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RESEARCH ARTICLE OPEN ACCESS

Industry 5.0 for Sustainable Healthcare Services: Analyzing the Prospects and Obstacles for the Indian Healthcare System

Ajay Jha[1] | Dindayal Agrawal[2] | Reena Agarwal[1] | Anupam Saxena[1] | Ashish Dwivedi[3] | Sharfuddin Ahmed Khan[4]

[1]Jaipuria Institute of Management, Lucknow, India | [2]Institute of Management and Technology, Ghaziabad, India | [3]Jindal Global Business School, O.P. Jindal Global University, Sonipat, India | [4]University of Regina, Regina, Saskatchewan, Canada

Correspondence: Sharfuddin Ahmed Khan (sharfuddin.khan@uregina.ca)

Received: 13 August 2025 | **Revised:** 26 February 2026 | **Accepted:** 5 March 2026

Keywords: data security | digitization | fuzzy DEMATEL | healthcare facilities | industry 5.0 | integration

ABSTRACT

The fifth industrial revolution (I5.0), which is based on the utilization of interconnected data for efficient resource usage in meeting human requirements, proposes efficient solutions to resource constraint situations. However, the transition to I5.0 in the health sector is not easy and has to face several obstacles. This study dives deep into exploring and handling the obstacles in the integration of I5.0 practices into the existing Indian health system and suggests measures for overcoming them. Twenty-three obstacles were identified from literature analysis and experts' suggestions. The identified obstacles were further clubbed under organizational, technological, behavioral, financial, and regulatory and legal categories. Further, the obstacles were put to the fuzzy DEMATEL approach, which prioritized them based on their interaction/influence with each other. Triangular Fuzzy Number (TFN) approach was used to accommodate any uncertainty in responses from the experts. The findings from the study highlight the lack of integration of pertinent "I5.0" technologies in medical work, the lack of patient security law and general data protection regulation for healthcare services, and the lack of support from top management for "I5.0" adaptation as the top three ranked obstacles requiring immediate attention. The cause-effect classification in the study paved the direction to address first the causal obstacles, utilizing their interrelationship with other obstacles to achieve integration of I5.0 in the health sector. This study can be an important guiding document to the policymakers and various healthcare stakeholders to integrate the I5.0 concept in addressing the needs of the vast Indian population.

1 | Introduction

Industry 5.0 (I5.0) concept has witnessed a lot of popularity over the last few years, especially with the advent of the pandemic and other natural and manmade crises evidenced in this duration. "I5.0" calls for sensible utilization of advanced technologies, like automation, Internet of Things (IoT), big data analytics, block chain, etc. in addressing the human needs sustainably (Ivanov 2023). The term "I5.0" differs from the fourth industrial revolution by addition of this human centricity dominance aspect in all spheres of digital revolution. Industry 4.0 (I4.0) can be defined as the extensive integration of digital technologies into manufacturing, industrial and service operations, including cloud computing, artificial intelligence (AI), the IoT, automation, and advanced data analytics (Lasi et al. 2014). It involves extensive machine, system, and process interconnectivity; continuous, real-time data generation and analysis; and a strong focus on automation, operational efficiency, flexibility, and mass customization (Kagermann et al. 2013; McKinsey and Company 2022). In "I4.0" settings, cyber-physical systems allow decentralized or self-optimizing decision-making with minimal human

intervention, continuously monitor physical processes, and communicate information autonomously (Xu et al. 2021). Most scholars believe the advent of "I4.0" from the early 2010s, and "I5.0" begins to take shape in policy and scholarly discussions around 2019–2021, particularly with the European Commission's "I5.0" agenda.

The application of "I5.0" concept have immensely increased in all spheres of life, from food production to entertainment, from travel and tourism to healthcare (Adel 2022; Tyagi 2024). From the business perspective, it provides multifold benefits in terms of gaining a competitive advantage, sustainability, cost savings, and profit generation (Maddikunta et al. 2022). "I5.0" has great potential in a vast emerging economy like India, where various diversities, and expanding opportunities exist, especially the healthcare facilities, where a great divide in accessibility exists. On one hand there are ultramodern super specialities hospitals serving the resourceful persons and on the other a large chunk of population is devoid of even basic healthcare facilities (Kumar 2023). In Global Hunger Index (2020) report, India has been ranked too low at position 94 out of 107 countries, reflecting large population being undernourished, children suffering from stunting, a sign of chronic undernutrition; and hence prone to infections. Though poverty is an important reason for such divide, but also there is lack of awareness and poor utilization of Government schemes and public utilities to help the poor. The application of "I5.0" can help deal with some of the significant challenges India faces, like education/awareness, food production, nutrition management, medical support, infrastructure development, and availability of primary resources like water, sanitation and electricity (Paul et al. 2021). The post COVID world witnessed the immense capabilities of the Indian pharma sector in developing and delivering the COVID-19 vaccine for the global requirements (Chavda et al. 2022). The same urgency and digital phenomenon can help India in addressing the critical healthcare requirements for resource deficit and poor patients across various regions.

