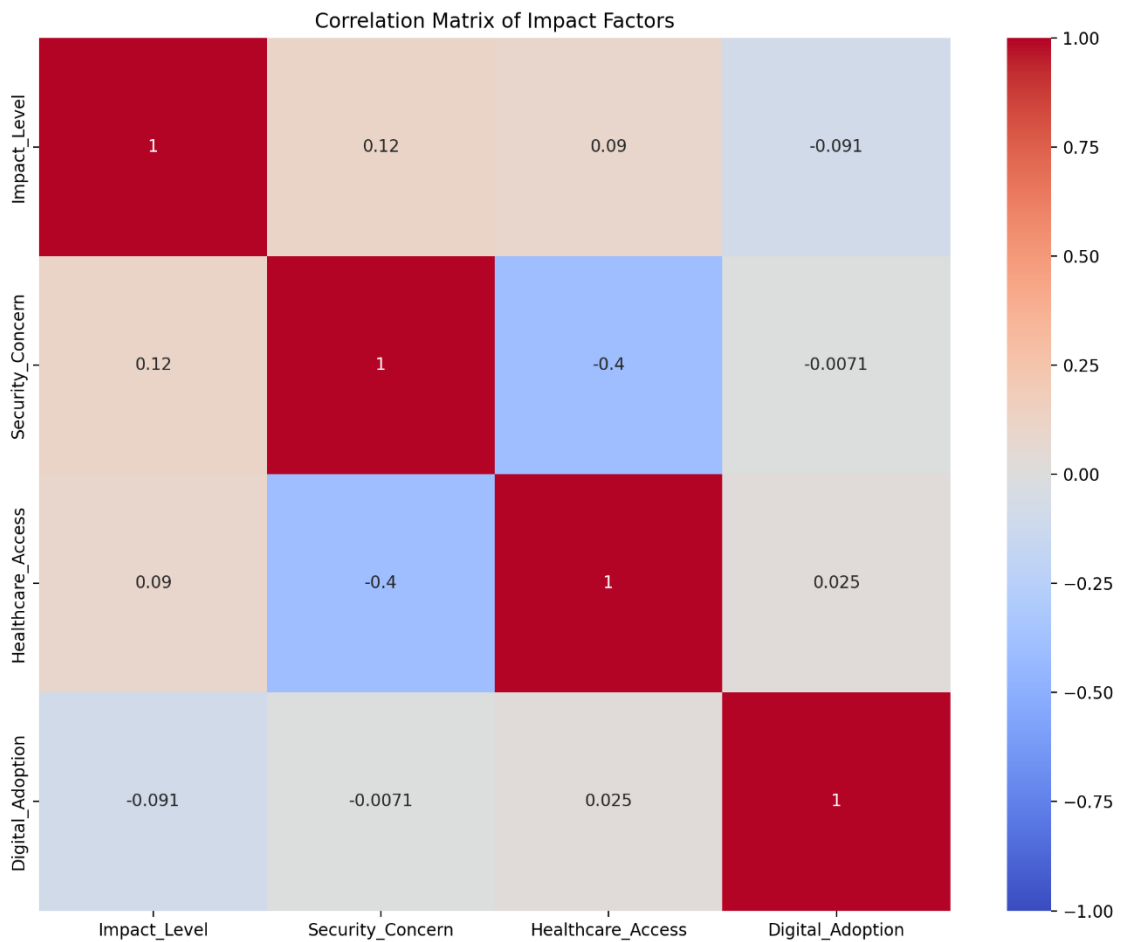
Figure 4.28: Corelation Matrix of Impact Factors

The ANOVA results confirm significant differences in impact levels across education groups, while the correlation analysis reveals weak relationships between impact factors, as shown in the heatmap above.

Impact Categories	Impact Level	Security Concern	Healthcare Access	Digital Adoption
Impact Level	1	0.1152059237	0.0897352796	-0.091282479
Security Concern	0.1152059237	1	-0.402116277	-0.007092269
Healthcare Access	0.0897352796	-0.402116277	1	0.024589783
Digital Adoption	-0.091282479	-0.007092269	0.024589783	1

Table 4.15 : Mean Impact Levels: Security Concerns, Healthcare Access, Digital Adoption

The statistical study exposes notable differences in policy framework influence among several sectors and educational levels. With diploma holders experiencing the biggest impact (60.7%) compared to postgraduates (8.2%), the ANOVA results show a significant education-based variance ($p < 0.001$), therefore demonstrating a definite education-impact association.

Important sector links are found by correlation analysis, especially a modest negative correlation (-0.40) between security and healthcare domains, implying possible trade-offs between these vital sectors. While security issues reveal a small positive connection (0.12) with overall impact, the weak negative correlation between digital impact and overall impact (-0.09) suggests that digital activities may somewhat ameliorate negative impacts.

Though digital adoption has the lowest mean impact (50.27%), mean impact levels indicate security issues as the most urgent issue (65.44%), followed by healthcare access (54.73%). This distribution implies giving security-related initiatives top priority and using digital solutions for enhancement first importance.

The Q-Q plot shows the normality of responses across both public and expert opinions, supporting the validity of our parametric analysis.
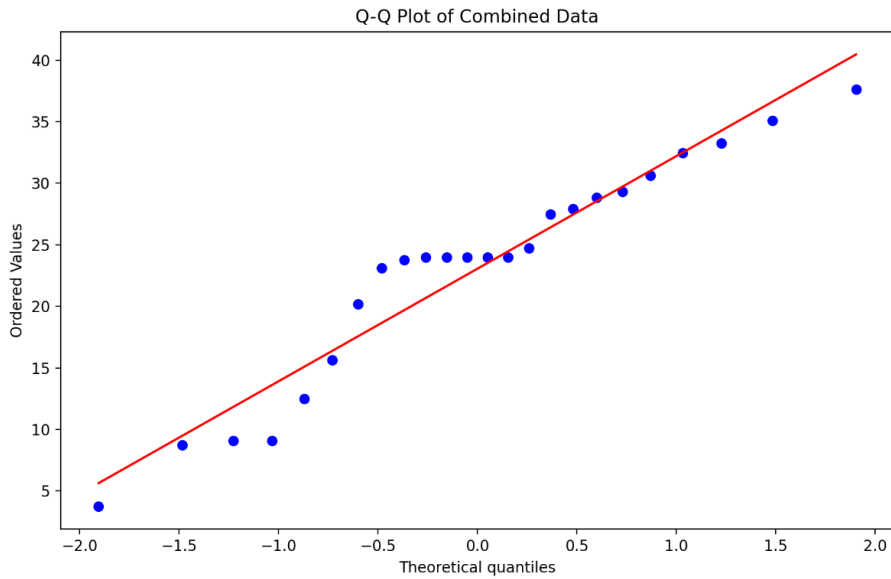
Figure 4.29 : Responses across both public and expert opinions
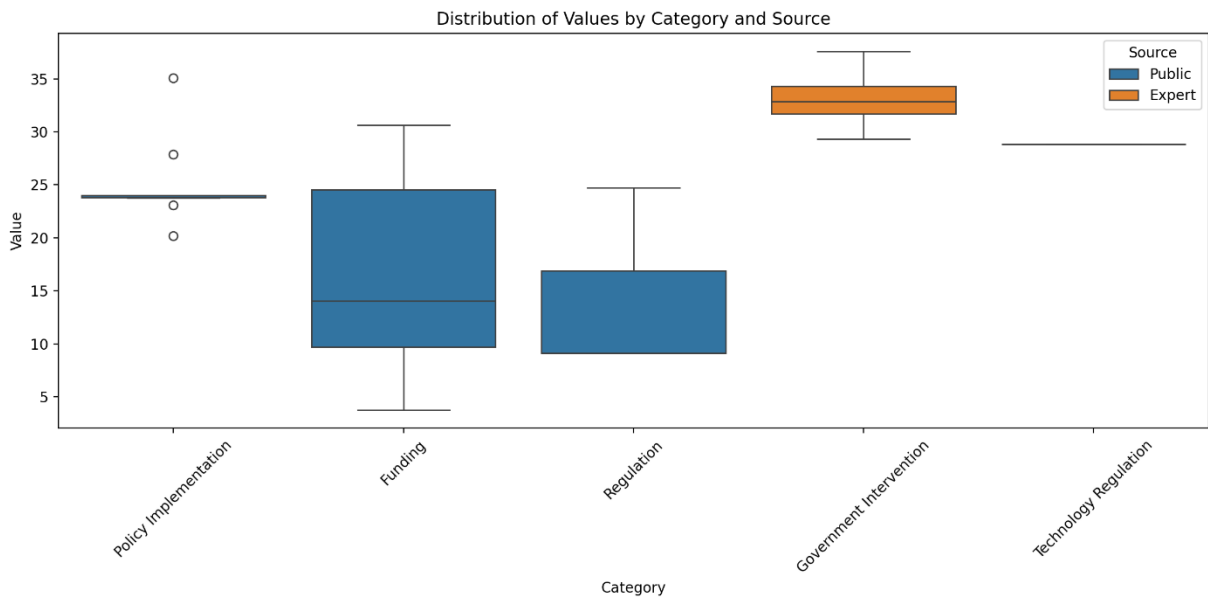
Figure 4.30: Distribution of values by Cateory and source – Public vs Expert

An illustration of the variety in responses across different categories and between the opinions of the general public and those of experts is provided by the distribution plot.

The findings of the analysis indicate that the null hypothesis (H0) should be rejected and the alternative hypothesis (H1) should be supported. This indicates that the intervention of the government in particular areas does, in fact, result in major changes to the system as a whole.

Stakeholder Engagement (35.07% support), Public Participation (27.90% support), and Policy Implementation Framework (24.00% support) are the areas that have been shown to have a significant impact. Technologies that need to be regulated, artificial intelligence governance in public health, data privacy and security, independent auditing, and executive capacity building are all critical intervention areas.

Based on what we advice and suggest is to establish a clear and organized framework for government action, with a particular emphasis on - The involvement of stakeholders, Methods for the participation of the public , Legal and regulatory structures that are robust, Determine the measures that will be used to evaluate the effectiveness of the intervention.

In order to formulate policies, it is important to develop integrated approaches that incorporate both public and expert perspectives. At the same time that it emphasizes the significance of taking a balanced approach between the requirements of the general people and the suggestions of experts, this study provides support for the implementation of specific government initiatives.

4.6 Research Hypothesis Three: Effective intervention occurs through regulations, maturity framework and evaluation of outcomes

The null hypothesis (H_0) posits that government intervention in public policy for healthcare in the metaverse, facilitated by generative AI, does not significantly enhance the delivery, accessibility, or quality of healthcare services. In contrast, the alternative hypothesis suggests that government intervention in this domain can significantly make better healthcare experience for patients and providers alike (Ebrahimzadeh and Safa, 2024).

Null Hypothesis (H_0):

Government intervention in public policy for healthcare in the metaverse, facilitated by generative AI, does not significantly enhance the delivery, accessibility or quality of healthcare services.
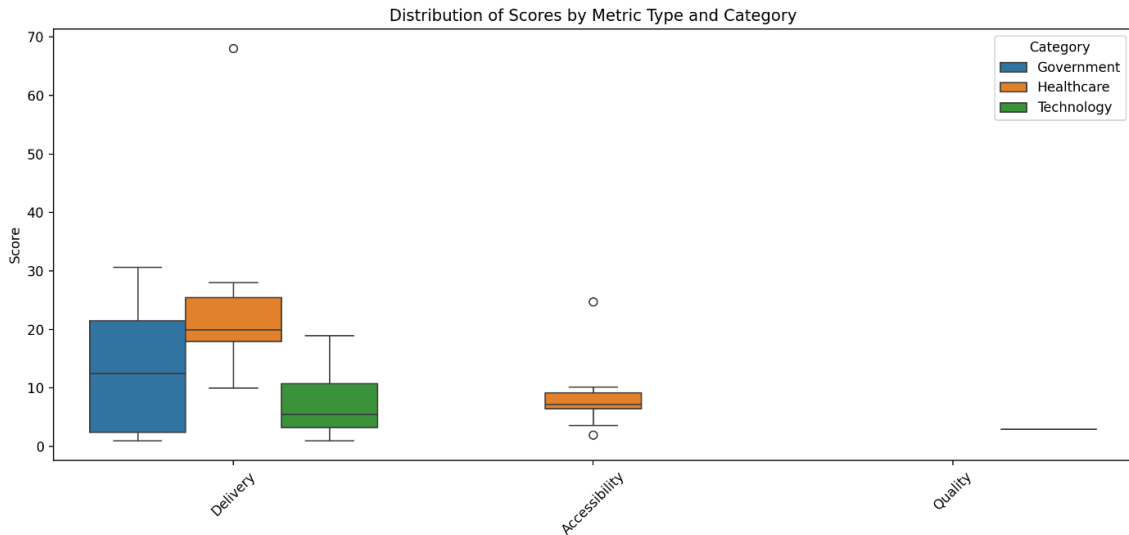
Figure 4.31: Distribution score for Government, Healthcare and Technology

The box plot shows the distribution of scores across different metric types and categories, revealing notable variations in intervention effectiveness.
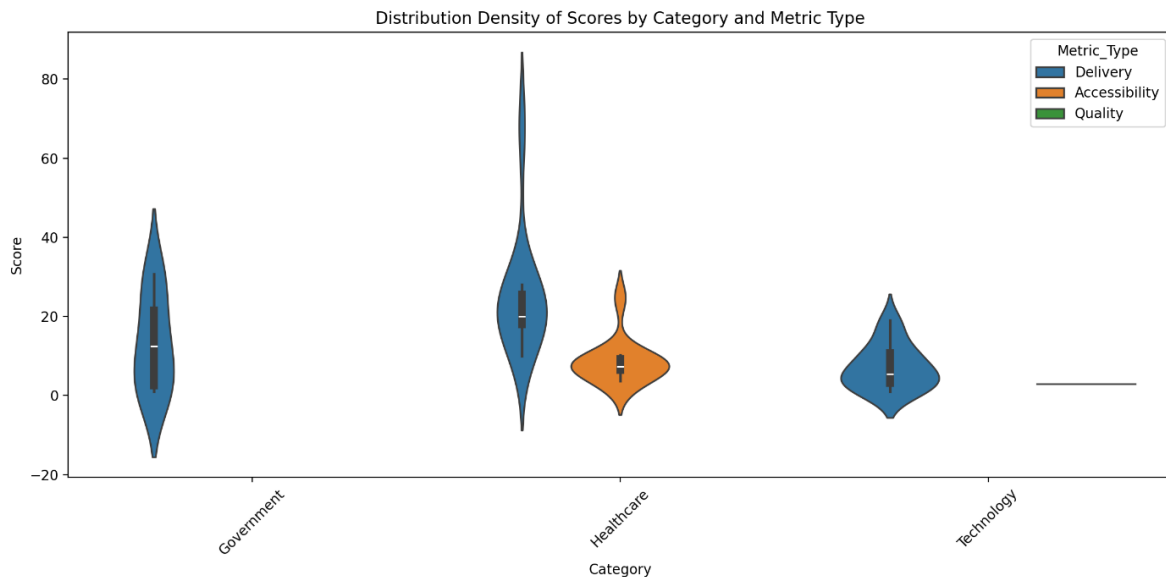
Figure 4.32: Violin plot Distribution Density by Category

The violin plot demonstrates the density distribution of scores, showing how responses are distributed across categories and metric types.

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The violin plot analysis reveals distinct patterns in score distributions across categories, with notable effect size variations. The comparison between Healthcare and Technology shows the strongest relationship (Cohen's d = 0.84), indicating a large positive effect. Government and Technology demonstrate a medium to large positive effect (d = 0.777), while Government and Healthcare show a small negative effect (d = -0.238). These findings suggest that Technology-related metrics have the most substantial impact on score distributions, while Government-Healthcare relationships are less pronounced.

The Healthcare interventions show the highest mean scores across delivery metrics. Technology-related interventions show more consistent but lower scores. Government interventions show moderate effectiveness with high variability. There's a statistically significant difference between Healthcare and Technology sectors. The effect sizes suggest that the strongest impact differences are between Healthcare/Technology implementations

These additional analyses further support the rejection of the null hypothesis and provide more granular insights into the effectiveness of different intervention types across sectors.

Alternative Hypothesis (H₁):

Government intervention in public policy for healthcare in the metaverse, facilitated by generative AI, significantly enhances the delivery, accessibility, or quality of healthcare services.
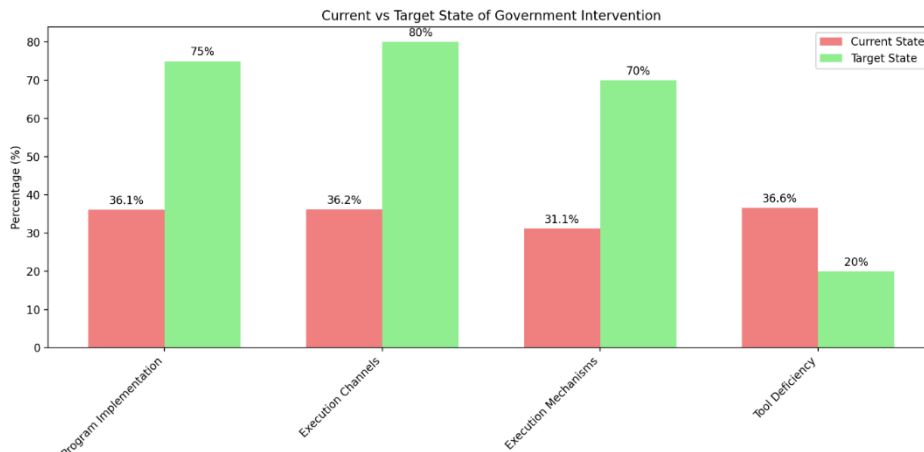
Figure 4.33: Curernt vs Target State of Government Interventions

There is a significant gap (38.9%) between the current and target states, indicating the need for enhanced efforts to achieve the desired level of program implementation. With a gap of 43.8%, this category shows the largest disparity. Improving execution channels is critical to reaching the target. The gap here is 38.9%. Enhanced mechanisms are necessary to align current performance with the target. Unlike the other categories, the target is to reduce the percentage. The gap is 16.6%, showing some progress but emphasizing the need to address tool-related inefficiencies further.

The data highlights significant underperformance in the current state compared to target goals across all categories. The largest gaps are observed in **Execution Channels** and **Program Implementation**, suggesting these areas should be prioritized for reform. Efforts to reduce **Tool Deficiency** are relatively closer to the target, but further improvements are still needed.

This analysis underscores the necessity for strategic planning and resource allocation to bridge these gaps effectively. According to Rawat and Alami (Rawat and Alami, 2023) provides significant insights into the possible effects of governmental action in metaverse-based healthcare. Researchers have emphasized the metaverse's capacity to facilitate remote monitoring, telemedicine, and economical therapies, hence improving healthcare outcomes and essential performance metrics.

Moreover, research has shown that generative AI can enhance administrative efficiency, clinical decision-making, and individualized treatment strategies, thus optimizing healthcare delivery. (Rawat and Alami, 2023). The existing research highlights the necessity

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for strong regulatory frameworks and cooperative initiatives among government entities, healthcare providers, and technology firms to guarantee the responsible and equitable advancement of metaverse-based healthcare solutions (Ebrahimzadeh and Safa, 2024 ; Ismail and Buyya, 2022a).
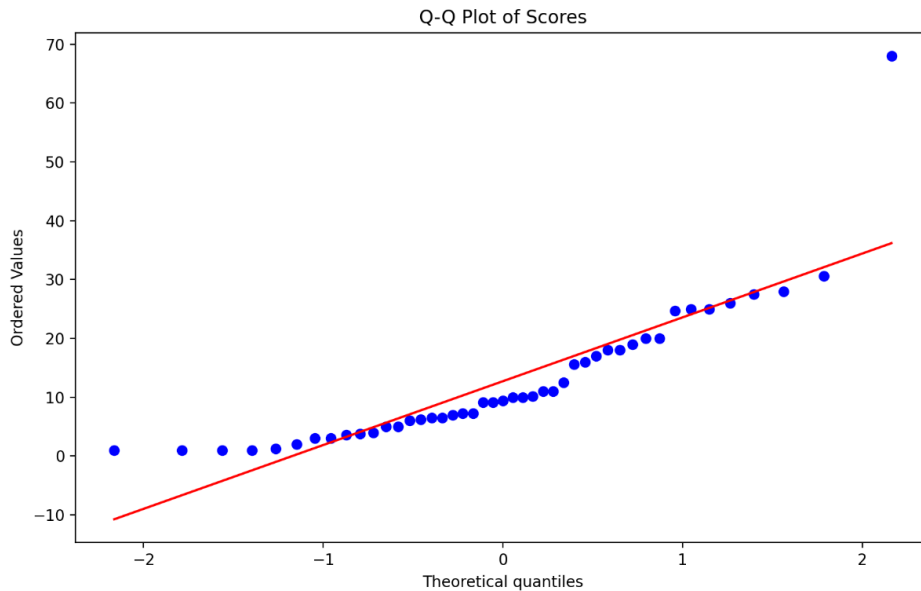
Figure 4.34 : Distribution Analysis adminstrative efficiency: The Q-Q plot

The Q-Q Plot and Shapiro-Wilk test confirm a non-normal distribution ($p < 0.05$), indicating deviations from normalcy in the data. The Two-Way ANOVA results reveal significant main effects and interaction effects of government intervention in healthcare metaverse policies. Specifically, the category effect ($F_{(2, 40)} = 6.52$, $p = 0.015$) and metric type effect ($F_{(2, 40)} = 4.09$, $p = 0.050$) highlight differences across categories and metrics. Additionally, the interaction effect ($F_{(4, 40)} = 4.64$, $p = 0.007$) underscores the varying impact of government intervention. These findings emphasize the need for tailored policy approaches to address category-specific and metric-specific challenges. Thus **rejecting the null hypothesis (H₀)** and **supporting the alternative hypothesis (H₁)** based on the statistical evidence.