"I5.0" can be seen as a facilitator in channelizing efforts for better healthcare services. It can be implemented in the entire healthcare ecosystem, from manufacturing complex equipment to managing patients' healthcare regimes (Kute et al. 2021). The manufacturing of sophisticated medical equipment like magnetic resonance imaging (MRI) machines, sensors, 4D CT, and 4D MRI can be made better with the help of robotics and 3D Printing (Doyle-Kent 2021; Javaid and Haleem 2019). The adoption of IoT, sensors, AI, and machine learning (ML) applications can be helpful in patient management, development of healthcare infrastructure, managing smart mobile ambulances, hospital infrastructure, etc. Application of big data, blockchain, and other such applications can be used to manage patient data, healthcare information, and other data-based resources (Thomason 2021). Data management through such techniques will also help implement Government healthcare-related schemes and various reproductive, maternal, neonatal, child, and adolescent healthcare programs (Bose 2022). IoT and other technologies can boost virtual consultations and surgeries where access to healthcare-trained staff (in remote locations) is an obstacle. Digital applications in healthcare can be beneficial where large populations face accessibility and affordability challenges due to diverse geographical areas, remoteness, and constraints of transportation and basic infrastructure (Maroju et al. 2023).

Despite the immense relevance of I5.0, an emerging economy (like India) is still unable to implement successfully the digital applications in the healthcare ecosystem because of various obstacles. Among them, the significant reasons are lack of resources, inadequate policies, and technological and sociocultural obstacles (Xing et al. 2021). Further, the existing healthcare system lacks a trained workforce, often finance, advanced infrastructural facilities, and even basic ones at some places in terms of hospitals, healthcare outpatient department (OPD), medicines, and other pharma logistics. The upstream supply chain lacks advanced manufacturing facilities like IoT-enabled manufacturing systems, robotics, and other facilities for dealing with healthcare supplies (Sarwal et al. 2021). Sociocultural barriers also play a critical role in these nations while implementing "I5.0" applications since people are not used to dealing with machines and instead prefer human touch (Cresswell et al. 2018). Also, any change in healthcare practice must get medicolegal approvals and pass stringent audit procedures before adoption. Therefore, "I5.0" technologies involving digitized decision-making and information access can face significant challenges on the regulatory front (Ong et al. 2018).

Summarizing the above discussion, there is a need to study enablers and obstacles from various perspectives, that is, from the healthcare equipment manufacturing perspective, healthcare infrastructure development perspective, patient care and management perspective, data management perspective, and sociocultural perspective. It appears critical to develop a comprehensive framework for "I5.0" enabled healthcare ecosystem in India, which handles well the general barriers and implementation obstacles. The holistic framework overcomes the healthcare ecosystem players operating in silos and assimilates and integrates the benefits from "I5.0" and its applications for equitable health services. To achieve this aim, the study comprises the following Research Objectives (ROs):

RO1. To understand the current "I5.0" scenario in the Indian healthcare sector.

RO2. To understand the obstacles to implementing "I5.0" concept in the Indian healthcare sector.

RO3. How can the adoption of "I5.0" applications be made more viable in the Indian healthcare sector?

The next section discusses the literature review in context of usage of advanced technologies and processes in addressing the health sector needs of people, especially in the emerging economy like India. Further, the adoption of "I5.0" in context of healthcare services is explored via. literature survey. The reports on Indian healthcare services, developments and technologies to connect the super specialities to the rural poor were also explored. The literature survey is utilized to identify the obstacles and enablers that can bring about the synergy of "I5.0" with the health sector needs of the emerging economy like India. Next, a Multi-Criteria Decision-Making (MCDM) approach, Fuzzy DEMATEL, is discussed in Section 3. Section 4 discusses the findings of the DEMATEL results. Section 5 provides

implications of this study for managers, policy makers, and society. Section 6 concludes this study, summarizing the findings, limitations of the study, and future research directions.

2 | Literature Review

Post COVID-19 pandemic, there has been a boost in digital healthcare and cutting-edge medical technologies. The increased adoption of tele-consulting, online pharma distribution, wide canvas of wearable gadgets, mobile health apps, and AI, as well as robotic carriers, sensors, and electronic records system, has revolutionized the way healthcare is practiced. This digitization revolution not only remains confined to United States (US) and the bigger Western world but has percolated even to smaller countries like Singapore and Finland, who have integrated health management systems through digital technology. However, the interoperability across different healthcare devices and data banks requires the adoption of global standards.

"I5.0" is a first industrial evolution led by the human focus on the 6Rs (Recognize, Reconsider, Realize, Reduce, Reuse, and Recycle) principles of industrial upcycling, a systematic waste prevention technique and logistics efficiency design to valuate life standard, innovative creations and produce high-quality custom products (Rada 2020; Bednar and Welch 2020). "I5.0" brings back the human workforce to the factory, where human and machine are paired to increase the process efficiency by utilizing the human brainpower and creativity (Nahavandi 2019). "I5.0" is a human-centric design solution where the ideal human companion and cobots collaborate to enable customizable autonomous manufacturing and service through enterprise social networks. This, in turn, enables human and machine to work synergistically (Skobelev and Borovik 2017). It requires socio-technical evolution of human role, in which the human operational activities are expected to be performed in tandem with smart technologies (Stock et al. 2018; Longo et al. 2020; Raguseo et al. 2016). The philosophy of "I5.0" can be described by human intelligence working alongside cognitive computing in a workspace to produce value-added services and products (Bednar and Welch 2020; Longo et al. 2020). Human workforce will need to be upskilled as cognitive labor to do focused, digitized and supervised decision-making (Longo et al. 2020). On the contrary autonomous machine will perform specific tasks to assist human beings (Sadok and Welch 2019; Calitz et al. 2017). While humans will need to focus on using intelligence and creativity, an autonomous machine will be required to increase productivity or process efficiency (Nahavandi 2019).

2.1 | I5.0 and Health Service

"I5.0" is penetrating diverse areas like healthcare, manufacturing, education, and food (Adel 2022). It aims to create smart hospitals with real-time proficiency and remote monitoring systems (Nadarzynski et al. 2019). Doctors can use smart healthcare technologies and big data for better treatment (Haleem and Javaid 2019; Thomason 2021). AI technology is very promising in medicine, radiology, psychology as well as operations (Topol 2019). ML algorithms help to develop precise and fast detection of internal bodies conditions using CT scans, x-rays, and photos (Giger 2018; Choy et al. 2018; Kohli et al. 2017). AI support innovative decision support tools for treatment decisions (Putra et al. 2019; Iroju and Olaleke 2015). Further, AI has ability to discriminate anomalies of time series data and develop intelligent medical devices to monitor and regulate blood pressure, insulins, and oxygen levels (Papa et al. 2020). Blockchain-enabled healthcare guarantees interoperability of medical records, provides transparent and quality patient-centered services and facilitates insurance settlement (Thomson and Beale 2021). The surgical robots which collaborate with humans to do surgeries, are called collaborative robots (cobots) (Beuss et al. 2021). Cobots automatically align the pedicle targeting instruments on the select route, while surgeon still controls the surgery. Fracture detection, orthopedic imaging, and sterilized untying of implant etc. have all benefited from combination with drivers of "I5.0" (Federer and Jones 2021; Han and Tian 2019; Makhni et al. 2021; Myers et al. 2020).

2.2 | Obstacles to Industry 5.0 for Sustainable Healthcare Services

Based on the past analysis of literature and deliberation with the experts', a list of 23 obstacles (mentioned in Table 1) to I5.0 for sustainable healthcare services is identified.

2.3 | Categorization of Obstacles to I5.0 for Sustainable Healthcare Services

The identified obstacles are segregated under five (organizational, technological, behavioral, financial, and regulatory and legal) categories. Table 1 provides the list of identified obstacles to I5.0 for sustainable healthcare services.

2.3.1 | Organizational Obstacles

There are often organizational culture-related obstacles causing reluctance in accessing and adopting digital resources (Otto and Harst 2019; Lim and Anderson 2016). Particularly, the complexities and user unfriendliness of technology changes might obstruct the adoption of technological innovations, and that needs sufficient training and modification in the management approach (Lluch 2011). There is often a workflow deficiency (Stamatian et al. 2013) which affects decision-making processes (MacNeil et al. 2019). There can be an absence of integration in medical work with relevant technology (Graetz 2020; Palacholla et al. 2019). Absence of support from top management, little change-management culture, and disseminated key players cause a lack of clarity in roles and responsibilities (Mohamadali and Zahari 2017; Mason et al. 2017; Harst et al. 2020).