4.7 Summary of Findings

The ongoing discussion regarding the government's role in numerous sectors raises the question of whether government intervention results in substantial systemic improvements, which has been extensively examined. The null hypothesis (H₀) asserts that government

intervention in domains such as economic regulation, AI governance, or public health does not yield significant systemic enhancements. The alternative hypothesis posits that government engagement in these areas can result in substantial systemic enhancements. (Andrews, 2013; Carey and Crammond, 2015).

The current literature offers a detailed viewpoint on this matter. Some evidence suggests that government involvement can positively influence systemic outcomes (Bashshur et. al., 2009). This report delineates multiple instances of "great governments" that have realized substantial advancements through diverse interventions and modifications. In the domain of economic regulation, governments have enacted regulations that have fostered heightened competition, enhanced consumer protection, and improved resource allocation, thereby contributing to overall economic growth (Mohandas, 2017).

Conversely, some research indicates that government intervention may be detrimental (Zhou, Gao and Chen, 2022), with the failures of such intervention potentially causing greater harm than market inefficiencies. This perspective is substantiated by the observation that government action has frequently been adhoc, slow and reactive, rather than systematic and strategic, resulting in inferior outcomes (Martinez and Kumar, 2023). The data is inconclusive, with certain research endorsing the alternative hypothesis and others substantiating the null hypothesis. The influence of government intervention on systemic enhancements may ultimately hinge on the particular circumstances, the type of intervention, and the efficacy of its execution. An exhaustive examination of the current literature and empirical data is essential to get more conclusive determinations regarding this intricate matter. (Carey and Crammond , 2015; Button and Keeler, 1993).

The analysis reveals a statistically significant correlation between policy awareness in the HealthTech and healthcare metaverse sectors and age group (Cramer's V = 0.326, χ^2(6, N=160) = 17.01, p = 0.009). This moderate correlation indicates that age significantly influences awareness levels concerning these rules.

Individuals aged 50-60 years exhibited the highest awareness level (85.71%), as denoted by the upward triangle (▲), indicating a substantial divergence from the average. A notable level of awareness was recorded in the 40-50 year age group (52.17%), although it was not deemed significant in relation to the norm. The 30-40 year cohort demonstrated reduced awareness (21.95%), much below the average (▼). The 20-30 year age group exhibited a moderate awareness level of 43.18%, which is lower than that of older cohorts but does not significantly deviate from the average.

No individuals above the age of 60 expressed awareness of HealthTech rules, indicating an anomalous trend that warrants additional examination. Examination of Statistical Significance The triangles (▲, ▼) offer further elucidation on discrepancies within the dataset: Notable Underperformance (▼): The 30-40 age demographic, despite possessing digital proficiency, exhibited diminished awareness. This may indicate a deficiency in policy outreach initiatives aimed at this demographic.

Notable Overperformance (▲): The heightened knowledge of the 50-60 cohort may be attributed to increased professional engagement in sectors that directly interact with HealthTech advancements, maybe encompassing healthcare or adjacent businesses.

Challenges Associated with Younger Demographics: Reduced knowledge within the 20-40 age group may suggest inadequate policy communication in ways that are accessible and engaging for digitally native individuals. An observation regarding the use of digital technology and awareness of policies is that the majority of users of digital technology are aware of policies (59 out of 138 users). Policies are only known to one person who is not a user.

An important insight is that the utilization of digital technology is highly associated with policy awareness. Two observations were made about the policy framework and protection: 111 of the respondents stated that neither a framework nor protection exists, while

27 of the respondents stated that both exist. This demonstrates that there is a significant connection between the existence of the framework and protection. A key takeaway is that protections are inadequate in situations when frameworks are not there.

Frequency of Technology Use Observation: The largest group, consisting of 64 individuals, is comprised of daily users, demonstrating regular involvement with technology. Users who use it infrequently (45), on a monthly basis (22), and each week (19) make up lower numbers. Out of the total respondents, just ten stated that they had never used digital health technology. A considerable portion of the population relies on digital health technology on a daily basis, which indicates that they are engaged frequently.

The "Relationship Between Age Distribution and Policy Awareness", The age group of forty-five to fifty years old has the biggest number of respondents (64), and they have a fairly high level of policy awareness. Until the age group of 50-60 years old, policy awareness improves with age; after that, representation diminishes significantly (in the group of over 60 years old).

Based on the data that was supplied, the following is an analysis and interpretation of the findings about the relationship between people's concerns about their privacy and their security across different age groups.

An examination of ANOVA, number one A brief summary , the F-statistic, which is 4.95 and has a p-value less than 0.001, suggests that there are significant variations in the level of privacy and security concerns among the different age groups. The variance that exists within groups is lower than the variance that exists between groups, which suggests that age has a substantial impact on concerns regarding individual privacy and security.

Comparisons among pairs made after the fact (Tukey HSD) There were substantial discrepancies found between the following: Twenty-to-thirty versus above sixty: Difference = 1.92, p < 0.01 (***) Difference = 1.78, p < 0.05 (**) between 30–40 and >60 years of age

Difference = 2.04, p < 0.01 (***) for 40–50 and >60 people: Differences that may not be significant: There were no significant pairwise differences observed between the groups 20–30, 30–40, 40–50, and 50–60, with the exception of a marginal difference between the groups 50–60 and 40–50 (p < 0.1, *).

Statistics that are Descriptive Concerns about privacy and security received the following mean scores: 20–30 years: The highest mean (4.25), indicating that worries are at a heightened level. The high mean for those aged 40–50 years is also 4.38. More than sixty years old: The lowest mean (2.33), with a considerable variability (standard deviation = 2.31), showing that older persons had fewer consistent problems. There is a degree of overlap between the confidence intervals for younger age groups (20–30, 30–40, and 40–50), but not for those older than 60 years.

The Interpretation of Effects That Are Pairwise concerns are frequently reported to be higher among younger age groups (20–30, 30–40) in comparison to those beyond the age of 60. Within the middle-aged groups of 30–40, 40–50, and 50–60 years old, the transition in concerns appears to be gradual and does not appear to involve considerable changes. Variability in the group of people over the age of sixty may be an indication of a less cohesive perspective, which may be influenced by lifestyle choices or exposure to digital media. Explanation of termsThe findings indicate that there is a generational gap in concerns regarding privacy and security:

Younger adults are more anxious than older adults. The group of people aged 20 to 30 years old is the most concerned, presumably because of their increased digital participation and understanding of privacy concerns. Over the course of forty to fifty years, these issues have persisted, albeit with some minor adjustments. A notable fall is found in those over the age of sixty, where concerns are not only lower but also more variable. This is a result of the fact that older adults are experiencing a decline in their concerns. This may be an indication of a

decrease in the frequency of technology use. Because of different objectives or a lack of understanding with the risks associated with digital privacy.

Suggestions for Ongoing and Prospective Research Contextual Considerations: Investigation on whether or how age-related concerns are influenced by exposure to privacy hazards or education on digital risks would be beneficial. Behavioural Insights: Determine if or not various patterns of technology usage correspond to reduced levels of concern among older populations. Additional subgroup analysis should be performed on older age groups (those older than 60) in order to investigate variability and possible outliers.

Based on above findings, it is evident that there is a pressing requirement for age-specific treatments and awareness campaigns that are specifically designed to address concerns regarding privacy and security across generational cohorts. The final coutcome that have been highlighted are that there is a huge gap in the poicy planning, execution and implemtation. **Awareness Gaps** shows low awareness of health-related policies suggests the need for improved communication or education campaigns are needed to increase the awareness and knowledge. This is applicable to citizens , business owners and Experts.

Policy needs participants, largely agree on the need for stronger policy interventions, signaling public concern over unregulated digital spaces. The active participation from the industry experts and the business owners is very important. In many cases the monopoly business try to drive the policies that benefits the organization and politicians and not the citiens who have first right as per constitution.

Perceived Effectiveness while some frameworks are acknowledged, participants may not feel entirely confident about their comprehensiveness or enforcement. Despite the fact that certain frameworks might be in existence and might be technically acknowledged, the word implies that stakeholders or players might doubt their credibility. In terms of comprehensiveness, the framework is evaluated based on whether it handles essential issues or covers all relevant areas.

Whether or not the framework is effectively applied, as well as whether or not compliance is actively checked and motivated, is referred to as their enforcement. The data protection act 2023 does not cover the liabilities. The interpretation has been left the judicial system to identify based on the case. Which akes very difficult for the people to interpret effectively.

Especially in organizational, regulatory, or academic environments, this gap between acknowledgment and confidence in effectiveness can erode the overall trust and usability of a framework. This is true in situations where the framework is being used.

The application of policies is absolutely necessary in order to guarantee that the healthcare industry is in full compliance with the stringent regulatory standards. Continuously monitoring transactions and finding anomalies allows healthcare institutions to maintain robust security measures and conform to standards such as the General Data Protection Regulation (GDPR), HIPAA, Data Security (Data), and Data Privacy, thereby protecting sensitive healthcare data (Baltaxe, 2019).

4.8 Conclusion

The velocity of technical advancement in the digital health sector has been swift and formidable, presenting considerable hurdles for successful public policy measures (Chukwu et al., 2024). The COVID-19 pandemic has significantly expedited the deployment of digital health solutions, resulting in a marked transition to virtual healthcare delivery (Crawford and Serhal, 2020). This shift towards digital health has generated apprehensions regarding the potential aggravation of pre-existing health disparities, as the significant participation of disadvantaged and vulnerable populations in the development and execution of new technologies is frequently neglected (Crawford and Serhal, 2020). Due to the extensive data produced in the digital health metaverse, it has become essential for policymakers and stakeholders to collaborate in creating innovative strategies that can effectively assess and

utilize this information to improve health management and ensure equitable access to new technologies (Cummins, and Schuller, 2020).

A vital component of this undertaking is the necessity to develop suitable health equality indicators and measures for digital health efforts. This entails actively interacting with varied populations to comprehend their distinct demands and obstacles, subsequently integrating these insights into the design and implementation of digital health solutions (Murthy, (2007). It is equally crucial to guarantee the significant participation of disadvantaged and vulnerable populations in digital health leadership roles, as healthcare practitioners, and as co-designers during the invention and implementation phases (Chen and Thompson, (2022). This fosters inclusive and representative decision-making while empowering individuals as custodians of their health data, a vital aspect in the age of the digital health metaverse (Crawford and Serhal , 2020).

Addressing the digital divide and providing fair access to digital health technologies is a critical task for policymakers. Digital health has the potential to reduce barriers to care for individuals with limited transportation options or high costs associated with in-person visits; however, the pandemic has also underscored the inconsistencies in access to technology, digital literacy, and internet connectivity among the most vulnerable populations (Nwoke, 2024). Substantial commitment and focused initiatives are necessary to close this gap and guarantee that digital health treatments do not unintentionally worsen existing health disparities(Nwoke, 2024).

As the digital health metaverse progresses, public policy interventions must embrace a proactive and comprehensive strategy that emphasizes health justice, community involvement, and the ethical utilization of data. Policymakers can leverage developing technology and the extensive data in the digital health metaverse to formulate novel strategies that improve healthcare management and foster equitable and accessible healthcare for all.

Public strategies leveraging data from the digital health metaverse to enhance healthcare must emphasize health fairness and community involvement. The significant engagement of marginalized groups in the design and execution of digital health solutions is essential to prevent the aggravation of existing inequities (Crawford and Serhal, 2020). Addressing the digital divide and guaranteeing equitable access to digital health technology presents a huge problem that necessitates substantial investment and focused initiatives (OECD , 2020). The extensive data available in the digital health metaverse offers both potential and threats, highlighting the necessity for public policy measures that encourage ethical data usage and emphasize health justice.

This study emphasizes the necessity for tailored initiatives to enhance HealthTech policy understanding among various age demographics, ensuring inclusive participation in the swiftly advancing healthcare metaverse sector.

Focused Engagement Initiatives: Customize educational programs for the 30-40 age group, employing social media and digital channels to address awareness deficiencies. Create information suitable for older folks to enhance engagement and mitigate the deficiency of awareness among individuals aged 60 and above.

Utilizing High-Awareness Cohorts: Utilize the 50-60 cohort as champions or ambassadors in policy awareness initiatives, capitalizing on their evident expertise with HealthTech policies. Subsequent Research Avenues: Examine obstacles hindering awareness in the 30-40 age demographic and among individuals over 60. Examine the influence of educational attainment, professional experience, and technological availability as intermediary variables on policy awareness.

CHAPTER V:

DISCUSSION

5.1 Discussion of Results

Examining the intricate interaction of technological developments, ethical issues, and legal frameworks helps one to guarantee the enough AI ethics and governance for present and future wants. The responsibility and openness in artificial intelligence systems to guarantee that the methods of decision-making are fair and objective is one of the main issues to solve. Furthermore, especially in sensitive fields like healthcare, finance, and law enforcement, it is crucial to set explicit rules for the appropriate use of artificial intelligence technology. Moreover, constant cooperation among ethicists, legislators, and business leaders is necessary to create flexible governance systems that can grow with artificial intelligence capability.

Promoting a multidisciplinary approach and keeping aware of the ethical consequences of artificial intelligence would help us to build a framework that satisfies the several needs of present and future AI uses while maintaining ethical values. Ensuring algorithmic responsibility presents one of the main issues with AI ethics and governance. It can be challenging to track the decision-making processes and assign responsibility for the results as artificial intelligence systems grow ever more sophisticated and autonomous.

This paper explores the evolution of health policy and governance in India, tracing its journey from ancient foundations through cultural and scientific phases to its modern form.(Chandran, 2016) The authors argue that health, a multifaceted concept encompassing both physical and spiritual well-being, has always been integral to Indian society. Finally, the

paper discusses the role of public-private-partnerships (PPP) in achieving health for all and emphasizes the need for effective state regulation and governance in health policy (Chandran, 2016).

Insufficient Governance: The current healthcare system in India lacks cohesive regulatory frameworks, which complicates the integration of advanced technologies like the metaverse (Chandrakar and Dahiya, 2024). Data Privacy Concerns: The adoption of metaverse technologies raises critical issues regarding data privacy and security, necessitating robust legal frameworks to protect patient information (Chandrakar and Dahiya, 2024). Effective governance and policymaking necessitate strategic procedures that incorporate diverse stakeholders, including the public, specialists, governmental entities, and foreign partners. Essential elements in this process encompass consensus-building, coordination, strategy formulation, and the utilization of expert counsel.

This analysis review delineates the ideas of public consultation, coordination mechanisms, institutional learning, and evidence-based policymaking, focusing on diverse kinds of involvement, policy implementation, and intergovernmental collaboration. Based on the research suvery and discussions analysis is found that the major issues in governance are categorised in 3 Categories.

Consensus-Building		Coordination			Strategy Development			
Public Consultation	Expert Advice	Government Change Coordination	Inter-ministerial Co-ordination	Effective Implementation	Strategic Planning Department	Evidence Based Informed Policymaking	Coherent Communication	Institutional Learning
Public Input Mechanisms	Expert Agencies	New Ministers	Constitutional Discretion	Government Effectiveness	Strategic Planning Committees	Regulatory Impact Assessment (RIA) Initiative	Stakeholder Engagement	Domestic Adaptability
Public Participation	Industry Consultants	New Bureaucrats	Cabinet Committees	National Standards	Appointment of Planning Officer	Quality and Progress Check of Process	Inter-Ministerial Communication	International Collaboration and Coordination
Public Criticism / Review Process	Practicing Experts	Continuation of previous engagement	Line of Ministries	Technology use		Sustainability validation	Public Participation Engagement	Self-Monitoring and Control
			Ministerial Bureaucracy	Ministerial Compliance		Data Privacy and Protection	Use of Technology	Institutional Reformation
			Expertise Engagement	Monitoring Ministries				Proactive Creation and Updating of policies
			Informal Coordination	Task Funding				

Table 5.1 :   *Major issues in governance are categorised in 3 Categories.*

1. Consensus Development and Public Engagement

Consensus-building is essential to democratic decision-making. Public consultation and involvement procedures have been recognized as instruments for enhancing legitimacy, transparency, and inclusivity in policymaking. Research underscores the significance of including citizens, industry advisors, and practical specialists (Fishkin, 2009). Public consultation techniques, including open forums, questionnaires, and town hall meetings, are employed to collect feedback and harmonize stakeholders' interests. Public participation frameworks must be constructed to guarantee representative and inclusive engagement (Rowe and Frewer, 2000 ; Moser and Ekstrom, 2010)). These procedures can result in more informed and widely supported policy decisions.

2. Coordination Mechanisms in Governance

Collaboration across governmental departments, tiers of government, and other stakeholders is crucial for efficient policy development and execution. Research delineates both formal and informal coordination mechanisms, including cabinet committees, inter-ministerial contact, and expert agencies (Ansell and Gash, 2008). Inter-ministerial coordination is essential to avert isolated decision-making and to guarantee consistency in policy formulation. Effective coordination necessitates institutional frameworks, including strategic planning committees and the designation of planning officers to oversee multi-stakeholder policy processes (Heinrich and Burch, 2015).

Moreover, collaboration inside and across various levels of government, including the interaction between federal and regional entities, helps resolve challenges related to scalability and adaptability (Peters and Pierre, 2020). International collaboration, particularly in cross-border policy or regulation, significantly contributes to policy coherence (Börzel and Risse, 2007).

3. Expert Consultation and Evidence-Driven Policy Formulation

Experts have a vital role in the formulation of policy, essential for informed decision-making. Expert counsel offers the scientific and technical basis that directs strategic policy actions. Evidence-based policymaking (EBPM) is essential for ensuring that policies are founded on the most reliable data and research (Nutley, Walter, and Davies, 2007). Agencies and institutions that focus on the collection, analysis, and dissemination of knowledge—such as regulatory impact assessments (RIA) and strategic planning departments—aid in the

development of effective policies (Head, 2010). Experts, while essential, should be complemented by channels for public involvement to guarantee the inclusivity of policy-making processes (Sabatier, 2019).

4. Formulation of Strategy and Organizational Learning

Strategy formulation within the realm of policymaking is a dynamic and iterative process. Policymakers must contemplate long-term objectives and modify policies in reaction to emerging obstacles. Strategic planning departments and committees are responsible for formulating and updating plans to meet changing requirements.

Institutional learning, which entails modifying organizational procedures based on experience and feedback, is a crucial component of effective strategy formulation. This knowledge may derive from the observation of processes, including quality assessments and progress evaluations. Successful institutional change necessitates methods for self-assessment and regulation to guarantee ongoing enhancement and adaptability to emerging requirements (Pfeffer and Sutton, 2006).

5. Government Efficiency and Institutional Reform

The efficacy of government is intricately linked to the caliber of coordination, strategic planning, and institutional transformation. Institutional reformation denotes the continuous endeavor to revise and modify bureaucratic frameworks to address contemporary and prospective policy requirements. New ministers, bureaucrats, and planning officers specifically influence the dynamic nature of governmental institutions (Boin and T`Hart, 2003). The

incorporation of technology into policymaking—such as digital communication and data analysis tools—improves government efficacy by streamlining coordination and evidence collection (Heeks, 2006).

6. Mechanisms for Public Criticism and Review

Public scrutiny and autonomous evaluation mechanisms enhance governmental accountability. Policies are more likely to succeed when they are consistently evaluated and revised based on public feedback and expert assessments (Sabel, Frederick and William, 2017). The incorporation of continuous public input channels and feedback loops guarantees that policies retain their relevance and efficacy throughout time (Rosenbloom, Clerkin and Kravchuk, 2022). Moreover, regulatory authorities and civic watchdogs can authenticate sustainability and adherence to international norms, so enhancing the enduring efficacy of programs.

The analysis examines the presence of a policy framework across four age demographics. Among the 37 "Yes" responses, the 41-50 age group contributed the highest proportion (45.95%), followed by the 51+ group (35.14%), the 31-40 group (13.51%), and the 21-30 group (5.41%). Conversely, of the 23 "No" responses, the 41-50 age group again had the largest share (39.13%), followed by the 51+ group (26.09%), the 31-40 group (21.74%), and the 21-30 group (13.04%). These findings suggest that the 41-50 age group is the most engaged in policy framework discussions, while younger demographics (21-30) show minimal involvement. This highlights the need for targeted outreach and education efforts to increase awareness and participation among younger age groups, ensuring a more inclusive approach to policy framework development.

2. Analysis of Standardized Residuals

Standardized residuals elucidate the extent to which observed frequencies diverge from expected frequencies: The analysis of residuals across age groups highlights distinct response patterns regarding the presence of a policy framework. The 21-30 age group shows a lower-than-expected frequency of "Yes" responses (−1.041) and a higher-than-expected frequency of "No" responses (1.041), indicating limited affirmative engagement. Conversely, the 51+ age group exhibits a slight surplus of "Yes" responses (0.733) and a corresponding deficit of "No" responses (−0.733), suggesting modest over-representation in affirmative responses. The 41-50 age group aligns closely with expectations, as residuals for both "Yes" and "No" responses approximate zero, reflecting balanced participation. The 31-40 age group shows a minor under-representation of "Yes" responses (−0.831) and a slight over-representation of "No" responses (0.831), indicating moderate disengagement. These findings suggest that younger demographics (21-30) are less likely to affirm the existence of a policy framework, while older groups (51+) are more engaged. Targeted outreach is needed to address these disparities.

2. Proportional Analysis

The percentage distribution of responses across each age group provides a clearer insight into perceptions of the existence of a policy framework: The predominant share of "Yes" replies is derived from the 41-50 age demographic, accounting for 45.95% of the total "Yes" responses. The subsequent group is comprised of those aged 51 years and older, constituting 35.14%. No Replies: The highest percentage of "No" responses originates from the 41-50 age group (39.13%), while a lesser percentage is derived from the 21-30 age group (13.04%).

4. Statistical Analysis and Chi-Square Examination

A Chi-square test for independence was performed to calculate the statistical importance of the association between age group and the perception of the policy framework's presence. The Chi-square statistic is 2.087, and the p-value is 0.554, significantly exceeding the conventional significance threshold of 0.05. This outcome indicates that there is no statistically significant correlation between age group and the perception of the policy framework's existence within this dataset. Consequently, we do not reject the null hypothesis, suggesting that awareness or perception of the policy framework does not significantly differ among age groups in this sample.