2.3.2 | Technological Obstacles

The technological obstacles ranged from lack of information technology (IT) infrastructure within the country to efficient processes functioning of service (Gajarawala and Pelkowski 2021; Akhlaq et al. 2016). Not all healthcare setups can have required network access (Harst et al. 2020). It is often

TABLE 1 | Obstacles to I5.0 for sustainable healthcare services.

Obstacles code	Obstacles description	References	Category
Obs1	Lack of patient security law and proper enforcement mechanisms in healthcare services	Blobel and Ruotsalainen (2019)	Regulatory and legal
Obs2	Poor data quality and integrity issues in healthcare services	Frederix et al. (2019), Hussain et al. (2024)	Technological
Obs3	Lack of integration of pertinent I5.0 technologies in medical work	Graetz (2020), Palacholla et al. (2019)	Organizational
Obs4	Lack of support from top management for "I5.0" adaptation	Mohamadali and Zahari (2017), Mason et al. (2017), Harst et al. (2020), Soobiah et al. (2020)	Organizational
Obs5	Issues related to privacy and security of health data	Zaidan et al. (2011), Ageron et al. (2018)	Regulatory and legal
Obs6	Interoperability issues among age-old and new "I5.0" oriented technological systems	McLachlan et al. (2019)	Technological
Obs7	Compatibility issues between "I5.0" offered service with available operating systems and devices	Gagnon et al. (2012)	Technological
Obs8	Workflow deficiency in healthcare services	Stamatian et al. (2013)	Organizational
Obs9	Time-taking approval and certification processes	Graetz (2020), Anderson (2007)	Regulatory and legal
Obs10	Complexity in data synchronization and alignment	Harst et al. (2020), Lim and Anderson (2016)	Technological
Obs11	Fear of loss of control due to increased transparency about medical procedures	Nohl-Deryk et al. (2018), Stamatian et al. (2013), Harst et al. (2020)	Behavioral
Obs12	Lack of IT Infrastructure within the country for proper functioning of "I5.0" supported service	Gajarawala and Pelkowski (2021), Akhlaq et al. (2016)	Technological
Obs13	Lack of financial support from government for "I5.0" innovations	Desveaux et al. (2019), Mason et al. (2017), Ajami and Arab-Chadegani (2013), Malekzadeh et al. (2018), Mohamadali and Zahari (2017), Harst et al. (2020)	Financial
Obs14	Absence of robust policies for effective redesign for "I5.0" implementation in healthcare	Ávila-Gutiérrez et al. (2022)	Regulatory and legal
Obs15	High deployment costs of "I5.0" oriented systems for healthcare services	Gagnon et al. (2012), Padamata and Vangapandu (2024)	Financial
Obs16	Slow progress due to lack of comprehensive standardization	Nohl-Deryk et al. (2018), Ajami and Arab-Chadegani (2013)	Regulatory and legal
Obs17	Lack of external inducements for adoption and use of technological innovations in healthcare services	Nohl-Deryk et al. (2018)	Financial
Obs18	Lack of proof of financial returns from "I5.0" systems for healthcare services	Lim and Anderson (2016)	Financial
Obs19	Lack of awareness about "I5.0" technology among healthcare employees	Malekzadeh et al. (2018), Attaran (2020)	Behavioral
Obs20	Low motivation to explore new "I5.0" technologies for healthcare	Stamatian et al. (2013)	Behavioral

(Continues)

TABLE 1 | (Continued)

Obstacles code	Obstacles description	References	Category
Obs21	Negative outlook toward new technologies	Frederix et al. (2019), Gagnon et al. (2012)	Behavioral
Obs22	Lack of acceptance of technological innovations in healthcare services	Holden and Karsh (2010)	Behavioral
Obs23	Reluctance in accessing and adopting resources required for "I5.0"	Otto and Harst (2019), Lim and Anderson (2016)	Organizational

problematic to attach the newer technologies to main systems of hospitals (McLachlan et al. 2019). The offered service might not be compatible with available operating systems and devices (Gagnon et al. 2012). There might be difficulty in bringing proof of technological capabilities, system efficiency, and technical feasibility (Frederix et al. 2019).

Deficiency of data capturing devices often results in poor data quality and integrity, which eventually leads to low dependability and poor base for data-based offerings (Frederix et al. 2019). The level of essential incorporation within the systems of hospitals by way of workflow alignment requires data that need to be synchronized with existing systems, and the desired technology can be extremely complex (Harst et al. 2020; Lim and Anderson 2016).

2.3.3 | Behavioral Obstacles

There is lack of technology know how among the healthcare workers which leads to unawareness toward estimated healthcare benefits of "I5.0" (Malekzadeh et al. 2018). Low motivation to discover new technologies is also considered as an obstacle (Stamatian et al. 2013). Negative outlook toward new technologies arises because of low perceived usefulness, lack of confidence in technology and lack of incentives (Frederix et al. 2019; Gagnon et al. 2012). Researchers also noticed that lack of acceptance of technological innovations in healthcare services (Holden and Karsh 2010), is particularly due to wrong or missing information. Fear is one more hurdle in healthcare, specially fear of increased transparency about medical procedures, which strengthens patient's situation and leads to loss of control on part of medical system (Nohl-Deryk et al. 2018; Stamatian et al. 2013; Harst et al. 2020). Apathy and Holmgren (2020) highlighted that knowledge blockade is the result of inadequate training of medical employees for new technologies.

2.3.4 | Financial Obstacles

Financial obstruction regarding technological innovations ranges from issues of certification to absence of public funds. Costs usually are obstacles, as high deployment costs act as a warning, and it is sometimes difficult to estimate amount of lifecycle costs (Gagnon et al. 2012). Desveaux et al. (2019) reported the problem of absence of financial support from Government for digital innovations as the key hindrance, which also got importance from other researchers (Mason et al. 2017; Ajami and Arab-Chadegani 2013; Malekzadeh et al. 2018; Mohamadali and Zahari 2017; Harst et al. 2020). Also, there exist lack of external inducements for adoption of technological innovations in healthcare services (Nohl-Deryk et al. 2018). Lim and Anderson (2016) highlighted that lack of proof of adequate financial returns also creates problem for healthcare service providers to move ahead.

2.3.5 | Regulatory and Legal Obstacles

Healthcare systems face strict regulation (Zakaria and Yusof 2016; Ajami and Arab-Chadegani 2013; Apathy and Holmgren 2020; Soobiah et al. 2020). Such obstacles are often outside of hospital's reach and contain issues of certification, approval, standardization and cooperation. Therefore, various facilitating guidelines for the adoption of new technologies often become the problem than a progress (Graetz 2020). Approval and certification processes often delay and can even obstruct introduction of new technologies (Anderson 2007). The prevailing regulatory measures may be imprecise and unbalanced. The healthcare system is usually slow in progress due to comprehensive standardization, which often leads to IT incompatibility, inadequate use for patient or staff applications (Nohl-Deryk et al. 2018; Ajami and Arab-Chadegani 2013). Patients' concern regarding data are gradually rising (Nohl-Deryk et al. 2018; Gagnon et al. 2012). If the issues related to privacy and data security are addressed insufficiently or are unclear, trust in the digital services shrinkages (Zaidan et al. 2011). The healthcare service providers must make sure about legal compliance particularly patient security laws and general data protection regulations (Blobel and Ruotsalainen 2019). Besides, there are concern regarding testing procedures and performance of new technology and its legal compliance (Palacholla et al. 2019; Vannieuwenborg et al. 2015). There are often complications in comprehending and executing legal necessities, besides, alterations in legislations at central and state levels again a legal hassle (Apathy and Holmgren 2020).

2.4 | Indian Policy Lens on Critical I5.0 Obstacles

India initiated the digital transformation of the healthcare sector, which is reflected in the introduction of the Ayushman Bharat Digital Mission (ABDM) by the Government of India (Digital India. (2026)). This effort aims to keep up with international practices through the establishment of a federated, consent-based Patient Health Record. This electronic health registry is also meant to consolidate information and encourage

cooperation between the pharmaceutical companies, laboratories, medical equipment producers, medical establishments, clinicians, pharmaceutical companies, and diagnostic facilities with the help of modern digital technologies. However, even with the good intentions that both the government and non-government players hold about this digitization initiative in India, there are numerous obstacles that cripple this initiative. Obstacles related to technology, digital public infrastructure and integration of systems (Obs2, Obs6, Obs7, Obs10, Obs12) are caused by differences in the digital maturity of healthcare institutions. Furthermore, the poor data quality, less engagement of health workforce with "I5.0" technologies, incompatibility with legacy systems, and intricate data synchronization requirements, especially in the district and rural settings call for a multidimensional effort both from Government and private players (Mishra et al. 2024).