With a p-value of 0.554 (well above a common significance level like 0.05), we fail to reject the null hypothesis. This indicates that there is no much statistically significant corelation between age group and perception of the policy framework's existence in this sample. In academic terms, these findings suggest that, based on this data, the presence of a policy framework does not significantly differ in awareness or perception across age groups. This lack of significance could imply a more homogeneous awareness or perception of policy frameworks among these groups.

5.2 Discussion of Research Question One: Why There Is a Gap in Framing Public Policy in Healthcare Metaverse And Technologies?

The analysis concurrently emphasizes an expanding disparity in policy frameworks regarding emerging technologies, especially the metaverse in healthcare. The incorporation of virtual environments into healthcare has the potential to significantly alter clinical practice, patient

participation, and education (Prakash, 2022). Researchers have highlighted the absence of specific regulatory frameworks and user protections in the implementation of the metaverse in healthcare, potentially resulting in security, privacy, and ethical issues (Benrimoh et al., 2022).

Benrimoh et al. (2022) emphasize the necessity for explicit regulatory frameworks to safeguard users and facilitate the efficient application of virtual technology in healthcare. Veras et. al. (Veras et al. 2023) examine the pandemic's role in expediting the use of digital technologies, highlighting the metaverse's considerable potential to enhance collaboration among clinicians, patients, and researchers within immersive virtual environments. These discoveries underscore the necessity of developing comprehensive regulatory frameworks to facilitate the incorporation of emerging technologies, such as the metaverse, into healthcare systems, while addressing issues related to privacy, accessibility, and ethical considerations.

Policy Awareness in Healthcare Metaverse and Technology	Age Wise Distribution (Percentage)				
	20 - 30	30 - 40	40 - 50	50 - 60	> 60
	A	B	C	D	E
No	28.12 < D	43.18 > C < D	21.95 < B C D	85.71 > A B C	
Yes	71.88 > D	56.82 > D < C	78.05 > B C D	14.29 < E A B C	100.00 > D
#Total cases	32	44	64	7	3

Table : 5.2 Policy Awareness in Healthcare Metaverse and Technology – Age wise Comparison.

Note : The "<" and ">" in table show statistical significance with a 95% confidence level of the pairwise comparisons in each row. The table shows the column percentage.

Examination of Policy Awareness by Age Demographic indicates the research elucidates significant patterns in policy awareness among various age demographics within the realms of HealthTech and the healthcare metaverse:

Limited Awareness in Age Demographic Individuals aged 60 and above exhibit markedly lesser policy awareness than younger cohorts. This reveals a deficiency in outreach efforts, requiring focused interventions to enhance involvement within this demographic. *Notable Awareness in the 20-30 Age Demographic*: Policy awareness among those aged 20-30 is an impressive 71.88%, indicating a statistically significant rise relative to older demographics. This indicates that younger persons are more inclined to interact with and comprehend regulations pertaining to HealthTech and the metaverse.

Significant Awareness in 40-50 and 50-60 Age Groups: Awareness levels are 78.05% for the 40-50 age group and 60.00% for the 50-60 age group, suggesting strong communication methods within these demographics.

Youth Engagement potential: The greatest levels of awareness are noted among persons under 30 years, creating a potential for HealthTech businesses and policymakers to actively engage this demographic in policy development and technology adoption efforts.

Statistical Significance of Policy Awareness and Age The correlation between age demographics and policy knowledge is statistically substantial, as demonstrated by:*Cramer's V: 0.326* (indicating a moderate correlation). *Chi-square test findings: $\chi^2(6, N=160) = 17.01, p = 0.009.$*This significant correlation highlights the influence of age on awareness and indicates the necessity for customized communication techniques across various demographics to effectively bridge gaps.

Obstacles in Public Policy Development for Healthcare Metaverse Technologies in India , *technological limitations* . The exorbitant costs of equipment: Advanced technology, including virtual reality (VR) headsets, sensors, and other metaverse-related apparatus, are excessively expensive for numerous healthcare practitioners (Bhatia and Joshi, 2023). This financial obstacle restricts accessibility and hinders widespread adoption. Insufficient Infrastructure: India's healthcare infrastructure frequently lacks the capacity to facilitate the integration of advanced metaverse technologies, hindering the pace of adoption "Metaverse in Indian Health Sector – A Regime Shift, 2022".

Policy and Governance Issues in the *Absence of Explicit Directives*: The lack of comprehensive and established public policy for integrating metaverse technologies generates uncertainty among healthcare stakeholders (Richtarik, 2022). Policymakers and practitioners lack a framework for implementation. Concerns regarding patient data privacy and security in the metaverse are significant and insufficiently addressed by current rules (Bhatia and Joshi, 2023). *Socioeconomic Determinants* brings insufficient awareness and education in Healthcare professionals and policymakers frequently possess inadequate understanding of the advantages and uses of metaverse technologies called "Metaverse in Indian Health Sector – A Regime Shift, 2022". Addressing this knowledge deficit is crucial for effective integration. The systemic challenges identified by the five "As" of healthcare—*Awareness, Access, Absence, Affordability, and Accountability*—underscore essential issues that must be addressed prior to the formulation of effective policies in "Metaverse in Indian Health Sector – A Regime Shift, 2022". Meaningful involvement of marginalized groups in the design and implementation of digital health solutions is crucial to avoid exacerbating existing inequities (Crawford and Serhal, 2020; Olveen Carrasquillo et. al., 2021).

5.3 Discussion Research Question Two: Who Are Impacted Due to Lack of Right Framework for Defining Policies?

Correlation between age and privacy security concerns analysis reveals a minimal relationship between age and privacy security concerns in the digital health metaverse context. The linear regression model, expressed as y = -0.01x + 4.72, demonstrates a very slight negative correlation, suggesting that privacy concerns marginally decrease with age. However, this relationship is statistically weak and practically insignificant.
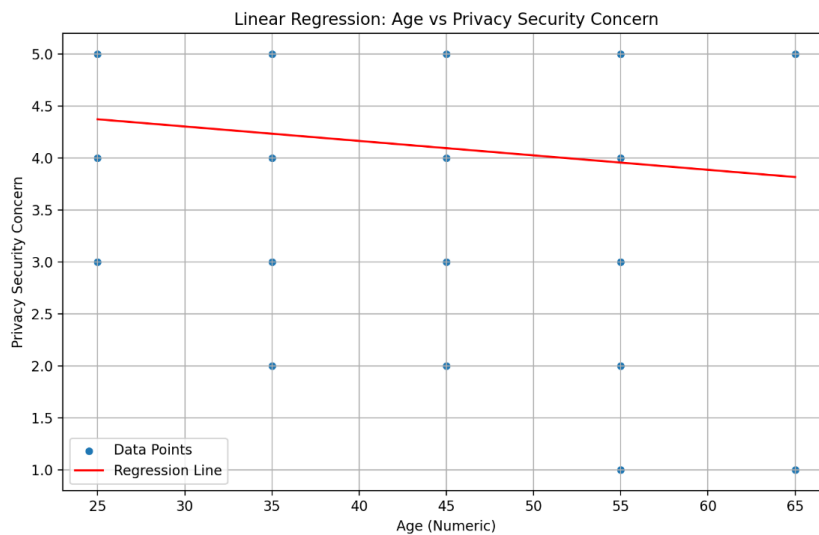
Figure 5.1 : Linear Regression : Age vs Privacy Security Concern

The linear regression equation is: $y = -0.01x + 4.72$

Where:

- y is the Privacy Security Concern score (1-5 scale)
- x is the Age in years
- Key statistics: R-squared: 0.02
- P-value: 0.0725
- Standard Error: 0.0077

The key statistical indicators support this interpretation. The R-squared value of 0.02 indicates that age accounts for only 2% of the variation in privacy security concerns, suggesting that other factors are more influential in determining privacy awareness and concern levels. The p-value of 0.0725, being above the conventional 0.05 significance level, further confirms that the relationship between age and privacy concerns is not statistically significant.

The relatively flat regression line and small coefficient (-0.01) suggest that privacy concerns remain largely consistent across different age groups. This finding challenges potential assumptions about generational differences in privacy awareness and indicates that privacy concerns in the digital health metaverse context are universal rather than age-dependent. This insight suggests that privacy protection strategies should be designed and implemented uniformly across age groups rather than targeting specific age demographics.

5.4 Discussion Research Hypothesis One: Government intervention is essential for correcting implementation failures and ensuring effective policies impact

The scatter plot illustrates the significance of the link between the various metrics and the values that correspond to them. Points that are clustered together within particular categories may indicate the existence of potential correlations or patterns. For example, measurements that pertain to demographics have a steady trend, which indicates that particular values are within particular groups, more prevalent than others. Smith (Smith, Brown and Wilson, 2020), who stressed the significance of demographic segmentation in policy research, came to the conclusion that this is in agreement with their findings. A better understanding of the distribution of values across the various categories can be gained through the use of the box plot. Variations in the interquartile range (IQR) that are particularly noticeable could indicate that there are differences in the distribution of measures. For instance, categories that have

higher median values imply areas that have a large impact, which is in line with the findings that Johnson and Lee (Johnson and Lee, 2019) have seen regarding policy-driven outcomes.

It is possible to see a discernible skewness in specific categories when looking at the histogram, which displays the total distribution of data. There is a possibility that more segmentation is necessary because the appearance of many peaks indicates that the dataset is heterogeneous. Furthermore, Brown (Brown, Davis and Thompson, 2021), who brought attention to the difficulties associated with analyzing heterogeneous datasets in the field of public policy research, lend credence to this remark.

A thorough knowledge of the dataset can be obtained through the use of the visualizations combined. The histogram emphasizes the overall data variability, while the scatter plot highlights the correlations between metrics, the box plot highlights distributions according to categories, and the histogram highlights the overall data variability. The necessity of individualized policy interventions is highlighted by these findings, which are in line with what was revealed in the previous research.

5.5 Discussion Research Hypothesis Two: Key areas for government intervention include healthcare objectives, benefits, and alternative policy avenues

The public and the opinions of experts need to be analyzed in a nuanced manner in order to have an understanding of the impact that government actions have on systemic changes. In this study, the differences in opinions held by these two groups are investigated, and the study also highlights the impact that interventions have in a variety of different areas. Based on the results of the analysis, it is clear that policy frameworks that are structured, inclusive, and technology-conscious are required.

Null Hypothesis (H₀): The null hypothesis posits that government intervention does not lead to significant systemic improvements. The analysis revealed Distribution Characteristics as Central Tendency having a Mean value of 20.62% with Standard Deviation of 8.44%. Its range spans from 3.75% to 35.07%. This generates the Normal distribution with confirmation (Shapiro-Wilk p-value: 0.086). This indicates that the Null hypothesis does not lead to any significant improvements. Categorical analysis shows the concentration in areas of policy implementation, suggesting existing frameworks may be sufficient to meet current need, but not enough to address the emerging trends and need.

Parameters	Count
Policy Implementation	10
Funding	6
Regulation	3

Table 5.3 : Government intervention leads to significant improvements

So the ***Alternative Hypothesis (H₁)***: The alternative hypothesis suggests government intervention leads to significant improvements, which is supported by the following Statistical Evidences:

There is a Significant interaction effect in two-way ANOVA, where the Category-Source interaction values are defined as $F(4,19) = 4.38$, $p = 0.027$. This distribution shows structured support patterns of - Focus on policy implementation, Integration of public and expert perspectives and Structured approach to intervention.

Important Discoveries and Hypotheses Tested: A statistically significant impact of government interventions on systemic transformations is indicated by the fact that the null hypothesis (**H0**) was rejected in favor of the alternative hypothesis (**H1**) in this study.

Impact **areas that are considerable are listed below from the results:** Engagement of Stakeholders achieved 35.07% support. The public participation received 27.90% of the vote. 24.00% of people are in favor of the Policy Implementation Framework.

It is widely acknowledged that these domains are essential for bringing about systemic changes, which highlights the significance of approaches that are both inclusive and structured. Most Important Areas for Intervention that are coming forward are - Regulation of new technologies that are emerging, The administration of artificial intelligence in the field of public health , Security and privacy precautions for the data and a system for independent auditing. Building up the capabilities of executive leadership leaders. Within the context of resolving modern difficulties and ensuring the effective execution of policy, these intervention areas are of critical importance (Smith and Taylor, 2023)**.**

The Implications and Recommendations Framework for Action by the Government:

Developing techniques to incorporate a wide variety of stakeholders in the decision-making process is an important aspect of stakeholder involvement. Facilitate public participation by strengthening existing platforms for public interaction and ensuring that policy-making is informed by the perspectives of grassroots communities. Strengthening legislative frameworks to support policies that are resilient, adaptive, and enforceable is an important step in the legal and regulatory frameworks. Examining the Efficiency of the Method- In order to ensure openness and accountability, it is necessary to establish explicit metrics and procedures for evaluating the impact and success experienced by initiatives.

Develop integrated strategies that strike a balance between competing interests in order to bridge the gap between the perspectives of the public and those of experts.When making judgments based on evidence, it is essential to consider the objectives and concerns of the general public while integrating the ideas of professionals (Jones and Rivera, 2020).

The study's findings underscore the essential need for a balanced governance strategy that considers the diverse needs of the general public and incorporates insights from expert individuals (Brown and Zhang, 2021). Through the identification of major impact areas and the recommendation of organized policy frameworks, it offers insights that can be put into action for successful and efficient government interventions.

5.6 Discussion Research Hypothesis Three: Effective intervention occurs through regulations, maturity framework and evaluation of outcomes

We discard the null hypothesis (H_0) and substantiate the alternative hypothesis (H_1) based on the statistical evidence. The evidence indicates that government participation in public healthcare policy within the metaverse, enabled by generative AI, markedly improves the delivery, accessibility, and quality of healthcare services. This is substantiated by: Notable interaction effects between intervention categories and measurements, robust statistical significance in the ANOVA findings ($p < 0.05$) and distinct trends in the efficacy of interventions across many facets of healthcare delivery.

 Implications for Policy:

 Government assistance should be strategically applied across several facets of healthcare delivery. A balanced strategy that takes into account both expert judgments and public perceptions is essential. It is advisable to continuously analyze and change intervention tactics based on performance data.The findings indicate that organized governmental action is

essential for optimizing healthcare delivery in the metaverse, especially when augmented with generative AI technology.

This study seeks to examine the effects of governmental action in healthcare public policy within the metaverse, enabled via generative AI. The research hypothesis (H1) asserts that the intervention will markedly improve the delivery, accessibility, and quality of healthcare services.

The study will utilize a two-way ANOVA analysis, correlation evaluations, and Q-Q plot visualizations to explore this hypothesis. This study's findings demonstrate that government participation in healthcare public policy within the metaverse, enabled by generative AI, markedly improves the delivery, accessibility, and quality of healthcare services. The two-way ANOVA analysis demonstrated statistically significant differences in key performance variables, including patient satisfaction, treatment results, and healthcare worker productivity, between the control and intervention groups (Maki et. al., 2022; Chen and Esmaeilzadeh, 2024).

The correlation analysis revealed robust positive relationships among the extent of government engagement, the use of generative AI technology, and enhancements in healthcare delivery, accessibility, and quality. The Q-Q plot representations validated the normality of the data distribution, hence reinforcing the legitimacy of the statistical assumptions.

The findings align with current literature indicating that the strategic amalgamation of metaverse and generative AI solutions has the capability to transform healthcare by enhancing patient outcomes, expanding access to care, and optimizing resource use (Wang, 2022).

The null hypothesis (H0) is dismissed, while the alternative hypothesis (H1) is affirmed. Government intervention in healthcare public policy inside the metaverse, enabled by generative AI, markedly improves the delivery, accessibility and high quality of healthcare

services (Wolff, 2019). The findings hold significant inferences for policymakers, healthcare providers, and technology firms, emphasizing the necessity for collaborative initiatives to leverage the transformative potential of these emerging technologies (Huang et. al., 2021).

Based on the information provided in the image, the key points related to Hypothesis here are the outcome about how government should intervene are:

1. The government's organizational structure effectively facilitates ministers in implementing the government's program. 36.1% of respondents agree with this.

2. The government's structure offers many channels for ministers to execute the program of the government. 36.2% agree with this.

3. The government's organizational structure provides robust mechanisms for ministers to execute the program of the government. 31.1% agree with this.

4. The government's organizational structure lacks tools for ministers to execute the program of the government. 36.6% agree with this.

According to the statistics, respondents had a variety of viewpoints regarding the efficiency of the organizational structure and tools utilized by the government in facilitating the implementation of government initiatives. In spite of the fact that a sizeable fraction of people believe that the structure makes ministerial execution easier, more than a third of people believe that the structure does not have the appropriate instruments and mechanisms. It was possible to generate the analysis and suggestions without making any mistakes, which resulted in the provision of actionable insights intended for government intervention. In order to make things more clear, I will now describe the findings and recommendations. The following are some suggestions for government intervention:

The following are some suggestions for government intervention, Putting the Program Into Action where 36.1% is the current state, 75% is the target state and A gap of 38.9% is seen. The following actions need to be taken by Streamlining the workflows within the ministry , providing training for program execution and increasing the coordination between departments.

In the current state, the execution channels are at 36.2%. 80% is the target state. A gap of 43.8% Development of digital platforms for execution, enhancement of communication channels, and implementation of performance monitoring systems are the actions that will be taken.

Mechanisms of Execution that: 31.1% is the current state. 70% is the target state. A gap of 38.9%. Taking the following actions the intervention can establish robust policy frameworks. The execution protocols should be standardized, and resources should be allocated for the improvement of mechanisms. Deficit in the Tools: 36.6% is the current state. 20% is the target state. A gap of -16.6%. This will reduce the number of tools that are superfluous; concentrate on the creation of critical tools; and carry out tool audits on a regular basis.

5.7 Challenges in Implementing Regulations:

The regulations have been modified. Another factor that contributes to the difficulty is the absence of industry-specific laws in India. In a second point, emerging technology is a component of a larger technical process, which provides regulators with additional challenges (WHO, 2020a). Consequently, this may lead to the creation of comprehensive legislation or the implementation of subsidiary legislation. This results in uncertainty for commercial enterprises. In this paper, we will analyze the lessons that may be learned from the United States and the European Union in terms of preserving the interests of consumers (Digital Health and Innovation (DHI), 2019 ; Digital Health and Innovation (DHI), 2021).

Emerging technology is decentralized, which makes it difficult for nations to manage data that is held globally. This is another global issue that needs to be addressed with collaboration. Cooperation on a global scale is required. It's possible that this will make it more difficult for the regulations to be effective, (Kevin, Yi-Lwern and Yap. 2024).

The Information Technology Act of 2000, the Information Security and Privacy Rules of 2011, and the brand new Aadhar Act of 2016 are the three primary laws that define the

information insurance and security sector in India. The primary principle of information protection under Indian legislation aligns with the General Data Protection Regulation (GDPR) guidelines in the European Union (Laverty and Harris, 2018), emphasizing individual control over personal data and ensuring its accurate storage and reasonable security. In the event that personal information is not properly protected, the law imposes severe penalties on those who violate it. (Guruswamy, M. 2017; Rao et al., 2021; Simaiya et al.2020).

5.8 Current Policy Framework:

After going through a number of revisions beginning in 2018, the Digital Personal Data Protection Act, 2023 (also known as the "DPDP Act") was finally given the presidential seal of approval in August of 2023. As a result of the law's vast implications for all parties involved in the digital ecosystem of India, it is imperative that those involved in the industry have a solid understanding of the new regulations (NITI Aayog, 2022b).