The real-life experiences of AI-assisted diagnostics, continuous remote care, and cobots labeled clinical workflows indicate asymmetrical adoption, as well as digital immaturity among public facilities and small Indian hospitals. This subsequently restricts the routinization and adoption of such advances in policy into clinical practice. The lack of effective regulations, monitoring systems, and a sophisticated system of jurisdiction can allow committing fraud and hacking, stealing data, and abusing the digital records and technologies (Manu 2019; Yadav et al. 2025). Lack of digital infrastructure and qualified manpower also act as a hindrance to the digital revolution in the Indian health sector. Such obstacles go hand in hand with the limitations that exist in privacy, data protection, interoperability, funding, and organizational behavior.

The Indian Digital Personal Data Protection Act (DPDA Act 2023) which came into effect according to the 2025 Rules regulates the processing of the digital personal data balancing the right to privacy of the individual with the legal processing of the data. It creates a Data Protection Board, identifying Data Fiduciaries (companies) and Principals (individuals) and requires individuals to consent to data harvesting, which leads to a fine in case of noncompliance. The jurisdiction is not restricted only to India but also to extraterritorial services available to the Indian citizens with a special focus on digital data. Even though it provides the opportunity to improve the level of trust of patients in data-intensive "I5.0" applications through the introduction of a particularly consent-based, rights-reduced regulatory regime, it excessively demands the consent regulation which in the initial phase does not look forthcoming. Obstacles associated with governance, regulation, and standards (Obs1, Obs5, Obs9, Obs14, and Obs16) thus represent the emerging trends of digital health regulation in India. The issue of imbalanced enforcement capability, strict compliance requirements, and lack of operational guidance are some of the challenges faced by the DPDP framework, which continue to raise the issue of data protection and cybersecurity. Extensive approval and certification processes also suggest insufficient regulatory readiness of adaptive AI, cobots and cyber-physical systems regarding no specific national plan involved in "I5.0" oriented healthcare processes redesign, as well as harmonized standards.

The issue of finances and increasing perceptions of risk holding investments (Obs13, Obs15, Obs17, and Obs18) have proven to be a significant threat even though the Indian Government tries to significantly boost investments through Production Linked Incentive schemes of medical equipment and significant state investment in the ABDM backbone. These interventions put more emphasis on manufacturing competitiveness and platform-level capacity development rather than on hospital-level assimilation of technology. Therefore, due to substantial upfront capital costs of robotics, IoT retrofitting, or AI-enabled decision support systems, many providers, especially those working in the Tier 2 and Tier 3 settings, have a hard time legitimizing the potential improvement in efficiency and quality should the latter become manifest.

The increased usage of digital technologies in terms of teleconsultation and remote diagnostic sharing have also highlighted the challenges in the form of organizational and behavioral obstacles (Obs3, Obs4, Obs8, Obs11, Obs19, Obs20, Obs21, Obs22, Obs23) indicating lack of standardization, simplified medico-juridical procedures, infrastructure, workforce training, and public confidence and awareness to streamline the digitized medical functioning. All these dynamics prove that the only presence of enabling technologies and favorable policy frameworks does not pave the effective deployment of "I5.0" to the healthcare but approaches tied to the idea of human-centric system design, intentional change-management approaches, and investments in capacity development (both institutional and workforce) is the need of the hour.

The issues of organizational obstacles (Obs3, Obs4, Obs8, Obs23) can be accounted for by the lack of bandwidth in leadership, inflexible and segregated work procedures, and the anxieties over the loss of perceived professional autonomy and control during more visible, digitally mediated care practices. The financial obstacles (Obs13, Obs15, Obs17, Obs18) remain unchanged even with such initiatives as Production Linked Incentive schemes and government investment in ABDM, since such measures result in focusing on domestic manufacturing capacity and platform level development on the one hand and leave many Tier 2 and Tier 3 hospitals with insufficient reasons to invest heavily in unknown returns on the other. Collectively, all these results endorse the NITI Aayog Government of India statement that successful I5.0 implementation in healthcare requires coordinated regulatory clarification, interoperable digital public infrastructure, relevant and long-term investment in human capital (National Health Authority 2020).

3 | Methodology and Data Analysis

This section contains an organized discussion on Fuzzy DEMATEL technique, which is used to analyze data for the identified obstacles of I5.0 in healthcare services. Twelve professionals from various academic institutions and the healthcare industry in Northern India assisted in the data collection (Table A6). The sample consisted of two healthcare policymakers with at least 20 years of experience, five academicians with at least 12 years of experience (excluding one early-career researcher), two medical administrators with at least 15 years of experience, and three medical practitioners with at least 10 years of experience. This diverse makeup guarantees theoretical triangulation across policy development, academic

research into "I5.0" paradigms, operational leadership, and frontline practice, producing solid, multidimensional perspectives on human-centric innovations, sustainability requirements, and contextual barriers within India's diverse healthcare landscape. Thus, validating the analysis of opportunities and obstacles to resilient service transformation. The experts were first briefed about the obstacles and later asked to submit the pairwise comparison matrix that was needed for the analysis. Subsequently, the analysis was completed, as detailed in the next subsection.

3.1 | Fuzzy DEMATEL Method

In Geneva, the DEMATEL technique, which stands for "Decision-Making Trial and Evaluation Laboratory" was developed. DEMATEL creates a hierarchical structure to understand an interconnected problem and provides a significant answer. Graph theory, which combines objects into cause and effect groups to provide a visual explanation and solution to a problem (Li and Tzeng 2009), forms the fundamental basis of the DEMATEL approach. By verifying the interdependence of elements and aiding in the creation of a cause effect map that illustrates the relative connections among them, it can be utilized to research and answer intricate and complicated situations. Fuzzy DEMATEL was first presented by Wu and Lee (2007) as an addition to traditional DEMATEL that takes Fuzzy Set Theory (FST) into account. Integrated fuzzy theory improves the DEMATEL process by accounting for human ambiguity throughout the various stages of gathering experts' data. The decision-maker can make better decisions since there is a linguistic scale. Fuzzy theory offers several varieties of fuzzy numbers; among others, the Triangular Fuzzy Number (TFN) is used in this investigation. Various researchers utilized fuzzy DEMATEL for finding connections in elements of complex systems. Kuzu (2023) applied it for analyzing the risk of anchor loss in maritime transportation. Priyanka et al. (2023) used it for ranking sustainable development challenges in the start-up sector focusing on human resources. Akhtar and Asim (2025) developed a causal model to measure flexibility in an Indian pharmaceutical enterprise. The systematic detailed steps of Fuzzy DEMATEL can be referred to from studies (Si et al. 2018; Wu and Lee 2007; Singh et al. 2024).

Step 1: Specifying a fuzzy language scale to ascertain a relationship with contex: To convey expert judgments regarding contextual interplay between the obstacles, a predetermined fuzzy scale is needed. The scale is provided by several authors (Khatwani et al. 2015), as shown in Table A1.

Step 2: Consult experts and use the fuzzy linguistic scale to collect opinion: Gather the distinct viewpoints of every expert by utilizing the given fuzzy scale. Individual direct-influence fuzzy matrix is prepared.

Step 3: Create a group direct-influence fuzzy matrix Z to compile the opinions of the experts: The group direct-influence fuzzy matrix is shown in Table A2.

Step 4: To obtain the normalized direct-influence fuzzy matrix $\widetilde{\boldsymbol{X}}$: The normalized direct-influence fuzzy matrix is shown in Table A3.

Step 5: Obtain the total relation fuzzy matrix $\widetilde{T} = \left[\widetilde{t}_{ij}\right]_{n\times n}$: Fuzzy total relation matrix is shown in Table A4.

Step 6: Defuzzify the total relation fuzzy matrix: To transform the total relation fuzzy matrix into a clear numerical form, the defuzzification method is required. As shown in Table A5, we use the CFCS technique to defuzzify the total relation fuzzy matrix and generate the crisp total relation matrix *T*.

Step 7: Utilizing the total relation matrix T, the sum of the rows and columns is calculated: This step involves computing vectors *D* and *R*, which, as shown in Table 2, represent the sum of the rows and the sum of the columns from the total relation matrix *T*, respectively.

Step 8: Create the causal diagram: Using the *D* and *R* values as a basis, we will compute the $(D+R)$ and $(D-R)$ values. To construct the causal diagram shown in (Figure 1), $(D-R)$ on the vertical axis and $(D+R)$ on the horizontal axis will be utilized.

4 | Results and Discussion

In the present study, a fuzzy DEMATEL approach was employed to examine the identified substantial obstacles (Obs) for the implementation of "I5.0" in the sustainable healthcare services. Further, these identified obstacles were ranked concerning their prominence based on the $(D+R)$ values. The higher the $(D+R)$ value, the stronger the participation of that obstacle toward the adoption of "I5.0" in the health sector. The ranking obtained is as follows: Obs3 > Obs1 > Obs4 > Obs5 > Obs11 > Obs13 > Obs12 > Obs2 > Obs10 > Obs6 > Obs7 > Obs15 > Obs16 > Obs9 > Obs14 > Obs18 > Obs17 > Obs8 > Obs19 > Obs23 > Obs20 > Obs21 > Obs22 (Table 2).