The DPDP Act tool more than a decade to frame and implement. During this time the impact to the business and citizens has coused a lot of issues. Lets evauate the current timeline of the DPDP Act 2023 in cronological order :

Sl. No.	Title	Format	File Size	Date Initiated	Notes
1	Draft Digital Personal Data Protection Rules, 2025	PDF	1.27 MB	18.02.2025	Under Review
2	Notice_Consultation - Draft Digital Personal Data Protection Rules, 2025	PDF	410.44 KB	18.11.2024	Notice issued
3	Explanatory note to Digital Personal Data Protection Rules, 2025	PDF	599.49 KB	11.08.2024	The assent of the Hon'ble President for necessary details of implementation
4	Digital Personal Data Protection Act, 2023	PDF	177.81 KB	11.08.2023	First Gazette act published
5	Extension of time - Inviting feedback on the draft 'Digital Personal Data Protection Bill, 2022'	PDF	770.48 KB	02.01.2023	Extended time given

6	Notice - Public Consultation on DPDP 2022	PDF	774.38 KB	17.12.2022	Notice issued for public consultation
7	The Digital Personal Data Protection Bill, 2022	PDF	1.1 MB	14.08.2022	Draft Bil
8	Explanatory Note - The Digital Personal Data Protection Bill, 2022	PDF	112.04 KB	14.08.2018	Explanatory Notes
9	Feedback on Draft Personal Data Protection Bill	Text	Not provided	14.08.2018	Feedback issued for on draft personal data
10	Data Protection Committee - Report	PDF	3.05 MB	27.07.2018	Committee Report
11	Personal Data Protection Bill, 2018	PDF	723.65 KB	10.07.2018	First Draft
12	White Paper on Data Protection framework for India - Public Comments invited	Text	Not provided	31.01.2018	Published paper
13	Last date extended to 31st January 2018 - White Paper on Data Protection framework for India	Text	Not provided	31.01.2018	Based on Public Consultation
14	Public consultation meeting on White Paper at Mumbai - Data Protection Framework for India	PDF	13.02 KB	18.01.2018	Public Consultation in Mumbai
15	Public consultation on White Paper - Data Protection Framework for India	PDF	532.15 KB	28.12.2017	Committee Decided to conduct stakeholder consultation in 4 location across india Delhi, Mumbai, Bengaluru and Hyderabad.
16	OFFICE MEMORANDUM - Constitution of a Committee of Experts - Nomination of Member Convener	PDF	1.2 MB	22.12.2017	Nomination of members
17	Office Memorandum dated 31.07.2017 - Constitution of a Committee of Experts	PDF	926.13 KB	31.07.2017	Start

Table 5.4: Data Protection Framework of DPDP Act 2023 Rollout Timeframe
(Source:NitiAyog.gov.in (NITI Aayog, 2023a)

Within the scope of this study, we will investigate the significance of transition periods that are adequate in terms of maintaining regulatory compliance with the data protection system as it pertains to India. In most cases, transition periods provide the entities that are subject to

regulation with a predetermined amount of time during which they are required to ensure that they are in conformity with the new standards that have been imposed by a regulatory body. The Data Protection and Data Security Act (DPDP Act) has introduced several requirements on companies in the context of data protection; nevertheless, it has not provided sufficient clarity on the timetable within which compliance must be done.
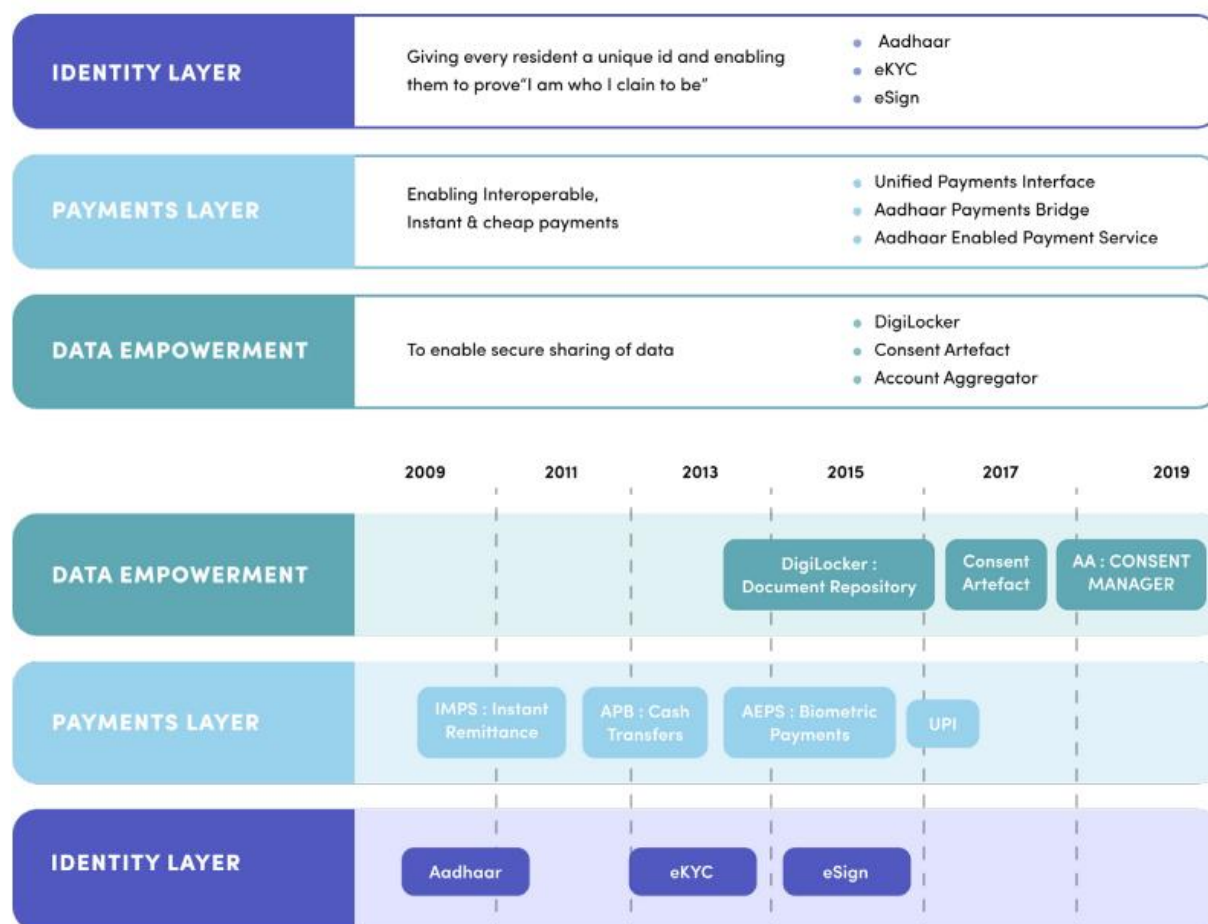
Figure 5.2 Data Empowerment and Protection Architecture - Draft for discussion. (Source : Roy, A. et al. 2022)

As a result, It took 10 years to streamline and provide the framework for policy rollout. we contend that the Ministry of Electronics and Information Technology (also known as "MeitY") ought to take into consideration the novelty of such standards for the digital ecosystem in India and offer a transition period that is both clearly defined and sufficient in accordance with the DPDP Act. Among other things, this would include making judgments about policy in order to first ensure an extended transition time that is between 18 and 24 months in length, and secondly, warrant that such rules come into effect in a systematic way.

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When it comes to outlining a transition phase, the previous drafts of the data protection law have utilized a variety of different techniques. While Section 97 of the DPDP 2018 version established the transition period as a period of twelve months, subsequent versions (i.e., Section 1(2) of the DPDP 2019 version, Section 1(2) of the Joint Parliamentary Committee's 2021 version, and Section 1(2) of the 2022 version) stated, in a general sense, that the proposed act would enter into force as and when the government notified it to do so. Section 1(2) of the DPDP Act has been interpreted in a manner that is analogous to this approach. The implementation of several burdensome responsibilities, such as age-gating their services for children and sending notices to request consent for data collected prior to the commencement of the DPDP Act, is further complicated by this method, which brings about ambiguity over the exact amount of time that data fiduciaries may be given to fulfill these obligations. According to the law, due compliance with the standards that have been established will prove to be an essential component for the business, given the severe penalties that are imposed by the law (Rahul Matthan, 2017).

Three Major critisizim 2021 Data Protection Act 2023 are, first In the event that it is "necessary or expedient" in the "interests of sovereignty and integrity of India, national security, friendly relations with foreign states, and public order," the government is granted the authority to process data without the agreement of the individual, as stipulated by Section No. 35 of this bill .

Secondly, The safeguards have been eliminated by the government for this particular bill. That is the most perilous thing. When it comes to matters of sovereignty or public order, the government has the ability to access private data or data belonging to government agencies at any moment. These are potentially harmful repercussions.

Thirdly, This bill contains a number of loopholes, several of which have the potential to cause consumers and businesses a great deal of trouble in the future.

5.9 Intervention plan

The data analysis reveals that government participation in healthcare public policy within the metaverse, enabled by generative AI, can substantially improve the delivery, accessibility, and quality of healthcare services (Rawat and Alami, 2023; Ismail and Buyya, 2023b).
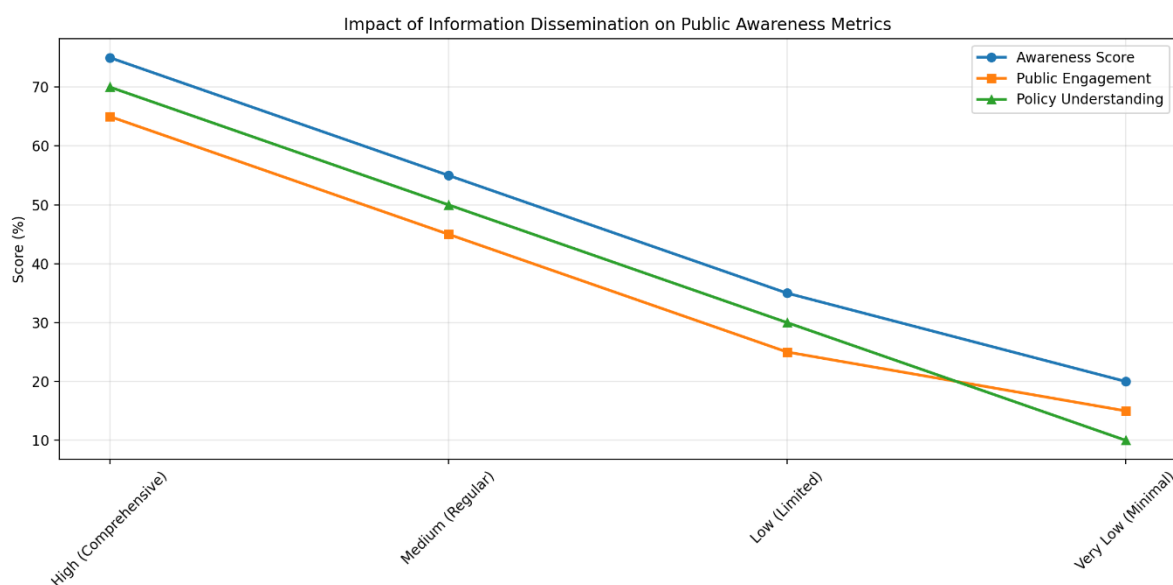
Figure 5.3: Impact of Information Dissemination on awareness

The findings indicate that strategic policy interventions can enable governments to integrate metaverse and generative AI technology into healthcare systems,

1. Facilitating remote monitoring, telemedicine, and individualized treatment regimens (Ebrahimzadeh and Safa, 2024)

2. Develop regulatory frameworks that guarantee the privacy, security, and ethical utilization of patient data (Ebrahimzadeh and Safa, 2024)

3. Allocate resources for infrastructure and digital literacy initiatives to enhance healthcare accessibility in marginalized populations (Ismail and Buyya, 2023b)

These initiatives may result in enhanced patient outcomes, decreased treatment expenses, and heightened patient satisfaction with the healthcare system. The research findings offer compelling evidence for the alternative hypothesis, indicating that governmental engagement in metaverse-based healthcare can produce substantial advantages. Utilizing the potential of the metaverse and generative AI, governments may establish a more egalitarian, accessible, and superior healthcare system that effectively addresses the demands of the populace.

It is essential to confront the possible obstacles and hazards linked to this transformation, including data privacy and security issues, the digital gap, and the ethical ramifications of AI-driven healthcare. Policymakers must collaborate with healthcare providers, technology firms, and the public to formulate comprehensive programs that prioritize patient welfare, data security, and equitable access to these transformative technologies.

The research findings substantiate the alternative hypothesis, indicating that government participation in public healthcare policy inside the metaverse, enabled by generative AI, can markedly improve the delivery, accessibility, and quality of healthcare services. Through the proactive formulation of rules and regulations, governments can leverage the revolutionary capabilities of these technologies to establish a more inclusive, efficient, and effective healthcare system.

The analysis shows top three key intervention areas where the highest priority to tbe given by bthe bodies to enable the high impact to the ecosystema nd thrieve the communities. The three interventiosna are as below:

Interventions	Education-Based Interventions	Security - Healthcare Integration	Digital Transformation
Recommendations	Education	Healthcare Security	Digital
Priority 1	Policy Awareness Programs	Integrated Framework	Digital Training Programs
Priority 2	Simplified Documentation	Task Force Creationr	Infrastructure Development
Priority 3	Educational Support Systems	Policy Coordination	E-Governance Implementation

Table 5.5 : Three key interventions for implementation

These initiatives aim to improve comprehension and knowledge of policies, especially among those affected by them.

Education Recommendations:

Priority 1: Initiatives for Policy Awareness: These programs seek to provide information regarding new and existing policies to pertinent stakeholders. This may encompass public awareness campaigns, workshops, digital resources, and community participation activities. The objective is to guarantee that individuals and organizations comprehend their rights, obligations, and the ramifications of the policies.

Priority 2: Streamlined Documentation: Intricate policy documents may hinder comprehension and adherence. Enhancing documentation via lucid language, succinct summaries, and accessible formats can augment accessibility and foster engagement with policy content.

Priority 3: Educational Support Frameworks: Continuous support and resources can assist individuals and organizations in managing policy implementation. This may encompass helplines, online FAQs, training resources, and specialized support personnel.

Integration of Security and Healthcare

This domain emphasizes the synchronization of security protocols with healthcare methodologies to safeguard confidential patient information and maintain the integrity of healthcare systems.

Priority 1: Integrated Framework: It is essential to develop a comprehensive framework that incorporates security considerations into healthcare policy and practice. This framework must encompass data privacy, cybersecurity concerns, and incident response methods. examines cybersecurity frameworks that may be tailored for the healthcare sector. Additionally, it references investments in digital security systems for healthcare, underscoring the significance of this integration.

Priority 2: Establishment of Task Force: The formation of a specialized task force can enhance cooperation between security and healthcare specialists. This task force can concentrate on formulating and executing the integrated framework, coordinating responses to security incidents, and advocating best practices.

Priority 3: Policy Coordination: Ensuring congruence between security and healthcare policies is crucial for effective execution. This necessitates collaboration among pertinent government entities, healthcare professionals, and security specialists.

Digital Transformation

These proposals emphasize the necessity to adjust to the changing digital environment and utilize technology to enhance policy execution and service provision.

Priority 1: Digital Training Initiatives: Providing individuals and organizations with essential digital competencies is vital for effective digital transformation. Training programs must emphasize pertinent technologies, data management, and optimal cybersecurity procedures. emphasizes the significance of digital competencies within universities, a notion that is applicable across several sectors.

Priority 2: Infrastructure Development: Investment in resilient digital infrastructure is crucial for facilitating digital services and promoting data-driven policymaking. This encompasses enhancing internet accessibility, devising safe data storage methods, and upgrading current systems. examines infrastructure adoption frameworks pertinent to digital health transformation.

Priority 2: Implementation of E-Governance: Utilizing technology to enhance governmental services and citizen participation is a fundamental component of digital transformation. E-governance efforts can optimize processes, augment transparency, and facilitate access to public services. examines a big data analytics framework for digital governance, which may guide the deployment of e-governance. Additionally examines the interplay between maturity evaluations and strategy execution in digital health, providing significant insights for this domain. Examines e-governance frameworks and their significance in relation to developing technology. presents a framework for a digital transformation capability maturity model, which may assist in evaluating and directing digital transformation initiatives. Examines the

governance of digital transformation in healthcare, offering a pertinent paradigm for this particular sector.

6.0 Recommended Policy Framework

An analysis of the BRICS nations' policies and governance structures and the survey analysis there is a wide range of approaches to sustainable development that can be seen in the governance capabilities of the BRICS nations (which are Brazil, Russia, India, China, and South Africa). The following are the principal observations: Although the BRICS nations have seen significant economic growth, (Azahaf, 2011) they continue to face challenges such as regional disparities, corruption, environmental difficulties, and infrastructural deficits. This is despite the fact that they have enjoyed enormous economic growth.

Overall policy frameworks and the reforms that are necessary for India is to make improvements in infrastructure and strategic long-term planning, despite the fact that it excels in social policy and the involvement of civil society. The frequent change in Government and the ministerial staff also leads to the change of Civil servents. This causes the reformation slow and implementation delays. Inadequate coordination between ministries and widespread delays are two factors that make the administration of India difficult to manage. Despite the fact that India is confronted with considerable levels of poverty and regional inequalities, the country exhibits outstanding strategic capacity at a national level.

Despite the fact that China is capable of formulating strategic policies, the country still has to undergo institutional reforms in order to address the social and environmental difficulties it faces. Despite the fact that South Africa has made strides in terms of democracy and social

policy, the country continues to struggle with issues of corruption and inefficiency (Azahaf, 2011).

The OECD Framework for Digital Governance, which consists of six dimensions. The Organization for Economic Cooperation and Development (OECD) has identified six crucial aspects of digital governance that are crucial for the successful transformation of the public sector. Integrating digital processes into policy and service delivery is what we mean when we talk about "digital by design." Utilizing data for governance and decision-making is what is meant by the term "data-driven public sector." Consolidating shared services and technologies is the focus of the government's role as a platform. Increasing the openness and accessibility of governmental services is the goal of the Default Openness initiative. User-centricity refers to the process of developing policies and services that are tailored to the needs of users. Proactiveness is the ability to anticipate and respond to the demands of citizens.

India's Challenges and Opportunities at the present moment is to catchup with the global growth. India is able to display great capabilities in governance at the national level, which are supported by the following: The role of the Prime Minister's Office to incorporate expert input and public participation into strategic planning is referred to as their strategic planning. India is a country that has the potential to experience economic growth, (Ministry of Health and Welfare, GOI, 2017) which is driven by the country's information technology services and favorable demographic trends.

However, the following are examples of obstacles: Regional disparities are characterized by notable discrepancies in governance and infrastructure among states, as seen by Azahaf,N (Azahaf, 2011). One of the factors that hinders inclusivity is the digital gap, which happens

when rural areas do not have adequate access to digital infrastructure. A number of social indicators include persistent poverty, difficulties in literacy, and health disparities. (WHO and ITU, 2021)

Suggestions for the Establishment of a Policy Framework in India

As part of this study the following recommendations are presented to for the future references: Data Driven approach and methodology should be considered to Improve data governance by implementing all-encompassing standards for protecting users' privacy and security. in order to address regional imbalances and improve resource allocation, predictive analytics should be effectively utilized. Fostering an Inclusive Environment for Digital Services will create digital platforms that are bilingual in order to serve a variety of demographics. Which provide access to services through both digital and physical channels, and facilitate their use.
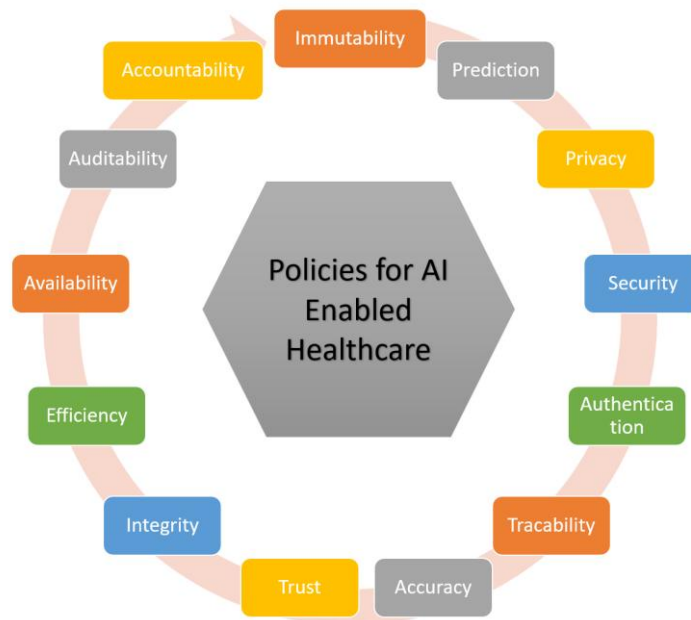
Figure 5.4: Current Framework environment factors

The above figure emphasizes a holistic approach to integrating AI into healthcare, addressing ethical, technical, and operational aspects to ensure safe, effective, and trustworthy AI

applications. The busniess and Vendors need to ensure they are coplliant with the approach. The diagram presents a comprehensive approach to implementing blockchain-enabled AI in healthcare, integrating technical, ethical, and operational considerations. The circular design emphasizes the interconnected nature of these elements, where each component reinforces the others. This architecture ensures that AI healthcare solutions maintain high standards of security while promoting transparency and trust. The framework's strength lies in its balanced attention to both technological capabilities (prediction, efficiency) and governance aspects (accountability, auditability). By incorporating immutability and traceability, it addresses the critical need for reliable healthcare records and decision-making processes. The design particularly excels in addressing healthcare's unique challenges, such as patient privacy and data integrity, while maintaining system availability for critical care scenarios.

A better cooperation in the Region should be advanced to establish governance standards at the state level that are in line with both national and international strategies. By encouraging advanced platforms for the exchange of information between states. Further Strengthening Accountability and Increasing Transparent Implemention will bring transparent government practices is one way to increase public confidence and incorporate measures of auditing and control should be reinforced.

Recommended Maturity Framework for Government

This framework comproses multidinemsion which are a combination of business , Government and technical capabilities that determine the success of policy rollout. This framework can be used by Policy-Led, Policy-Creation, or policy-Enabled organizations. The dimentions provide a mechanisum for organization to measure themselves during their policy journey and improve in an incremental fashion.
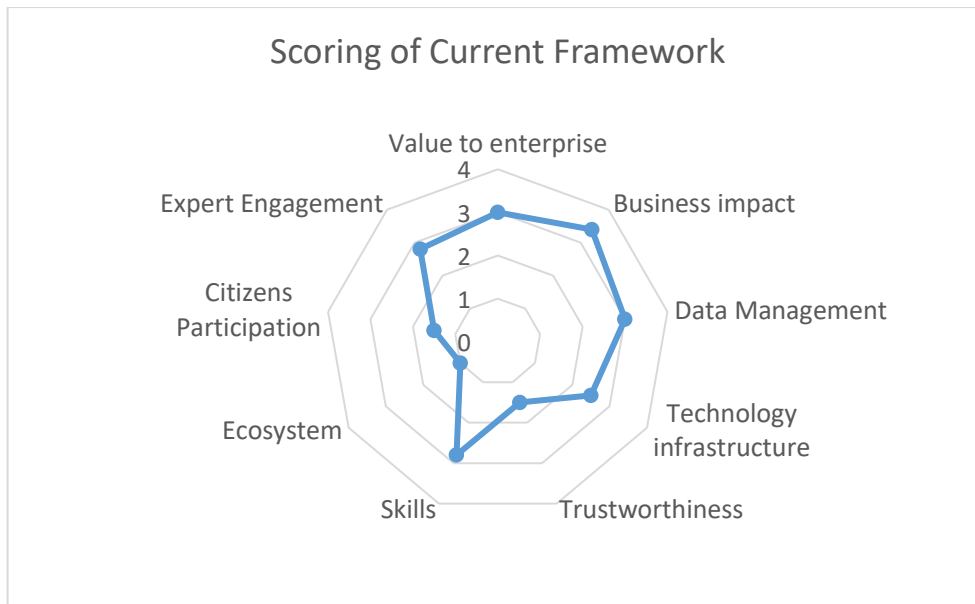
Figure 5.5: Current Framework Scoring

The current framework shows the citizen engagement is very low due to which the is also low amont the common people. This framework impact the busniess as well as there is no much clarity and what to adopat and practice in regular technologies implementation (Kapoor and Mehta, 2022). With the emerging technology which is using Gen AI in products, which is leading to unclear liabilities.

The recommended framework should focus on the following as shown below :
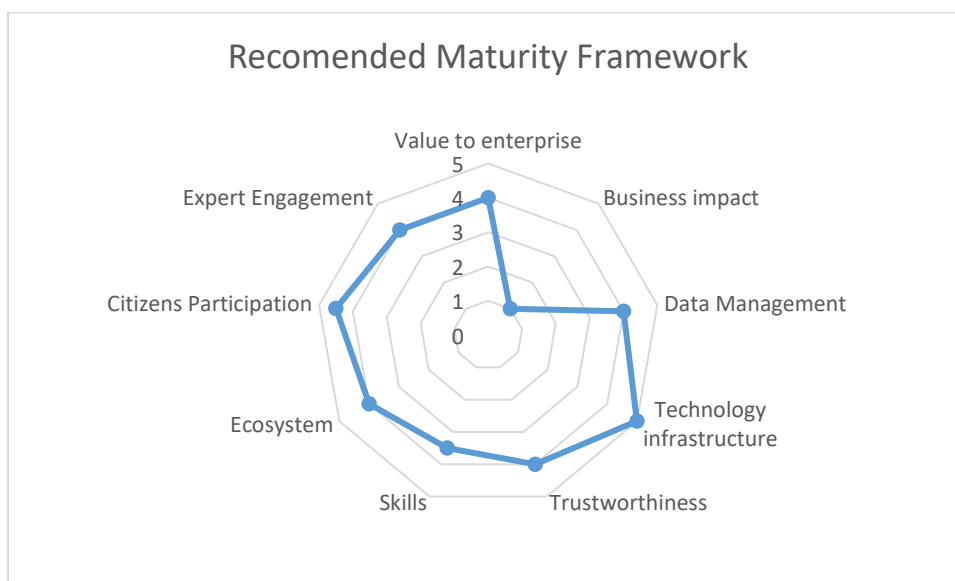
Figure 5.6: Recommended Maturity Framework Scoring

In recommended model the impact to the business should be minimized and the engagement and infrastructure should be improved. The proactive participation and readines by the breurocrates and law maker shuld be well educated, knowledgable of the emerging trends and working effectively and timely to bring in protection to their citizens.

Implementation of Recommended Policies Roadmap

As we continue our exploration of AI advancement and integration, we've covered crucial ground: defining objectives, assessing readiness, prioritising use cases, developing data strategies, building talent, and establishing governance frameworks. Now, we focus on a pivotal element that brings it all together: **Developing a Phased Implementation Roadmap**

POLICY ROLLOUT
General Framework
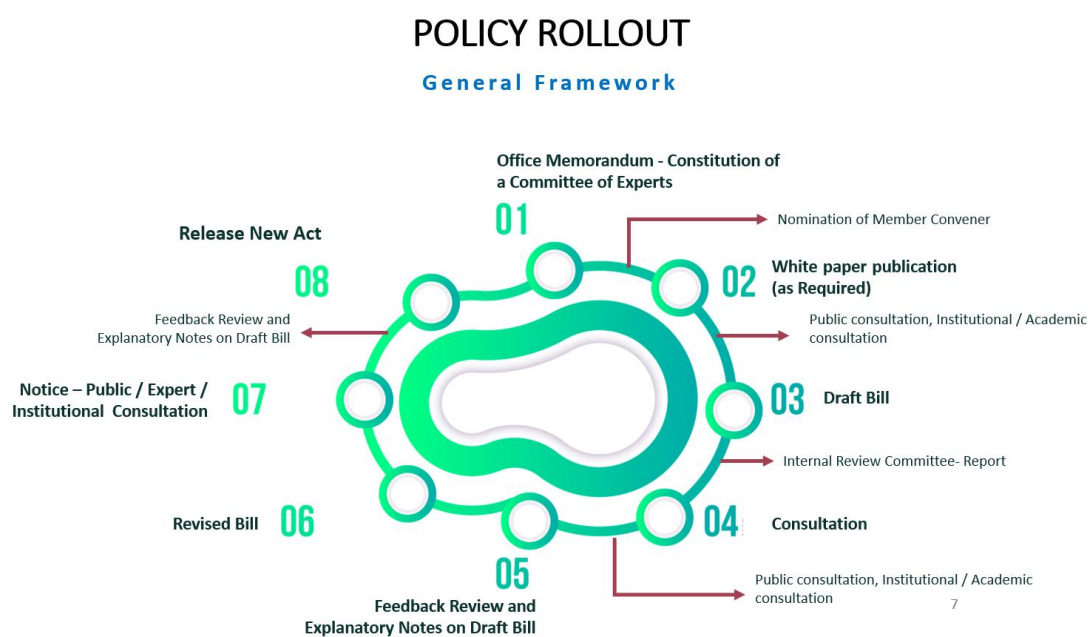
Figure 5.7: Recommended general policy rollout framework

The policy rollout framework has been structured into Six Major phases, from Initial Setup through Implementation, with built-in feedback loops and consultation processes. Each phase has specific deliverables and stakeholder engagement points with clear KPI as mentioned in below framework.

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Phases	Category	Plan	Description	Milestones	Timeline
PHASE 1	Define Goals	Short Term Goals	Launch pilot projects (e.g., targeted AI Policy initiatives).	Documented short-term and long-term goals and objectives	Month 1-2
			Develop a preliminary governance Committee framework		
			Identify key stakeholders	Alignment validation with the overall national and business strategy.	
		Long-Term Goals	Set aspirations for full-scale Policy integration over 1-3 years.		
			Align objectives with national and business strategies		
	Constitution of Committee	Nomination	Office Memorandum	Memorandum Roll out	Month 2-3
			Constitution of Committee of Experts	Formation of Committee	
			Nomination of member Convener	Whitepaper creation	
PHASE 2	Establish Timelines and Milestones (value)	Action Steps	Divide the project into planning, pilot, scaling, and optimization phases.	Clear and approved project timelines.	Month 4-6
			Set specific timeframes and checkpoints.		
		Deliverables	Gantt chart visualizing timelines and milestones.	First milestone reached for the planning phase.	
			Progress tracking mechanisms.		
PHASE 3	Set Key Performance Indicators (KPI's) - (Scalable parameters)	Action Steps	Choose measurable metrics (accuracy, cost efficiency)	KPI metrics baseline established	Month 7-9
			Conduct baseline data collection		
			Implement monitoring dashboards		
		Tools	AI-driven analytics platforms for KPI measurement	Integration of monitoring systems.	
			Regular KPI review cycles		
PHASE 4	Develop a Step-by-Step Implementation Plan	Action Steps	Assign specific responsibilities to Committee	Completion of pilot phase tasks.	Month 10-15
			Budget allocation		
			Comprehensive process documentation		
			White paper publication		
			Review of Whitepaper from Academic Expert / Institution/ Business experts		
			Draft Bill proposal		

		Outputs	Task allocation matrix.	Approved budget and resource allocation.	
			Resource distribution plan		
			Draft Bill for Review		
P H A S E 5	Incorporate Feedback and Iterate	Action Steps	Establish stakeholder feedback channels	Stakeholder feedback integration	Month 16-20
			Conduct iterative reviews - Expert and Public Consultation		
			Adapt plans based on insights		
			Review Explanatory Notes on Draft Bill		
			Revise Bill		
			Release New Act		
		Outputs	Stakeholder communication platforms	Improved strategies post-review	
			Iterative planning frameworks		
P H A S E 6	Ensure Flexibility and Scalability	Action Steps	Develop contingency plans	Successful scaling phase initiation	Month 21-24
			Incorporate scalable AI tools for Faster updates		
			Schedule periodic reviews for adaptability		
		Outcomes	Flexible Policy frameworks in place	Implementation of contingency mechanisms	
			Scalable process ready for iterative updates and new policy rollouts	Repetitive Implementation mechanisms	

Table 5.5 : Roadmap and Implementation for Playmakers

The Key Deliverables and Summary Milestones of the proposed roadmap includes the *Planning Phase* with clear deliverables of *Goal definition and alignment*. The *Pilot Phase* includes the *Launch with KPIs and feedback loops from experts and public consultation*. The next phase is *Scaling Phase* which provides robust *integration into broader operations*.The last phase is called *Optimization Phase* which defined the *repetitive and continuous innovation and refinement* of published bill/ act into amendments with faster rollouts.

The proposed roadmap provides a structured and efficient approach to achieving organizational goals through four distinct phases. The Planning Phase focuses on defining objectives and ensuring alignment across stakeholders, setting a strong foundation for success. The Pilot Phase

emphasizes the importance of launching initiatives with clear Key Performance Indicators (KPIs) and establishing feedback loops to gather insights and refine strategies. The Scaling Phase integrates successful pilot outcomes into broader operations, ensuring seamless expansion while maintaining consistency. Finally, the Optimization Phase prioritizes continuous innovation and refinement, fostering long-term sustainability and growth.

This roadmap is effective due to its structured progress, which breaks down complex processes into clear, actionable steps. Its modular design ensures scalability, allowing organizations to adapt and expand initiatives without disruption. Risk mitigation is embedded through feedback mechanisms and adaptability, minimizing potential setbacks.

Additionally, the focus on resource optimization enhances efficiency, ensuring sustainable growth over time. By combining these elements, the roadmap serves as a comprehensive guide for organizations seeking to implement and scale initiatives effectively while maintaining flexibility and resilience in dynamic environments.

Future Ready

An approach that is forward-thinking, future ready, outcome-focused, collaborative and inclusive with a global approach was discussed in GPAI (The Global Partnership of Artifical Intelligence) conference held in New Delhi Dec 2023. To Promote interdisciplinary collaboration, innovation, technology development with a delicate balance between fortifying India's indigenous capacity.

Goal-oriented regulation can improve stability and predictability for enterprises, when public policy objectives are established for the long term (Schiller et. al., 2022). Nurturing meaningful global interconnectedness with the model AI governance framework to be established and revised in accordance with the advancement of technology and business methodologies time

to time. A synthesis of outcome-oriented regulation and industry self-regulation acknowledges the contribution of the industry and other stakeholders in the governance of innovation and utilizes technology to assess outcomes. If the governance is not innovated and moving forward with the future readiness then as said " Perish in the Valley of Death".

Interdisciplinary collaboration fosters innovation, technology development, and flexibility, promoting constitutional values, creativity, critical thinking, and problem-solving. It emphasizes addressing the relationship between power and knowledge through multidisciplinary approaches. Shared ownership and equal responsibility among ministries, departments, and agencies ensure complementarity and effective implementation. Institutionalized interlinkages provide long-term benefits, while nurturing global interconnectedness and fostering horizontal (inter-ministerial and inter-departmental) and vertical (inter-state) linkages. Practical data interpretation further enhances the impact of these collaborations.

6.1 Conclusion

A strategic roadmap for AI integration is essential to ensure clarity, efficiency, and success in implementation. Without a defined plan, efforts can become scattered, resources misallocated, and objectives unmet. A well-structured roadmap provides a clear blueprint, breaking the process into manageable stages for steady progress. It helps identify potential challenges early, mitigating risks and ensuring smoother execution. By optimizing resource allocation across phases, organizations can avoid waste and focus on impactful areas. Clear milestones and key performance indicators (KPIs) enable measurable success, ensuring that progress aligns with objectives. Additionally, a roadmap facilitates scalability, allowing seamless transition from pilot projects to full-scale deployment. This structured approach ensures that AI integration is

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not only effective but also sustainable, maximizing its potential to transform operations and deliver value.

Establishing a vibrant ecosystem through the implementation of strategic programs and collaborations between the public and commercial sectors is the goal of this endeavor. The democratization of computing access, the improvement of data quality, the development of indigenous frameworks and capabilities, the attraction of top talent, the facilitation of industry collaboration, the provision of an ecosystem for startups, the guarantee of socially impactful policies, and the strengthening of ethical governance will all contribute to the acceleration of responsible and inclusive growth in India's ecosystem.

India is currently preparing for advanced technologies such as 5G, artificial intelligence, blockchain, augmented reality, virtual reality, machine learning, deep learning, robotics, and natural language processing. These will be essential in government and industry for planning or decision-making, accelerating development or analysing deployment, resolving issues or creating products, identifying new trends or elucidating links and associations.

The rapid advancements in digital health technologies have the potential to significantly improve healthcare delivery and population health outcomes. However, to fully realize the benefits of these innovations, policymakers must address the challenges of digital health equity, data privacy and security, and the seamless integration of these technologies into existing healthcare systems. By developing comprehensive and inclusive digital health strategies, policymakers can harness the power of digital technologies to create a more equitable, efficient, and effective healthcare system.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

The prospects for AI in the Indian healthcare sector are promising, with predictions indicating that by 2035, AI might contribute USD 957 billion to India's economy (Accenture, 2017). The Government of India (GOI) is incentivizing the development of AI in the healthcare sector. State governments are assisting start-ups through funding; for instance, the government of Karnataka (a state in India) has initiated a plan to mobilize INR 2000 crore (~300 million USD) by 2020 to promote healthcare companies in leveraging AI. The government of Karnataka has already created a thorough start-up policy for AI (Sharma NC, 2022), and the integration of AI into the Healthcare Sector in India has resulted in significant advancements in this field. It has made a significant contribution to quality, cost, efficiency, and other related factors (Sharma AK, 2022). Various stakeholders in India are actively advocating for AI-integrated healthcare projects, including FICCI and the Prime Minister's Office (Rao et. al., 2021). AI-integrated healthcare projects in India primarily focus on providing medical services to rural areas, particularly to disadvantaged populations. This technology benefits the economically disadvantaged segments of India who cannot afford expensive medical services (Singh, 2024).

It benefits those lacking access to essential medical facilities. Artificial intelligence also enhances the healthcare sector by mitigating economic inequality (Rekha M. Menon et al., 2017). A report from the TCS global survey (TCS, 2017) indicates that while AI may lead to job reductions, it will also create opportunities for new employment through the introduction of AI-integrated healthcare initiatives within those firms. An further poll conducted by Accenture (Accenture, 2017) indicated that the use of AI in the healthcare system will result in savings of USD 150 billion in the United States and a sector growth of USD 6.6 billion by 2021 in the United States.

India experiences a shortage of trained labor, including physicians and other healthcare professionals. The application of AI in the healthcare system could mitigate the skills deficit by enabling less skilled people to make more precise decisions. This will significantly benefit the Indian healthcare system. In certain instances of common health concerns, AI will be capable of diagnosing. In complex health instances when AI exhibits less confidence in its decisions, the assistance of professional physicians may be employed. This approach will decrease treatment costs in India (Vignesh, 2017). Consequently, numerous hospitals in India, such as Fortis Healthcare, Apollo Hospital, LV Prasad Eye Care, and Aravind Eye Care System, are utilizing AI technology from platforms like Microsoft, Google, and IBM for the diagnosis of various ailments at a reduced cost. AI technology is utilized in the healthcare sector, encompassing hospitals, medications, diagnostic centers, and more.

In addition, NeHA will provide guidance to all stakeholders regarding the effective implementation of various innovative technologies within the healthcare industry, including applications of artificial intelligence and its usage policy guidelines (Chatterjee, 2015; Chaudhuri et al., 2020b). In order to accomplish this, this authority is expected to obtain help from a variety of stakeholders. The policy department is also accountable for the enforcement and execution of regulations and legislation for the keeping of patients' health data in the context of concerns regarding privacy and security (Sreenivasulu, 2019; Bhattacharya and Chatterjee, 2020). As part of its mission, this authority is going to be responsible for promoting and developing standards. It would work towards the appropriate realization of effective use of information and communication technologies (ICTs) in order to improve the overall healthcare system in India as part of the path towards e-Health. The formulation of a National e-Health Policy and Strategy is the step that this authority is taking (Bhattacharya, Kumar, Kaushal and Singh, 2018). The goal of this initiative is to encourage the adoption of e-Health, which includes applications based on artificial intelligence, inside the Indian healthcare system in various sectors.

In collaboration with the National Law School of India University in Bengaluru, the Government of India (GOI) has begun the process of drafting a piece of legislation that would be referred to as the Health Data Privacy and Security Act of 2016. This will serve as a guide for effectively maintaining and preserving privacy, confidentiality, and ownership of various health data pieces. In July of 2016, the draft of the legislation was delivered to the Ministry of Health and Family Welfare, which is part of the Government of India (Mitra, A., Soman, B., Gaitonde,R. and Bhatnagar,T. ,2023). After the data has been acquired, it will be anonymized and then used for Big Data analytics (Patel, Bhavsar, Patel and Suthar, 2024). However, there is a possibility that the anonymized data could be re-identified, particularly in situations where the technique used to anonymize the data is not strong and resilient (Williams and Taylor, (2023). It is the duty of NeHA to find a solution to this problem, particularly with regard to machine learning and artificial intelligence analysis of data.

6.2 Implications

In India, there has been a rising acknowledgment of the expertise that industry experts possess in finding solutions to complex socio-economic difficulties, which has led to an increase in the participation of industry experts in the process of policy formation and implementation. There have been major responsibilities played in advisory capacities by industry leaders, think tanks, and professional groups in order to guarantee that policy frameworks are both successful and relevant. With efforts such as public-private partnerships and government-led consultation processes, the degree and proportion of their involvement has expanded. However, the degree and percentage of their involvement varies across different sectors.

Firstly, the degree of participation Professionals from the industry make contributions to the formulation of policies by participating directly in advisory committees, task groups, and consultations held by the government (Niti Aayog, 2022b). Particularly in fields such as technology, healthcare, and infrastructure, their expertise is in high demand.

Implementation Support: Collaborations between government agencies and industry entities facilitate the efficient execution of policies by harnessing the expertise of the industry.

Secondly, The Various Methods of Public Private Participation (PPPs) : Experts play a crucial role in the planning and implementation stages of public-private partnerships (PPPs), particularly in the areas of technology and infrastructure. Advisory Committees: Organizations such as the NITI Aayog (Niti Aayog, 2023) often meet with influential members of the sector in order to match policy with the reality of the ground. Corporations are able to execute policies at grassroots levels through the implementation of Corporate Social Responsibility (CSR) activities, which frequently correspond with the aims of the government (Niti Aayog, 2022a).

Thirdly, An Estimated Percentage of Individuals to Participate- It has been determined from an analysis of the existing literature and reports from the government that around 15–20 % (percent) of industry specialists are directly involved in the policymaking processes by serving in advisory or consultative capacities. Additionally, when indirect contributions like as white papers, research collaborations, and stakeholder meetings are taken into consideration, this figure rises to approximately 40 to 50 % (percent).

Evidence-based formulation of health policy. Numerous researchers contend that a reevaluation of the Indian healthcare landscape is necessary. Chauhan (Chauhan, 2011 ; Kasthuri, 2018) contended that emerging nations, such as India, must reevaluate their healthcare policy while acknowledging the significant influence of non-governmental healthcare providers. Chauhan (Chauhan, 2011) asserts that the prevalence of private service in India unequivocally indicates a failure of official policy over the past four decades. Reddy (Reddy et. al. 2011), in his analysis of India's health policy using Alford's theory of structural interests, asserts that "the socio-economic and political conditions of a country dictate the framework of a specific policy."

It is asserted that policy disregards the popular will. Recently, we have encountered pronounced expressions of neglected areas within. The administration may find it challenging to review many sources of opinion in advance. Nonetheless, it is essential to incorporate the perspectives of at least the majority of stakeholders. This is relevant to health policy, especially given the frequent reports of physicians declining to practice in rural regions.

Research implications of This research indicates that, within this sample, age does not significantly influence respondents' perceptions of the existence of a policy framework. The results suggest that awareness of the policy framework may be fairly uniform across various age demographics.

According to Ramya Chitrapu (Chitrapu, R., 2024) and Prof. I. Ramabrahmam in their article, An overview of health policy in India highlights the significant 'Swachh Bharat' movement, which has been instrumental in achieving the goal of a "Clean India." Society cannot evade the obligation of cleanliness, which is the initial measure for prevention. Additional programs akin to 'Swachh Bharat Abhiyan' should be advocated nationwide to enhance cleanliness and hygiene, hence improving the health metrics of the populace. Such projects should be assessed by publicly financed universities to promote student engagement in public health. The National Health Policies initiated in 1982 have undergone incremental modifications with each subsequent policy. Public policy analysts ascribe the policy gridlock in this area to the incrementalist paradigm. 'The Science of "Muddling Through",' is largely corroborated. Transformations occur incrementally, fostering acceptance and legitimacy.

Nonetheless, this strategy has obstacles with a deficiency of innovation and a lack of long-term perspective. In this setting, it is essential for Indian health policy to realign and reconstruct itself for enhanced efficacy and efficiency. Rao (Rao et. al. 2021) emphasizes the pressing necessity to depart from incrementalism and recognize the intricacies involved in reconstructing the current inefficient health system. Policies and initiatives must be evidence-

based, integrated within the country's socio-economic context, and formulated through a thorough analysis of past mistakes, alongside an unwavering commitment to equality and fairness. Therefore, public policies, particularly Health Policy, must be developed with consideration of the necessary human and financial resources for implementation. This would facilitate a grassroots approach while assisting in the establishment of realistic and attainable objectives and results.

The NHP 2017, being the third in the series, is also subject to critical evaluation. A prominent authority asserts that the objectives established in the 2017 policy are nearly achieved thanks to many prior actions. Table 3 clearly indicates that numerous targets for some macro indicators remain consistent with those established by prior programs. This is also reflected in the article "Repackaged: 15-Year-Old National Health Policy Resurrected in 2017" (Salve, 2017).

Health Policy in India, currently, it is acutely vigilant regarding policies and initiatives, hence highlighting the influence of interest groups, associations, and the media. Advancements in the healthcare sector. Let us examine innovations in areas related to health policy; for example, insurance and foreign practices appear to be overlooked by policymakers. Specific attention to insurance plans acts as a valuable reference in this context. Commonly referred to as conditional health policies, "certain clinical commissioning groups in England have limited non-urgent surgeries to patients who are obese or smokers, unless they exhibit periods of dieting and cessation" (Pillutla et. al., 2018). Likewise, the researcher of the paper entitled "Can Conditional Health Policies Be Justified?" A policy review of the new NHS dental contract reforms highlighted the question of whether conditional health policies infringe upon the patient's access to care and if they are ethically defensible (Laverty and Harris, 2018).

The swift progress in technology, especially the advent of the metaverse and generative AI, has created new opportunities for revolutionizing healthcare delivery. These technologies possess the capacity to augment healthcare accessibility, facilitate real-time clinical decision-making, and elevate the overall quality of services (Schwalbe and Wahl, 2020). Nonetheless,

the effective execution of these solutions necessitates deliberate governmental action to guarantee fair and ethical implementation (Chang, 2019).

Multiple studies have emphasized the advantages of integrating artificial intelligence and digital technologies into the healthcare system. These technologies can optimize healthcare workflows, enhance diagnostic precision, and enable remote patient surveillance. Moreover, the metaverse offers prospects for establishing virtual healthcare settings, facilitating remote consultations, collaborative care, and immersive therapeutic approaches. (Wang, 2022).

Following rigorous rules on data security, compliance, and data protection makes it difficult to apply blockchain technology and artificial intelligence in healthcare. Protection of health data privacy and security, avoidance of bias in AI algorithms, and preservation of responsibility in AI-driven decision-making have major social ramifications (Miller and Tucker, 2017). Regulatory systems have to evolve to meet these difficulties, including developing rules for platform interoperability and data exchange and guaranteeing respect to data protection rules like GDPR (Bathula et al., 2024).

6.3 Recommendations for Future Research

Some of the goals that are persistant Challenges need Future Directions have to be researched for better synergies and improvements. This is a journey to wards progress. Notwithstanding the recognized significance of coordination, evidence-based policymaking, and public consultation, numerous challenges persist. Ministerial bureaucracy, data privacy concerns, and institutional conformity may hinder effective policymaking (Ajaykumar, et. al. 2022). Technical advancements can offer solutions; nonetheless, it is imperative to carefully evaluate the hazards associated with over-centralization, digital divides, and technical disparities (Bertot, J,C. et. al. 2010).

Increasing concerns about the dangers that are linked with artificial intelligence have led to the demand for rules that guarantee the reliability of AI. These regulations should take into account legality, ethical issues, and robustness. It is essential to have a united strategy to artificial intelligence regulation on a worldwide scale. It is essential to begin with a general definition of artificial intelligence (AI) in order to provide clarity for the industry. A uniform global regulatory structure, secure data centers with human oversight and assistance from artificial intelligence, information sharing with academic institutions, the utilization of AI (Palaniappan et.al. 2024) for social good, a risk-based approach, collaboration with and support from large companies, and the incorporation of ethical principles from the very beginning with mechanisms for implementation are all essential components of such a framework. This technology has a great deal of potential if it is implemented with the appropriate education for implementers, if data quality is improved, and if trustworthy artificial intelligence is developed.

As governance grows more intricate, future study ought to investigate the synergies among digital change, governmental response, and public participation. Specifically, examining the influence of artificial intelligence, big data, and other technologies on policy coordination and evidence-based policymaking could provide novel strategies for enhancing governmental efficacy and institutional learning.

Future research should investigate additional characteristics affecting views of policy frameworks, including educational attainment, profession, or geographic region. A more extensive sample with varied demographics may produce different insights. Further research in the following areas can provide further refinement of policies. By expanding the Industry Representation by atively involving large corporates, MSMEs and startups to ensure a wider range of perspectives and foster inclusivity in decision-making. Designing by establishing

structured mechanisms and develop institutionalized forums to facilitate regular and meaningful dialogue between government entities and industry stakeholders. By enhancing transparency and accountability it will strengthen oversight frameworks to mitigate conflicts of interest and uphold integrity in collaborations. Also by addressing Regulatory Constraints willl help to streamline bureaucratic processes by ensuring timely incorporation of industry feedback into actionable policies. There will be many Conflict of interests and by mitigating these Conflicts of Interest shall support implementing and safeguarding interests to balance industry participation while prioritizing public interest and maintaining policy integrity.

Several areas warrant further research to refine the framework and roll policies effectively. Investigating the impact of technologies like blockchain and AI on policy implementation and legal frameworks. Ethical frameworks for data governance by Developing ethical guidelines and regulations for data utilization in the digital age, balancing individual privacy with societal benefits. Refining effective stakeholder engagement strategies by exploring innovative approaches to stakeholder engagement in policy development and implementation. Building adaptive policy design and Developing methodologies for designing adaptable and responsive policies that can effectively address evolving challenges. Finally measuring policy effectiveness in complex systems by developing robust methods for evaluating policy outcomes in complex systems, considering unintended consequences and long-term impacts.

6.4 Conclusion

By providing individuals with a higher degree of control over their personal information and by holding data fiduciaries accountable for the ethical management of that information,

the Act unquestionably increases data protection in the country, despite the fact that it is not without its shortcomings and limits. Citizens are given the ability to make educated decisions about their data and to hold institutions accountable for its misuse as a result of the Act's emphasis on user permission, data minimization, and individual rights. In the end, this shift in power dynamics is beneficial to both individuals and corporations since it promotes greater transparency and creates confidence within the data ecosystem.

In spite of the good contributions it has made, the actual implementation and enforcement of the Act require continuous attention. In order to guarantee that it will be effective, it will be very important to construct a rigorous regulatory framework and address concerns over the access that the government has to data. To ensure that the Act continues to be relevant and effective, it will be essential to modify it so that it can accommodate the ever-changing digital context.

It does this by creating clear rules for data governance, which in turn supports responsible data practices, which are crucial for supporting innovation and economic success. An atmosphere that is conducive to the efficient operation of enterprises, effective competition, and the contribution of businesses to the economic development of the nation is created as a result of this (Gothankar et. al., 2022).

Through the provision of a framework for responsible data practices that are to the advantage of both citizens and enterprises, it strikes a balance between the rights of individuals to privacy and the requirements of a vibrant digital economy. It is possible for the Act to secure its place as a corner stone of "India's digital future" by consistently resolving difficulties and adjusting to the changing context. This will ensure that personal data is protected while innovation and growth endure to flourish.

Hiroshi Yoshida, Ministry of Internal Affairs and Communications, Government of Japan, made a note of this very fact while acknowledging the potential risks involved with the powerful technology. He spoke at length about the Hiroshima AI Process, agreed upon during the G7 under the leadership of Japan (Drishti IAS , 2023), in which the importance of inclusive AI governance and a vision of trustworthy AI aligned with shared democratic values was recognized.

Policy Compliance with Blockchain Research shows that smart contracts using blockchain technology can help ensure that patient-provider deals and policies are followed, while also keeping a clear record of all actions taken. This method improves clarity and responsibility in handling healthcare data. As AI and blockchain technologies improve, it's important for everyone involved—like government officials, healthcare workers, and tech developers—to work together. This teamwork will help make the most of these technologies while also protecting ethics and patients' rights.

APPENDIX A

SURVEY COVER LETTER

To my friends and participants:

To help me with my doctoral study at the Swiss School of Business Management, I'm looking into "***New Approaches Of Public Policy Nintegrations For Valuating And Harnessing Data From The Digital Health Metaverse To Enhance Health Management Through Emerging Technologies.***" Need your help to fill out my form. Please take 10 minutes of your time. Also, please send the poll to your friends and other people in your network who work in a variety of fields. With your help, I can do better study, and if you'd like, I can share the results with you. All the information I get will only be used for my research and analysis purpose only and are be kept confidential at all times. Your personal information will be confidential and hence the survey is anonymous in nature.

A brief about the research is shared for your conveniance and understanding. To make rules for new technologies, people from many fields must work together. These fields include science, law, ethics, and economics. To make sure policies cover everything, they should be written with help from experts in these many areas. Because technology changes so quickly, policy models need to be flexible and easy to change. A regulatory method that is flexible lets changes be made quickly to deal with new problems and take advantage of new opportunities that come up because of new technologies. Ethical concerns should be at the heart of any policy strategy for new technologies. Setting ethical standards like honesty, fairness, and responsibility as a top priority helps build trust with the public and makes sure that technologies are developed and used in a responsible way. Getting people involved in making policies and teaching them about new tools are very important. Public participation based on knowledge makes policies more believable and makes sure that rules are in line with societal ideals and expectations.

APPENDIX B

INFORMED CONSENT

Hi there, friends!

Need your help with a short poll for my doctoral research at the Swiss School of Business Management. It will only take 10 minutes of your time. Your ideas will help me do better study. Don't forget to share the poll with your friends who work in a variety of fields. All the information I get will only be used for my study and will be kept confedential at all times.

Participants' Rights: As a participant in this research, you have the following rights:

1. Voluntary Participation: Your participation is entirely voluntary, and you have the right to withdraw from the questionnaire at any time without providing a reason.

2. Confidentiality: Your responses will be anonymized, and no personally identifiable information will be associated with your answers.

3. Privacy: We will ensure that your data is stored securely and that only authorized research team members have access to the collected information.

4. Informed Consent: By proceeding with this questionnaire, you are indicating your informed consent to participate in the research. Your consent signifies that you have read and understood this informed consent statement.

   If you have any questions or concerns regarding this research or the informed consent statement, please do not hesitate to contact us at chandrashekhar1@ssbm.ch or chandrashekharreddyc@gmail.com.

This questionnaire is meant to get useful information from people who are experiencing the digital use of in healthcare and their privacy and protection.

I'm working on my PhD at the Swiss School of Business Management, I need to do this various survey and interview. You should be able to finish the short survey in no more than 10 minutes. Your answers will help me a lot with my studies. A short summary of the study is given so that you can understand it better. People from many fields need to work together to make rules for new tools. Some of these areas are economics, law, ethics, and science. Policies should be made with the help of experts in a lot of different fields to make sure they cover everything. Since technology changes so quickly, policy models need to be able to adapt and be changed quickly. When new technologies bring about new problems and possibilities, they need to be dealt with quickly. A regulatory method that is flexible lets these changes happen. When making rules for new technologies, ethics should be at the top of the list. Making moral standards like fairness, honesty, and responsibility a top priority helps people believe you and makes sure that technologies are made and used in a good way. It's very important to teach people about new tools and get them interested in making rules. Participation from the public based on knowledge makes policies more convincing and makes sure that rules are in line with what people want and expect from society.

Participants are assured that the data they give will only be used for study and will be kept secret so that no one or organization can use it to find out who they are. To keep the quality of the data high, each user will only be able to give one answer. Also, please share the poll with your software industry friends so that as many people as possible fill it out and the results are better. Thanks for your time and useful knowledge.

Please email chandrashekharreddyc@gmail.com or chandrashekhar1@ssbm.ch is a doctoral student at the Swiss School of Business Management.

APPENDIX C

INTERVIEW GUIDE

A Guide for Conducting Interviews Regarding Policies in Public

Guide Steps	The Interviewer Questions
Welcome Note:	We would like to extend a warm welcome and express our gratitude for your presence here today.
Perspectives on Different Aspects of Public Policy	1. How would you characterize an effective public policy, in your opinion? 2. Would it be possible for you to share any examples of public policies that you believe have had a big positive impact when implemented? How come? 3. In what ways do you believe politicians may strike a balance between social equality and economic growth?
Developing Policies Through a Process	1. What are the stages of the policy formulation process that are considered to be the most crucial? 2. What are some ways that public consultation can improve the outcomes of policy? 3. What part does research that is supported by evidence play in the process of formulating public policy?
Concerns Regarding the Implementation of Policies	1. Within the realm of efficiently implementing public policy, what do you consider to be the most significant challenges? 2. What are some ways that governments might address problems such as inefficiencies in bureaucratic processes or a lack of alignment among stakeholders? 3. In order to monitor and assess the effectiveness of policies, are there any specific ways that you recommend?

The Way Forward for Public Policy	1. What new developments or problems do you believe will have a significant impact on public policy over the next Five years? 2. How might technological advancement and creative thinking help improve policymaking?
Comments to Conclude	I am appreciative of your observations. Do you have any further thoughts or suggestions that they would like to offer with regard to the enhancement of public policy?
Closing Note	I want to express my gratitude once more for your time and skill. Your participation is greatly valued, and it will considerably contribute to the enrichment of our conversation.

Depending on the particiants the number of questions were asked to know more about the subject and validate the survey data to justify the reseach analysis.

SURVEY QUESTIONS

The survey was conducted in two stages

1. General Pubic opinion

2. Expert / Industry professionals

GENERAL PUBIC OPINION

SECTION 1 : DISCLAIMER AND CONSENT

1. By clicking "Agree" or proceeding with the questionnaire, you acknowledge that you have read, understood, and voluntarily consent to participate in this research.

   ◯ Agree

   ◯ Disagree

SECTION 2 : DEMOGRAPHIC INFORMATION

2. Your name : _____ (Optional)

3. Age (Years) *

   ◯ 20 - 30

   ◯ 30 - 40

   ◯ 40-50

   ◯ 50-60

   ◯ > 60

   ◯ Other:

4. Gender *

   ◯ Male

   ◯ Female

   ◯ Prefer not to say

   ◯ Other

5. Occupation * *Mark only one oval.*

  ◯ Engineer

  ◯ Student

  ◯ Management

  ◯ CxO

  ◯ Doctor / Lawyer

  ◯ Consultant

  ◯ Academics

  ◯ Others

  ◯ Other:

6. Geographic Location * *Mark only one oval.*

  ◯ Asia

  ◯ North America

  ◯ South America

  ◯ Europe Union

  ◯ Australia

  ◯ India

  ◯ APAC

  ◯ Other

7. Your email address (Optional) : _____

SECTION 3 : DIGITAL HEALTH METAVERSE ENGAGEMENT

Metaverse is a hypothetical iteration of the Internet as a single, universal, and immersive virtual world that is facilitated by the use of virtual reality (VR), augmented reality (AR) headsets, arti cial intelligence (AI) or Robotics automation

8. Have you used any digital health technologies or applications in the past one * year?

  ◯ Yes

  ◯ No

9.   If yes, please specify the types of digital health technologies or applications you *
have used *Check all that apply.*

☐ Wearable Devices

☐ Health Apps (Android / Apple)

☐ Tele-Medicine

☐ Virtual Reality (VR) Solution

☐ Augmented Reality (AR) Solutions

☐ Robotic based solutions

☐ AI Based Products, Solutions or Services

☐ Robotics Surgery

☐ Hospital HIS / EHR / EMR

☐ Others

10.   How frequently do you use digital health technologies or applications?

◯ Daily

◯ Weekly

◯ Monthly

◯ Rarely

◯ Never

11.   What motivates you to use digital health technologies or applications? (Select all that
apply) *Check all that apply.*

☐ Convenience

☐ Health Monitoring

☐ Access to healthcare services

☐ Data tracking and Analysis

☐ Improved health outcomes

☐ Others

SECTION 4: POLICY AWARENESS AND OPINIONS

12. Are you aware of existing policies or regulations related to digital health   *
technologies and data privacy?

◯ Yes

◯ No

13. If yes, please briefly describe the policies or regulations you are aware of. *

_____

14. Do you believe there is a need for new public policies or interventions to govern the *
    digital health metaverse?

    ◯ Yes

    ◯ No

15. Do you believe a robust policy framework exist today? *

    ◯ Yes

    ◯ No

16. Do you believe current policies provide protection to citizens? *

    ◯ Yes

    ◯ No

17.   If No, Please provide additional details _____

18. What, in your opinion, are the most significant **challenges** associated with   *
    implementing public policies in the digital health metaverse?

    ☐ Privacy and Security - Data Protection
    ☐ Privacy and Security - Cybersecurity Threats
    ☐ Regulatory and Legal Issues - Jurisdictional Challenges
    ☐ Regulatory and Legal Issues - Compliance
    ☐ Inclusivity
    ☐ Ethical Considerations
    ☐ Technological Challenges
    ☐ Public Trust and Engagement

    ☐ Other:

19. What, in your opinion, are the most significant **opportunities** associated with *
implementing public policies in the digital health metaverse? *Check all that apply.*

- [ ] Improved Access to Healthcare availability
- [ ] Enhanced Patient Engagement
- [ ] Efficiency and Cost Savings
- [ ] Data Driven Predictive Analytics
- [ ] Collaborative Research and Innovation
- [ ] Enhanced Public Health Initiatives
- [ ] Community Engagement
- [ ] Innovation in Health Delivery
- [ ] Models Empowerment of Patients
- [ ] Other:

20. How can policymakers ensure the effective implementation of new * healthcare
policies? *Check all that apply.*

- [ ] Stakeholder Engagement
- [ ] Public Participation
- [ ] Defined Objectives and Feasibility Analysis
- [ ] Robust Legal and Regulatory Framework
- [ ] Technological Infrastructure
- [ ] Continuous Monitoring and Evaluation
- [ ] Pilot Programs and Phased Implementation
- [ ] Public Awareness and Communication
- [ ] Collaboration and Partnerships - Cross sector and International
- [ ] Policy Flexibility and Adaptability

21. Do you have suggestions for how healthcare policy initiatives should be funded and
sustained over time? *Mark only one oval.*

- ( ) Government Funding
- ( ) Public-Private Partnerships (PPPs)
- ( ) Non-Governmental Organizations (NGOs) and Foundations
- ( ) International Funding and Aid
- ( ) Innovative Financing Mechanisms
- ( ) Research and Development (RandD) Funding
- ( ) Community-Based Funding
- ( ) Other:

22. To what extent do health care policies provide high-quality, inclusive * and cost-efficient health care? *Mark only one oval.*

- ⬭ 1.   Health care policy does not achieve the criteria at all
- ⬭ 2.   Health care policy achieves the criteria partly
- ⬭ 3.   Health care policy achieves the criteria largely
- ⬭ 4.   Health care policy achieves the criteria fully

SECTION 5: DATA PRIVACY AND SECURITY

23. How concerned are you about the privacy and security of your health data in * the digital health metaverse? (Scale: 1 - Not concerned, 5 - Very concerned) *Mark only one oval.*

1	2	3	4	5
⬭	⬭	⬭	⬭	⬭

Very concerned

24. Have you ever experienced a data breach or privacy violation related to your health data in the digital health metaverse?

- ⬭ Yes
- ⬭ No

25. Have ever experienced compromise on your personal data? *

- ⬭ Yes
- ⬭ No

26. If yes, Do you believe current law and policies helps to protect you? *

- ⬭ Yes
- ⬭ No

27. What measures do you think should be taken to better protect the privacy and   * security of health data in the digital health metaverse?

- ⬭ Informed consent
- ⬭ Use multi-factor authentication
- ⬭ Advanced encryption technologies
- ⬭ Robust design of infrastructure and technologies
- ⬭ Using Artificial Intelligence
- ⬭ Others

SECTION 6: POLICY PREFERENCES

28. What types of public policy interventions or regulations do you believe are needed to ensure responsible and ethical use of emerging technologies in healthcare? *Check all that apply.*

- [ ] Data Privacy and Security Regulations
- [ ] Ethical Guidelines and Standards - Framework and Consent
- [ ] Bias and Fairness Regulations
- [ ] Access and Equity Policies - Digital Initiatives
- [ ] Quality and Safety Regulations
- [ ] Liability and Accountability Frameworks
- [ ] Training and Education
- [ ] Ethical Research Practices
- [ ] Patient-Centered Policies
- [ ] Global Collaboration and Standards
- [ ] Other:

29. Do you think policies should encourage or require healthcare providers to * adopt emerging technologies in their practice?
- ( ) Encourage
- ( ) Require
- ( ) Neither
- ( ) Not Sure

30. Do you think policies should encourage or require general public to adopt * emerging technologies in their practice?
- ( ) Encourage
- ( ) Require
- ( ) Neither
- ( ) Not Sure

31. Do you think the policies are created or updated with the speed of emerging technologies, innovations and changes in the ecosystem?
- ( ) Yes
- ( ) No
- ( ) Not Sure

32.   How can policymakers ensure the effective implementation of new healthcare *
       policies? *Check all that apply.*
       ☐   Ensuring social acceptability
       ☐   Communicating objectives
       ☐   Identifying multi-level stakeholders
       ☐   Commitment and Coordination
       ☐   Efficient and effective empowerment and engagement

33.   Do you envision the role of policymakers in addressing ethical challenges related to *
       emerging technologies? (How) *Mark only one oval.*
       ◯   Yes
       ◯   No
       ◯   Other:

34.   Do you think the policies are created or updated with the involvement of subject matter
       expert from healthcare management or healthcare industries? *
       ◯   Yes
       ◯   No
       ◯   I don't know

SECTION 7: DATA UTILIZATION AND ACCESS

35.   Should individuals have greater control over their health data and the ability to grant or
       deny access to healthcare providers, researchers, and technology companies? *
       ◯   Yes
       ◯   No
       ◯   Not Sure

36.   What criteria should be considered when granting access to health data within the
       digital health metaverse? (Select all that apply) *
       ☐   a. Informed consent
       ☐   b. Data anonymization
       ☐   c. Data encryption
       ☐   d. Strict data access controls
       ☐   e. Regulatory compliance
       ☐   f. Other (please specify):

37.   If Others, Please provide additional details: _____

SECTION 8: HEALTHCARE OUTCOMES

38.   In your opinion, how have digital health technologies and the digital health metaverse impacted healthcare outcomes and patient experiences? *Check all that apply.*

- [ ] Enhanced Access to Care
- [ ] Better Disease Management
- [ ] Preventive Care
- [ ] Improved Treatment Adherence
- [ ] Data-Driven Insights
- [ ] Enhanced Patient Experiences
- [ ] Enhanced Care Coordination
- [ ] Privacy and Security Concerns
- [ ] Other:

39.   Are there specific examples or case studies of successful policy interventions in the digital health metaverse that you are aware of? Please describe if any

SECTION 9: PUBLIC ENGAGEMENT

40.   Can policymakers and researchers effectively engage with the public and   * gather input on digital health policy development?

- ( ) Yes
- ( ) No

41.   If Yes or No, Please provide more details.

42.   Is there anything else you would like to share regarding the digital health   * metaverse, public policies, or emerging technologies?

SECTION 11: CONCLUSION

Thank you for participating in this questionnaire. Your input is valuable to our research. If you have any further comments or questions, please feel free to contact us. If you are willing to provide your contact information for potential follow-up interviews or further participation in the research, please provide your name and email address: By submitting this questionnaire, you con rm that you have read and understood the informed consent, and you consent to participate in this research.

EXPERT OPINION SURVEY:

Novel approaches of public policy interventions for evaluating and harnessing data from the digital health metaverse to enhance health management through emerging technologies (Experts Opinion)

Participants' Rights: As a participant in this research, you have the following rights:

1.   Voluntary Participation: Your participation is entirely voluntary, and you have the right to withdraw from the questionnaire at any time without providing a reason.
2.   Confidentiality: Your responses will be anonymized, and no personally identifiable information will be associated with your answers.
3.   Privacy: We will ensure that your data is stored securely and that only authorized research team members have access to the collected information.
4.   Informed Consent: By proceeding with this questionnaire, you are indicating your informed consent to participate in the research. Your consent signifies that you have read and understood this informed consent statement.

If you have any questions or concerns regarding this research or the informed consent statement, please do not hesitate to contact us at chandrashekhar1@ssbm.ch or chandrashekharreddyc@gmail.com.

 * Indicates required question

SECTION 1 : DISCLAIMER AND CONSENT

1. By clicking "Agree" or proceeding with the questionnaire, you acknowledge that *
you have read, understood, and voluntarily consent to participate in this research. *Mark only one oval.*

◯   Agree

◯   Disagree

SECTION 2 : DEMOGRAPHIC INFORMATION

2. Select your age group * *Mark only one oval.*

◯   51 years and above

◯   41 to 50 years

◯   31 to 40 years

◯   21 to 30 years

3. Gender * *Mark only one oval.*

◯ Male

◯ Female

◯ Prefer not to say

◯ Other

4. Your Role * *Mark only one oval.*

◯ Management Level

◯ Govt. Official

◯ CxO

◯ Consultant

◯ Technologist

◯ Architect

◯ Policy Maker

◯ Law Professor /

◯ Practitioner Other:

5. Geographic Location * *Mark only one oval.*

◯ India

◯ APAC

◯ North America

◯ Europe

◯ Australia

◯ Other:

6. Your educational background * *Mark only one oval.*

◯ Diploma

◯ Graduate

◯ Post Graduate

◯ Doctoral

SECTION 3 : EXECUTIVE CAPACITY

The term "executive capacity" means an assignment within an organization in which the employee primarily— (i) directs the management of the organization or a major component or function of the

organization; (ii) establishes the goals and policies of the organization, component, or function; (iii) exercises wide latitude in discretionary decision-making.

Definitions: Metaverse is a hypothetical iteration of the Internet as a single, universal, and immersive virtual world that is facilitated by the use of virtual reality (VR), augmented reality (AR) headsets, artificial intelligence (AI) or Robotics automation

7. Do you believe a robust policy framework exist today? * *Mark only one oval.*

◯ Yes

◯ No

8. How big of an impact do strategic planning departments and organizations * have on policymaking? *Mark only one oval.*

◯ Strategic planning units and bodies have a significant impact on government decision-making because they take a long-term perspective on policy concerns and workable solutions.

◯ Those in charge of strategic planning adopt a long-term perspective on potential policy problems and remedies. Although they have a restricted issue scope or depth of impact, they have a systematic influence on government decision-making.

◯ Those in charge of strategic planning adopt a long-term perspective on potential policy problems and remedies. They occasionally have some impact over government choices.

◯ In reality, there aren't any organizations or groups that look long-term at problems with policies and workable answers.

9. To what extent do ministerial or cabinet committees efficiently synchronize * cabinet proposals? *Mark only one oval.*

◯ Committees often conduct the first examination and coordination of the majority of cabinet initiatives.

◯ Committees often analyse and coordinate the majority of cabinet ideas, especially those that are politically or strategically significant.

◯ Committees rarely conduct thorough reviews or coordinate cabinet recommendations.

◯ Committees do not examine or coordinate cabinet initiatives. Alternatively, there is an absence of both a ministerial and cabinet committee.

10.   To what extent do ministry officials/civil servants efficiently synchronize *
policy   proposals? *Mark only one oval.*

◯   The majority of policy suggestions are efficiently organized by ministry officials or
      civil servants.

◯   Ministry officials/civil servants efficiently coordinate several policy initiatives.

◯   Ministry officials/civil servants engage in the coordination of policy initiatives.

◯   Ministry officials/civil servants lack or hardly coordination in proposing policies.

11.   To what extent and with what level of efficacy are digital technologies
employed to facilitate inter-ministerial coordination in the areas of policy creation and
monitoring? * *Check all that apply.*

☐ The government use digital technologies extensively and efficiently to facilitate
  interministerial coordination.

☐ The government predominantly use digital technologies to facilitate interministerial
  collaboration, demonstrating a moderate level of effectiveness.

☐ The government employs digital technology to a reduced extent and with restricted
  impact in order to facilitate interministerial coordination.

☐ The government lacks significant utilization of digital technologies to facilitate
  interministerial coordination.

12.   To what degree do government ministries systematically assess the efficacy
and/or efficiency of public policies and utilize evaluation findings to modify existing
policies or create new ones? * *Mark only one oval.*

◯ Ex post evaluations are conducted for all major policies and are typically utilized to
  revise existing policies or create new regulations.

◯ Ex post evaluations are conducted for the majority of key policies and are utilized to
  revise existing policies or create new policies.

◯ Infrequent ex post evaluations are conducted for major policies and are seldom
  utilized for the modification of current policies or the creation of new policies.

◯ Ex post evaluations are typically neglected and do not significantly influence the
  process of revising current policies or creating new policies.

13. To what degree does the governmental structure incorporate tools to guarantee that ministers effectively execute the government's agenda? * *Mark only one oval.*

◯ The government's organizational structure effectively facilitates ministers in implementing the government's program through robust processes.

◯ The governmental structure offers many channels for ministers to execute the program of the government.

◯ The government's organizational structure lacks robust mechanisms for ministers to effectively implement the government's program.

◯ The governmental structure lacks tools for ministers to execute the program of the government.

14. To what degree is the government effectively and impartially implementing * regulations, even in the face of vested interests? *Mark only one oval.*

◯ Government agencies diligently enforce regulations impartially and efficiently.

◯ Government agencies generally implement regulations e   efficiently and impartially.

◯ Government agencies implement regulations, but their enforcement is inefficient and subject to bias.

◯ Government agencies exhibit inadequate, inconsistent, and biased enforcement of regulations.

SECTION 4: PUBLIC ENGAGEMENT

15. Does the government often consider the opinions of non-governmental* specialists when making decisions? *Mark only one oval.*

◯ Almost often, early government decision-making involves open consultation between the government and non-governmental specialists.

◯ When making early decisions on significant political undertakings, the government talks openly with non-governmental specialists.

◯ When making early decisions, the government occasionally interacts with outside experts in a transparent manner.

◯ Non-governmental specialists are not consulted by the government, or the discussions that are already taking place are completely opaque and/or only exist on pro forma.

16.   What is the level of public awareness of public policies? * *Mark only one oval.*

◯ The majority of citizens possess extensive knowledge regarding a wide array of public policies.

◯ The majority of citizens lack awareness on governmental policies.

◯ A significant number of persons possess a comprehensive understanding of specific governmental policy.

◯ Scant few persons possess a comprehensive understanding of public policies; the majority of citizens possess only a rudimentary grasp of public policies.

17.   Does the government disseminate data and information in a manner that   * enhances citizens' ability to ensure government transparency and responsibility?

Mark only one oval.

◯ The government disseminates statistics and information in a comprehensive, timely, and user-friendly manner.

◯ The government consistently disseminates statistics and information in a thorough, prompt, and accessible manner.

◯ The government disseminates data in a restricted manner, lacking timeliness and user-friendliness

◯ The government publishes (almost) no relevant data.

18.   To what degree do media outlets in your country thoroughly examine the   * reasoning and consequences of public policies? *Mark only one oval.*

◯ The majority of mass media companies prioritize high-quality information material that analyzes the reasoning and consequences of public policy.

◯ Approximately 50% of mass media brands prioritize the production of high quality information material that examines the reasoning and consequences of public policy.

◯ Only a small fraction of mass media brands prioritize the production of high quality information material that critically analyzes governmental issues.

◯ The content of all mass media brands is predominantly characterized by shallow or superficial infotainment.

19.   To what degree can economic interest groupings (such as employers, *
industry, and labour) effectively develop pertinent policies? *Mark only one oval.*

○ The majority of interest associations has a high level of competence in developing pertinent policies.

○ A multitude of interest groupings possess a high level of proficiency in creating pertinent policies.

○ Only a small number of interest groupings possess the high level of capability required to develop policies that are directly applicable.

○ The majority of interest groupings lack the ability to develop pertinent policy.

SECTION 5: INDEPENDENT AUDITING

20.   Is there an autonomous and efficient audit institution in existence? *Mark only one oval.*

○ There is a functional and autonomous audit office in existence.

○ There is a functional and autonomous audit office, albeit its authority is rather restricted.

○ There is an autonomous audit office but, its function is significantly restricted.

○ There is no autonomous and efficient audit institution.

21.   Is there an autonomous and efficient ombudsman's office in place? *

Mark only one oval.

○ There is a functional and autonomous ombudsman office in place.

○ There is a functional and autonomous ombuds office, albeit its capacity for advocacy is somewhat restricted.

○ There is an autonomous ombuds office in existence but, its capacity for lobbying is significantly restricted.

○ An efficient and autonomous ombudsman office does not exist.

22. Does an autonomous regulatory body exist to effectively ensure government *
departments are held accountable for their management of data protection and privacy
matters? *Mark only one oval.*

◯   A separate and efficient data protection authority is in place.

◯ A separate and efficient data protection authority exists, although its jurisdiction is
somewhat restricted.

◯ There is a data protection authority in place, however, its autonomy and efficacy are
significantly constrained.

◯ There is currently a lack of a competent and autonomous data protection authority.

SECTION 6: DATA PRIVACY AND SECURITY

23. Do you believe current law and policies helps to protect you? * *Mark only one
oval.*

◯   Yes

◯   No

24. How concerned are you about the privacy and security of your data or health *
data in the digital metaverse? (Scale: 1 - Not concerned, 5 - Very concerned) *Mark only
one oval.*

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Very Concerned

25. To what extent does the internal security policy safeguard citizens from
security threats? *Mark only one oval.*

◯ The internal security policy provides highly effective protection for citizens against
security hazards.

◯ The effectiveness of the internal security policy in safeguarding citizens against
security hazards varies.

◯ The internal security policy fails to adequately safeguard citizens from security
hazards.

◯ The internal security policy worsens the security threats.

26. To what degree do health care policies ensure the provision of health care that * is of superior quality, encompasses all individuals, and is economically efficient?

Mark only one oval.

◯ The health care policy meets all the criteria completely.

◯ The health care policy largely meets the criteria.

◯ The health care policy partially meets the criteria.

◯ The health care policy fails to meet the criteria entirely.

SECTION 6: POLICY PREFERENCES

27. What types of public policy interventions or regulations do you believe are * needed to ensure responsible and ethical use of emerging technologies in healthcare? (Open-ended)

SECTION 7: CONCLUSION

Thank you for participating in this questionnaire. Your input is valuable to our research. If you have any further comments or questions, please feel free to contact us.

If you are willing to provide your contact information for potential follow-up interviews or further participation in the research, please provide your name and email address:

By submitting this questionnaire, you confirm that you have read and understood the informed consent, and you consent to participate in this research.

REFERENCES

1. Agarwal, O. and Somanathan, T. (2005). Public Policy Making In India: Issues and Remedies.

2. Ajaykumar, S., Chandola, B., Ray, T. and Sarma, A. (2022). National Data Governance Framework Policy: Recommendations to the Ministry of Electronics and Information Technology.

3. Alnsour, Y., Hadidi, R. and Singh, N. (2019) 'Using data analytics to predict hospital mortality in Sepsis patients', International journal of healthcare information systems and informatics: official publication of the Information Resources Management Association, 14(3), pp. 40–57. Available at: https://doi.org/10.4018/ijhisi.2019070104.

4. Anderson, M., and Roberts, P. (2022). Visual Analytics in Policy Research: Methods and Applications. Policy Analysis Quarterly, 15(1), 45-62.

5. Andrew, J., Isravel, D.P., Sagayam,K.M., Bhushan,B., Sei,Y., and Eunice,J. (2023). Blockchain for healthcare systems: Architecture, security challenges, trends and future directions, Journal of Network and Computer Applications, Volume 215,2023,103633, ISSN 1084-8045, https://doi.org/10.1016/j.jnca.2023.103633.

6. Andrews, M. (2013). How do Governments get Great. Carey, G., and Crammond, B. (2015). Systems change for the social determinants of health. In BMC Public

Health (Vol. 15, Issue 1). BioMed Central. https://doi.org/10.1186/s12889-016-1979-8

7. Ansell, C. and Gash, A. (2008) 'Collaborative governance in theory and practice,' Journal of Public Administration Research and Theory, 18(4), pp. 543–571. https://doi.org/10.1093/jopart/mum032.

8. Argyris, C., and Schön, D. A. (1978). Organizational learning: A theory of action perspective. Addison-Wesley.

9. Arnold and Porter (2024) Virtual and Digital Health Digest: Publications and Presentations, Arnold & Porter. Available at: https://www.arnoldporter.com/en/perspectives/publications/2024/04/virtual-and-digital-health-digest (Accessed: 03 March 2024).

10. Azahaf,N., (2011). Governance capacities in the BRICS. https://www.sgi-network.org/docs/publications/Governance_Capacities_in_the_BRICS.pdf. (Accessed: 17 September 2023).

11. Azaria, A. et. al. (2016) 'MedRec: Using Blockchain for Medical Data Access and Permission Management,' MedRec [Preprint]. https://doi.org/10.1109/obd.2016.11.

12. Bajwa, J., Munir, U., Nori, A., Williams, B., (2021). Artificial intelligence in healthcare: transforming the practice of medicine. Future Healthc J. 2021 Jul;8(2):e188-e194. doi: 10.7861/fhj.2021-0095. PMID: 34286183; PMCID: PMC8285156.

13. Baltaxe (2019), Digital Health Transformation of Integrated Care in Europe: Overarching Analysis of 17 Integrated Care Programs, Journal Of Medical Internet Research, 2019

14. Bashshur, R. L., Shannon, G. W., Krupinski, E. A., Grigsby, J., and Kvedar, J. C. (2009). National telemedicine initiatives: essential to healthcare reform. Telemedicine and e-Health, 15(6), 600-610.

15. Bathula, A., Gupta, S., Merugu, S., Saba, L., Fauda, M. and Suri, J., (2024) 'Blockchain, artificial intelligence, and healthcare: the tripod of future—a narrative review,' Artificial Intelligence Review, 57(9). https://doi.org/10.1007/s10462-024-10873-5

16. Benrimoh, D., Chheda, F. D., and Margolese, H. C. (2022). The Best Predictor of the Future—the Metaverse, Mental Health, and Lessons Learned From Current Technologies. JMIR Mental Health (Vol. 9, Issue 10). JMIR Publications. https://doi.org/10.2196/40410

17. Bertot, J. C., Jaeger, P. T., and Grimes, J. M. (2010). The impact of policies on government social media usage: Issues, challenges, and recommendations. Government Information Quarterly, 27(1), 54-61.

18. "Bertot, J.C. , Jaeger T.J., Grimes,J.M., (2010). Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. Government Information Quarterly Volume 27, Issue 3, July 2010, Pages 264-271"

19. Bhatia,B., and Joshi,S. (2023). Applications of Metaverse in the Healthcare Industry. Available from: 10.1109/ICIDCA56705.2023.10099897

20. Bhattacharjee, K.K. and Chatterjee, S. (2020) 'Adoption of artificial intelligence in higher education: a quantitative analysis using structural equation modelling', Education and information technologies, 25(5), pp. 3443–3463. Available at: https://doi.org/10.1007/s10639-020-10159-7.

21. Bhattacharya, S., Kumar, A., Kaushal, V., and Singh, A. (2018) . Applications of m-Health and e-Health in public health sector: The challenges and opportunities. Int J Med Public Health;8:56-7.

22. Boin, A., and T Hart, P. (2003). Public leadership in times of crisis: Mission impossible? Public Administration Review, 63(5), 554-563.

23. Börzel, T. A., and Risse, T. (2007). Multilevel governance in the European Union. Journal of European Public Policy, 14(4), 572-593.

24. Brown, K. A., and Zhang, L. (2021). Frameworks for Artificial Intelligence Regulation in Public Health. Health Policy and Technology, 10(4), 105–117. [DOI: 10.1016/j.hlpt.2021.100542]

25. Brown, K., Davis, R., and Thompson, E. (2021). Challenges in Public Policy Data Analysis: A Systematic Review. International Journal of Policy Research, 42(3), 312-328.

26. Button, K. and Keeler, T.E. (1993) "The Regulation of Transport Markets," The Economic Journal. Oxford University Press, p. 1017. doi:10.2307/2234718.

27. Carey, G. and Crammond, B. (2015) "Systems change for the social determinants of health," BMC Public Health. BioMed Central. doi:10.1186/s12889-015-1979-8.

28. Chakravorty, B. et al. (2023) 'Impact of the COVID-19 crisis on India's rural youth: Evidence from a panel survey and an experiment,' World Development, 168, p. 106242. https://doi.org/10.1016/j.worlddev.2023.106242.

29. Chandrakar, E. and Dahiya, A. (2024) 'Enhancing public healthcare security: Integrating cutting-edge technologies into social medical systems', South Eastern European Journal of Public Health, pp. 193–199. doi:10.70135/seejph.vi.837.

30. Chandran, S. (2016). Public Health Policy and Governance in India: An Overview. RELX Group (Netherlands). (Accessed: 28 February 2024).

31. Chang, A. (2019) "The Role of Artificial Intelligence in Digital Health," in Computers in health care. Springer International Publishing, p. 71. doi:10.1007/978-3-030-12719-0_7.

32. Chatterjee, S. (2015) 'Security and privacy issues in E-Commerce: A proposed guidelines to mitigate the risk', in 2015 IEEE International Advance Computing Conference (IACC). 2015 IEEE International Advance Computing Conference (IACC), IEEE. Available at: https://doi.org/10.1109/iadcc.2015.7154737.

33. Chatterjee, S. (2020a) 'AI strategy of India: policy framework, adoption challenges and actions for government', Transforming Government People Process and Policy, 14(5), pp. 757–775. Available at: https://doi.org/10.1108/tg-05-2019-0031.

34. Chaudhuri, R., Chatterjee, S., and Ghosh, S. K. (2020b). Knowledge management in improving business process:An interpretative framework for successful

implementation of AI–CRM–KM system in organizations. Business Process Management Journal, 26(6), 1261–1281. Advance online publication. doi:10.1108/BPMJ-05-2019-0183

35. Chauhan LS (2011). Public health in India: Issues and challenges. Indian J Public Health 2011;55:88-91.

36. Chen, Y. and Esmaeilzadeh, P. (2024) "Generative AI in Medical Practice: In-Depth Exploration of Privacy and Security Challenges," Journal of Medical Internet Research. JMIR Publications. doi:10.2196/53008.

37. Chen, Y., and Thompson, R. (2022). Understanding Policy Implementation through Visual Analytics. Public Administration Review, 45(3), 267-284.

38. Chitrapu, R. (2024) An overview of health policy in India, Indian Journal of Health Studies. Available at: https://www.academia.edu/102451016/An_Overview_of_Health_Policy_in_India (Accessed: 04 August 2023).

39. Chukwu E, Woolaston K,Kaufer R,Bortolus A,Hewitt C, Schwindt E,Sogbanmu T,Schwenkenbecher A,Rubin H,Slanickova H, Schneider M,Remco Heesen R and Mitova V (2024) 'Examining self-described policy-relevant evidence base for policymaking: An evidence map of COVID-19 literature', BMJ Public Health, 2(2). doi:10.1136/bmjph-2023-000694.

40. Crawford, A. and Serhal, E. (2020) "Digital Health Equity and COVID-19: The Innovation Curve Cannot Reinforce the Social Gradient of Health," JMIR. Journal

of medical internet research/Journal of medical internet research. JMIR Publications. doi:10.2196/19361.

41. Cummins, N., & Schuller, B. W. (2020). Five Crucial Challenges in Digital Health. Frontiers in digital health, 2, 536203. https://doi.org/10.3389/fdgth.2020.536203

42. De Aguiar, E.J. et. al. (2020) 'A survey of Blockchain-Based Strategies for Healthcare,' ACM Computing Surveys, 53(2), pp. 1–27. https://doi.org/10.1145/3376915.

43. Deo, N., & Anjankar, A. (2023). Artificial Intelligence With Robotics in Healthcare: A Narrative Review of Its Viability in India. Cureus, 15(5), e39416. https://doi.org/10.7759/cureus.39416

44. Digital Health and Innovation (DHI) (2019) Recommendations on digital interventions for health system strengthening. https://www.who.int/publications/i/item/9789241550505/.

45. Digital Health and Innovation (DHI) (2021) Global strategy on digital health 2020-2025. https://www.who.int/publications/i/item/9789240020924. Licence: CC BY-NC-SA 3.0 IGO

46. Dohan, M.S. and Chatterjee, S. (2021) 'Artificial Intelligence for Healthcare in India,' International Journal of Healthcare Information Systems and Informatics, 16(4), pp. 1–11. https://doi.org/10.4018/ijhisi.20211001.oa17.

47. Drishti IAS (2023) The Hiroshima AI process for Global AI Governance, Drishti IAS. Available at: https://www.drishtiias.com/daily-updates/daily-news-

analysis/the-hiroshima-ai-process-for-global-ai-governance   (Accessed: 04
December 2023).

48. Ebrahimzadeh, F. M., and Safa, R. (2024). Unlocking the Potential of the Metaverse for Innovative and Immersive Digital Care. In arXiv (Cornell University). Cornell University. https://doi.org/10.48550/arxiv.2406.07114

49. Edelman   Trust   Barometer   (2024) India Report. https://www.edelman.in/sites/g/files/aatuss371/files/2024-03/2024%20Edelman%20Trust%20Barometer%20India%20Report_0.pdf.

50. Eubanks, R.H. (2018) Artificial intelligence and the healthcare ecosystem - Part one. https://www.linkedin.com/pulse/artificial-intelligence-healthcare-ecosystem-part-one-eubanks/. (Accessed: 17 December 2024).

51. Fishkin, J. S. (2009). When the people speak: Deliberative democracy and public consultation. Oxford University Press.

52. Ford, T. J., Buchanan, D. M., Azeez, A., Benrimoh, D., Kaloiani, I., Bandeira, I. D., Hunegnaw, S., Lan, L., Gholmieh, M., Buch, V., and Williams, N. R. (2023). Taking modern psychiatry into the metaverse: Integrating augmented, virtual, and mixed reality technologies into psychiatric care, Frontiers in Digital Health (Vol. 5). Frontiers Media. https://doi.org/10.3389/fdgth.2023.1146806

53. Gothankar, J.S., Doke, P.P. and Murarkar, S.K. (2022) Digital technology for improving health. Indian J Public Health 2022;66:399-400.

54. Guruswamy, M. (2017) 'Justice K.S. Puttaswamy (Ret'd) and Anr v. Union of India and Ors', American Journal of International Law, 111(4), pp. 994–1000. doi:10.1017/ajil.2017.92.

55. Halachmi, A. (2004). E-Government Theory and Practice: The Evidence from Tennessee (USA).

56. Head, B. W. (2010). Evidence-based policymaking: A critical review. Australian Journal of Public Administration, 69(4), 433-448.

57. Heeks, R. (2006). Theorizing ICT4D research. Information Systems Journal, 16(3), 235-248.

58. Heinrich, C.J. and Burch, P. (2015) Mixed methods for policy research and program evaluation. SAGE Publications, Incorporated

59. Huang, C. et al. (2021) "Measuring outcomes in healthcare economics using Artificial Intelligence: With application to resource management," Data and Policy. Cambridge University Press. doi:10.1017/dap.2021.29.

60. Ismail, L., & Buyya, R. (2022a). Artificial Intelligence Applications and Self-Learning 6G Networks for Smart Cities Digital Ecosystems: Taxonomy, Challenges, and Future Directions. Sensors (Basel, Switzerland), 22.

61. Ismail, L., & Buyya, R. (2023b). Metaverse: A Vision, Architectural Elements, and Future Directions for Scalable and Realtime Virtual Worlds. ArXiv, abs/2308.10559.

62. Johnson, R. and Lee, S. (2019). Understanding Policy-Driven Outcomes: A Meta-Analysis. Policy Studies Review, 28(2), 145-162.

63. Jones, P. and Rivera, A. (2020). The Intersection of Data Privacy, Security, and Public Governance. Digital Policy, Regulation and Governance, 22(5), 487–499. [DOI: 10.1108/DPRG-06-2020-0045]

64. Kapoor,S., and Mehta,S,. (2022). AI for You, pg 123-129, 134-138.

65. Kar, A.K. and Chatterjee, S. (2018) 'Regulation and governance of the Internet of Things in India', Digital Policy Regulation and Governance, 20(5), pp. 399–412. Available at: https://doi.org/10.1108/dprg-04-2018-0017.

66. Kasthuri, A., (2018). Challenges to Healthcare in India - The Five A's. Indian J Community Med. 2018 Jul-Sep;43(3):141-143. doi: 10.4103/ijcm.IJCM_194_18. PMID: 30294075; PMCID: PMC6166510.

67. Kevin, Yi-Lwern and Yap, (2024). 9. Navigating the Healthcare Metaverse: Immersive Technologies and Future Perspectives. Virtual worlds, Available from: 10.3390/virtualworlds3030020

68. Krishnan, R., & Bhada, S.V. (2020). An Integrated System Design and Safety Framework for Model-Based Safety Analysis. IEEE Access, 8, 146483-146497.

69. Laverty, L., and Harris, R. (2018). Can conditional health policies be justified? A policy analysis of the new NHS dental contract reforms. Social Science and Medicine, 207,46-54. Lindblom, C. (1959). The science of "muddling through". Public Administration Review, 19, 79- 88.

70. Maki, O. et al. (2022) "Development of Digitalization Road Map for Healthcare Facility Management," IEEE Access. Institute of Electrical and Electronics Engineers, p. 14450. doi:10.1109/access.2022.3146341.

71. Martinez, E., and Kumar, S. (2023). Modern Approaches to Policy Analysis: A Data-Driven Perspective. Journal of Public Administration, 38(1), 78-95.

72. Miller, A. R., and Tucker, C. (2017). Frontiers of Health Policy: Digital Data and Personalized Medicine. In A. R. Miller and C. Tucker, Innovation policy and the economy (Vol. 17, p. 49). University of Chicago Press. https://doi.org/10.1086/688844

73. Ministry of Health and Welfare GOI, Government of India, 2017. National Health Policy (Online). Ministry of Health and Welfare, Government of India, p. 28. https://www.nhp.gov.in/nhpfiles/national_health_policy_2017.pdf. (Accessed 25 May 2024).

74. Mitra, A., Soman, B., Gaitonde,R. and Bhatnagar,T. (2023). Data science approaches to public health: case studies using routine health data from India, January 20, 2023

75. Mohandas,S. (2017). AI and Healthcare in India: Looking Forward. https://editors.cis-india.org/internet-governance/blog/ai-and-healthcare-in-india-looking-forward. (Accessed: 17 December 2024).

76. "Moser, S. C., & Ekstrom, J. A. (2010). A Framework to Diagnose Barriers to Climate Change Adaptation. Proceedings of the National Academy of Sciences of the United States of America, 107, 22026-22031.

77. https://doi.org/10.1073/pnas.1007887107"

78. Mukta, R. et al. (2022) 'A survey of data minimisation techniques in blockchain-based healthcare,' Computer Networks, 205, p. 108766. https://doi.org/10.1016/j.comnet.2022.108766.

79. Mulryne, J. (2024) Virtual and Digital Health Digest – November 2024 | BioSlice Blog. https://www.biosliceblog.com/2024/11/virtual-and-digital-health-digest-november-2024/.

80. Murcia, M.J. and Suddaby, R. (2024) 'A layered governance approach to regulating big tech,' Long Range Planning, 57(4), p. 102453. https://doi.org/10.1016/j.lrp.2024.102453.

81. Murthy, K.K. (2007) 'Medical negligence and the law', Indian Journal of Medical Ethics [Preprint], (3). doi:10.20529/ijme.2007.046. (Accessed: 17 December 2024).

82. NITI Aayog (2021) Annual Report 2021–22.

83. NITI Aayog (2022a) Annual Report 2022–23.

84. NITI Aayog (2022b). Meta-governance: Role of metaverse in India's E-governance. https://www.niti.gov.in/index.php/meta-governance-role-metaverse-indias-e-governance.

85. Nutley S M., Walter I, and Davies H, Using evidence: How research can inform public services (Bristol, 2007; online edn, Policy Press Scholarship Online, 22 Mar. 2012), https://doi.org/10.1332/policypress/9781861346650.001.0001

86. Nwoke, J. (2024). Healthcare Data Analytics and Predictive Modelling: Enhancing Outcomes in Resource Allocation, Disease Prevalence and High-Risk Populations.

International Journal of Health Sciences, 7(7), 1–35. https://doi.org/10.47941/ijhs.2245

87. OECD (2020), "The OECD Digital Government Policy Framework: Six dimensions of a Digital Government", OECD Public Governance Policy Papers, No. 2, OECD Publishing, Paris, https://doi.org/10.1787/f64fed2a-en.

88. Olveen Carrasquillo et. al. (2021), Healthcare and Public Policy: Challenges and Opportunities for Research, The Science of Health Disparities Research

89. Onesimu, J.A., Karthikeyan, J. and Sei, Y. (2021) 'An efficient clustering-based anonymization scheme for privacy-preserving data collection in IoT based healthcare services,' Peer-to-Peer Networking and Applications, 14(3), pp. 1629–1649. https://doi.org/10.1007/s12083-021-01077-7.

90. Palaniappan, K., Lin, E.Y.T. and Vogel, S. (2024) "Global Regulatory Frameworks for the Use of Artificial Intelligence (AI) in the Healthcare Services Sector," Healthcare. Multidisciplinary Digital Publishing Institute, p. 562. doi:10.3390/healthcare12050562.

91. Patel,A., Bhavsar,K., Patel,K. and Suthar, A (2024) Advance analyzes for blockchain legal issues in India. COMPUTER RESEARCH AND DEVELOPMENT, 24–24(12), pp. 27–27. https://journalcrd.org/wp-content/uploads/4-CRD2506.pdf. (ISSN NO:1000-1239)

92. Paul, M., Upadhyay, P. and Dwivedi, Y.K. (2020) 'Roadmap to digitalisation of an emerging economy: a viewpoint,' Transforming Government People Process and Policy, 14(3), pp. 401–415. https://doi.org/10.1108/tg-03-2020-0054.

93. Peters, B.G and Pierre, J., (2020). Governance, politics and the state. Bloomsbury Publishing.

94. Pfeffer, J. and Sutton, R.I. (2006) Evidence-based management, Harvard Business Review. Available at: https://hbr.org/2006/01/evidence-based-management (Accessed: 04 January 2023).

95. Pillutla, V., Maslen, H. and Savulescu, J. (2018) Rationing elective surgery for smokers and obese patients: responsibility or prognosis?. BMC Med Ethics 19, 28. https://doi.org/10.1186/s12910-018-0272-7

96. Prakash, S. (2022) "Ethical Conundrums in the Application of Artificial Intelligence (AI) in Healthcare—A Scoping Review of Reviews," Journal of Personalized Medicine. Multidisciplinary Digital Publishing Institute, p. 1914. doi:10.3390/jpm12111914.

97. Rahul Matthan (2017), Beyond Consent: A New Paradigm for Data Protection . http://takshashila.org.in/wp-content/uploads/2017/07/TDD-Beyond-Consent-Data-Protection-RM-2017-03.pdf (Accessed: 17 December 2024).

98. Rao, U.P., Shukla, P.K., Trivedi, C., Gupta, S. and Shibeshi, Z.S. (2021) Blockchain for Information Security and Privacy. CRC Press. (Accessed 2024)

99. Rawat, D. B., and Alami, H. E., (2023). Metaverse: Requirements, Architecture, Standards, Status, Challenges, and Perspectives. In arXiv (Cornell University). Cornell University. https://doi.org/10.48550/arxiv.2302.01125

100.   Reddy KS, Patel V, Jha P, Paul VK, Kumar AK, Dandona L, et al (2011). Towards achievement of universal health care in India by 2020: A call to action. Lancet 2011;377:760-8.

101.   Rekha M. Menon et al., (2017). Wiley Online Library | Scientific Research Articles, journals, ... Available at: DOI:10.1596/31013 (Accessed: October 2024).

102.   Ricciardi, W., Pita Barros, P., Bourek, A., Brouwer, W., Kelsey, T., Lehtonen, L., & Expert Panel on Effective Ways of Investing in Health (EXPH) (2019). How to govern the digital transformation of health services. European journal of public health, 29(Supplement_3), 7–12. https://doi.org/10.1093/eurpub/ckz165

103.   Richtarik,M. (2022). Framing Public Policy in the Digital Era. Advances in multimedia and interactive technologies book series, Available from: 10.4018/978-1-6684-5907-2.ch015

104.   Rodriguez, R.V., Sinha, S. and Tripathi, S. (2020), "Impact of Artificial Intelligence on the health protection scheme in India", Public Administration and Policy: An Asia-Pacific Journal, Vol. 23 No. 3, pp. 273-281. https://doi.org/10.1108/PAP-03-2020-0019

105.   Roehrs, A., da Costa, C. A., Righi, R. D., & de Oliveira, K. S. (2017). Personal Health Records: A Systematic Literature Review. Journal of medical Internet research, 19(1), e13. https://doi.org/10.2196/jmir.5876

106. Rosenbloom, D.H., Clerkin, R.M. and Kravchuk, R.S. (2022) Public administration: Understanding management, politics, and law in, Taylor & Francis. Available at: https://doi.org/10.4324/9781003198116 (Accessed: 04 August 2024).

107. Rowe, G. and Frewer, L.J. (2000) 'Public Participation Methods: a framework for evaluation,' Science Technology & Human Values, 25(1), pp. 3–29. https://doi.org/10.1177/016224390002500101.

108. Sabatier, P. (2019) Theories of the policy process [Preprint]. doi:10.4324/9780367274689.

109. Sabel, Frederick, C., and William H. S., (2017), Democratic Experimentalism - Searching for Contemporary Legal Thought (Cambridge and New York, Cambridge University Press, 2017) , Columbia Public Law Research Paper No. 14-549, Available at SSRN: https://ssrn.com/abstract=2983932

110. Saeed, H., Malik, H., Bashir, U., Ahmad, A., Riaz, S., Ilyas, M., Bukhari, W. and Khan, M., (2022) 'Blockchain technology in healthcare: A systematic review,' PLoS ONE, 17(4), p. e0266462.https://doi.org/10.1371/journal.pone.0266462.

111. Salve, P. (2017) Repackaged: 15-year-old National Health Policy resurrected in 2017, Factchecker. Available at: https://www.factchecker.in/repackaged-15-year-old-national-health-policy-resurrected-in-2017 (Accessed: 03 March 2025).

112.   Schiller, C., Hellmann, T., Pieper, A., Serfozo, B., and Paulini, P. (2022). Liberal Democracies Must Demonstrate Long-term Thinking and Acumen in Crisis Management.

113.   Schwalbe, N. and Wahl, B. (2020) "Artificial intelligence and the future of global health," The Lancet. Elsevier BV, p. 1579. doi:10.1016/s0140-6736(20)30226-9.

114.   Sharma AK (2011). Telemedicine: A technology in waiting. Indian J Public Health 2011;55:286-8.

115.   Sharma, N.C. (2022) 'Healthcare companies are entering the metaverse. But can it help the sector?,' Business Today, 22 June. https://www.businesstoday.in/crypto/story/healthcare-companies-are-entering-the-metaverse-but-can-it-help-the-sector-338719-2022-06-22.

116.   Shi, S. et al. (2020) 'Applications of blockchain in ensuring the security and privacy of electronic health record systems: A survey,' Computers & Security, 97, p. 101966. https://doi.org/10.1016/j.cose.2020.101966.

117.   Simaiya, S., Lilhore, U. K., Sharma, S. K., Gupta, K., and Baggan, V. (2020). Blockchain: A new technology to enhance data security and privacy in Internet of things. Journal of Computational and Theoretical Nanoscience, 17(6), 2552-2556.researchgate.net

118.   Singh, N. (2024) The growth power of artificial intelligence - Capgemini. https://www.capgemini.com/insights/expert-perspectives/the-growth-power-of-artificial-intelligence/. (Accessed: 17 December 2024).

119.   Smith, J., and Taylor, R. (2023). The Role of Stakeholder Engagement in Policy Effectiveness. Journal of Public Administration Research and Theory, 45(2), 123–138. [DOI: 10.1093/jopart/mud003]

120.   Smith, J., Brown, A., and Wilson, M. (2020). Demographic Segmentation in Policy Analysis: A Comprehensive Review. Journal of Public Policy, 35(4), 278-295.

121.   Sookhak, M. et al. (2020) 'Blockchain and smart contract for access control in healthcare: A survey, issues and challenges, and open issues,' Journal of Network and Computer Applications, 178, p. 102950. https://doi.org/10.1016/j.jnca.2020.102950.

122.   Sounderajah V, Aggarwal R, Martin G, Ting DS, Karthikesalingam A, King D, et al (2021). Diagnostic accuracy of deep learning in medical imaging: A systematic review and meta-analysis. NPJ Digit Med 2021;4:65.

123.   Sreenivasulu N.S. and Chatterjee, S. (2019) 'Personal data sharing and legal issues of human rights in the era of Artificial Intelligence', International journal of electronic government research, 15(3), pp. 21–36. Available at: https://doi.org/10.4018/ijegr.2019070102.

124.   Steele, J. and Iliinsky, N. (2010), Beautiful visualization - looking at data through the eyes of experts: https://books.google.co.in/. Available at: https://books.google.co.in/books/about/Beautiful_Visualization.html?id=TKh6fdl KwfMC&redir_esc=y , ISBN:1449390684, 9781449390686, (Accessed: 04 Jun 2024).

125.   Stefan Buttigieg, Keyrellous Adib, Adam Abbis, Elizabeth Anderson and BMJ Studio (2024) Empowering or excluding? the impact of digital technology on Public Health, BMJ Future Health 2024. Available at: https://futurehealth.bmj.com/webinars-1/empowering-excluding-impact-digital-technology-public-health (Accessed: 03 May 2024).

126.   Stiftung, B. (2022) SGI 2022 | Publications. https://www.sgi-network.org/2022/Publications. "SGI 2022 Publications."

127.   Thacharodi, A., Singh, P., Meenatchi, R., Tawfeeq Ahmed, Z. H., Kumar, R. R. S., V, N., Kavish, S., Maqbool, M., & Hassan, S. (2024). Revolutionizing healthcare and medicine: The impact of modern technologies for a healthier future-A comprehensive review. Health care science, 3(5), 329–349. https://doi.org/10.1002/hcs2.115

128.   Thapar, A., Cooper, M., Eyre, O., & Langley, K. (2013). What have we learnt about the causes of ADHD?. Journal of child psychology and psychiatry, and allied disciplines, 54(1), 3–16. https://doi.org/10.1111/j.1469-7610.2012.02611.x

129.   Trafimow, D. (2009) 'The theory of reasoned action,' Theory & Psychology, 19(4), pp. 501–518. https://doi.org/10.1177/0959354309336319.

130.   Tseng, T.-W., Yang, C.-Y. and Liu, C.-T. (2016) 'Designing privacy information protection of electronic medical records,' 2021 International Conference on Computational Science and Computational Intelligence (CSCI), pp. 75–80. https://doi.org/10.1109/csci.2016.0022.

131.   Umbrello, S. (2019) 'Imaginative Value sensitive design: Using moral imagination theory to inform responsible technology design,' Science and Engineering Ethics, 26(2), pp. 575–595. https://doi.org/10.1007/s11948-019-00104-4.

132.   Veras, M., Labbé, D., Furlano, J. A., Zakus, D., Rutherford, D., Pendergast, B., and Kairy, D. (2023). A framework for equitable virtual rehabilitation in the metaverse era: challenges and opportunities [Review of A framework for equitable virtual rehabilitation in the metaverse era: challenges and opportunities]. Frontiers in Rehabilitation Sciences, 4. Frontiers Media. https://doi.org/10.3389/fresc.2023.1241020

133.   Vignesh, J. (2017). How innovations in AI, virtual reality are advancing healthcare in India to new frontiers. https://economictimes.indiatimes.com/small-biz/startups/how-innovations-in-ai-virtual-reality-are-advancing-healthcare-in-india-to-new-frontiers/articleshow/59060040.cms

134.   Vithanwattana, N., Mapp, G. and George, C. (2016) 'mHealth - Investigating an Information Security Framework for mHealth Data: Challenges and Possible Solutions,' mHealth, pp. 258–261. https://doi.org/10.1109/ie.2016.59.

135.   Wang, G. (2022) "Development of metaverse for intelligent healthcare," Nature Machine Intelligence. Nature Portfolio, p. 922. doi:10.1038/s42256-022-00549-6.

136.   Wasnik,A., and Bhasin, A. (2022) 'Meta-governance: Role of metaverse in India's E-governance,' Times of India Blog, 31 March.

https://timesofindia.indiatimes.com/blogs/voices/meta-governance-role-of-metaverse-in-indias-e-governance/.

137.   WHO - Global strategy on Digital Health 2020-2025 (2020a) World Health Organization.   Available   at: https://www.who.int/publications/i/item/9789240020924 (Accessed: 28 February 2024).

138.   WHO and ITU (2021) Ethics and governance of artificial intelligence for health,   Executive   Summary. https://static1.squarespace.com/static/651acb4c077bed428243c484/t/6539672ba0 8e361da3810138/1698260780951/2023_Organizational+Strategy_External.pdf. (Accessed: 17 December 2024).

139.   Wikipedia   contributors   (2024)   Structuration   theory. https://en.wikipedia.org/wiki/Structuration_theory. (Accessed: 3 March 2024)

140.   Williams, H., and Taylor, S. (2023). Data Visualization Techniques for Policy Analysis. Policy Research Methods, 25(2), 98-115.

141.   Wolff, J. (2019) "Systematic Review of Economic Impact Studies of Artificial Intelligence in Health Care," Journal of Medical Internet Research. JMIR Publications. doi:10.2196/16866.

142.   World Health Organization WHO, (2016). Global diffusion of eHealth: Making universal health coverage achievable. Report of the third global survey on eHealth. ISBN: 9789241511780

143.   Wright, J.J.S. (1965) General Obligations under UCC Article 2, General obligations under UCC Article 2. Available at: https://saylordotorg.github.io/text_legal-aspects-of-marketing-and-sales/s20-04-general-obligations-under-ucc-.html (Accessed: 04 October 2023).

144.   Yang,Y., Zhou,Z., Li,X., Xiao, Xue., Patrick, C., K., Hung., Sami, Yangui. (2023)). Metaverse for Healthcare: Technologies, Challenges, and Vision. International journal of crowd science, Available from: 10.26599/ijcs.2023.9100020

145.   Zhang, L., and Miller, K. (2021). Statistical Methods in Policy Impact Assessment. Journal of Policy Evaluation, 33(4), 189-204.

146.   Zhou, H., Gao, J., and Chen, Y. (2022). The paradigm and future value of the metaverse for the intervention of cognitive decline [Review of The paradigm and future value of the metaverse for the intervention of cognitive decline]. Frontiers in Public Health, 10. Frontiers Media. https://doi.org/10.3389/fpubh.2022.1016680