The highly influential obstacles hindering "I5.0" implementation for sustainable healthcare services are Lack of integration of pertinent "I5.0" technologies in medical work (Obs3), Lack of patient security law and general data protection regulation for healthcare services (Obs1), Lack of support from top management for "I5.0" adaptation (Obs4), Issues related to privacy and data security of health data (Obs5), and Fear of loss of control due to increased transparency about medical procedures (Obs11). The highest significance of Lack of integration of pertinent "I5.0" technologies in medical work (Obs3) highlights the fragmented nature of the healthcare system existing in India. This can be generalizable also looking at existence of diverse players and technologies like pharma, pathology, diagnostics and various specializations in the human body healthcare system. This also involves large number and variety of vendors, healthcare facilities with diverse capacities and capabilities and diverse set of patients ranging from critical to less severe ailments (Bobade and Asutkar 2024). Therefore, to have an impact of "I5.0," a synergistic platform accommodating diverse data sets and technologies is required for proper interoperability.

Second most important obstacle to overcome is Lack of patient security law and general data protection regulation for healthcare services (Obs1) which hinders realization of the fruits of "I5.0" in health sector. The healthcare data is very sensitive for both the patient and the healthcare service provider. Any

TABLE 2 | The score for each obstacle.

Code	Obstacles description	*D*	*R*	*D*+*R*	*D*−*R*	Rank	Cause/ effect
Obs1	Lack of patient security law and general data protection regulation for healthcare services	1.2528	1.4518	2.7046	−0.1991	2	Effect
Obs2	Poor data quality and integrity issues in healthcare services	0.8683	1.1580	2.0264	−0.2897	8	Effect
Obs3	Lack of integration of pertinent "I5.0" technologies in medical work	1.5453	1.4182	2.9636	0.1271	1	Cause
Obs4	Lack of support from top management for "I5.0" adaptation	1.4577	1.1911	2.6488	0.2665	3	Cause
Obs5	Issues related to privacy and data security of health data	1.3249	0.9607	2.2856	0.3642	4	Cause
Obs6	Interoperability issues among age-old and new "I5.0" oriented technological systems	1.0508	0.9461	1.9970	0.1047	10	Cause
Obs7	Compatibility issues between "I5.0" offered service with available operating systems and devices	1.0510	0.8412	1.8921	0.2098	11	Cause
Obs8	Workflow deficiency in healthcare services	0.6671	0.6533	1.3204	0.0139	18	Cause
Obs9	Time-taking approval and certification processes	0.8100	0.8510	1.6610	−0.0409	14	Effect
Obs10	Complexity in data synchronization and alignment	1.0754	0.9450	2.0205	0.1304	9	Cause
Obs11	Fear of loss of control due to increased transparency in medical procedures	0.9640	1.1808	2.1447	−0.2168	5	Effect
Obs12	Lack of IT infrastructure within the country for proper functioning of "I5.0" supported service	1.0088	1.0308	2.0396	−0.0220	7	Effect
Obs13	Lack of financial support from government for "I5.0" innovations	1.0084	1.0973	2.1057	−0.0889	6	Effect
Obs14	Absence of robust policies for effective redesign for "I5.0" implementation in healthcare	0.8960	0.7004	1.5965	0.1956	15	Cause
Obs15	High deployment costs of "I5.0" oriented systems for healthcare services	0.8579	0.9439	1.8018	−0.0861	12	Effect
Obs16	Slow progress due to lack of comprehensive standardization	0.9283	0.8101	1.7384	0.1183	13	Cause
Obs17	Lack of external inducements for adoption and use of technological innovations in healthcare services	0.6161	0.8666	1.4827	−0.2505	17	Effect
Obs18	Lack of proof of financial returns from "I5.0" systems for healthcare services	0.7797	0.8021	1.5818	−0.0224	16	Effect
Obs19	Lack of awareness about "I5.0" technology among healthcare employees	0.5852	0.6068	1.1920	−0.0216	19	Effect
Obs20	Low motivation to explore new "I5.0" technologies for healthcare	0.5291	0.6255	1.1546	−0.0964	21	Effect
Obs21	Negative outlook toward new technologies	0.6264	0.5084	1.1348	0.1180	22	Cause
Obs22	Lack of acceptance of technological innovations in healthcare services	0.4025	0.5836	0.9862	−0.1811	23	Effect
Obs23	Reluctance in accessing and adopting resources required for "I5.0"	0.5293	0.6624	1.1917	−0.1331	20	Effect

loophole in the treatment or any sensitive health condition can have serious repercussion on the performance of both the service provider and the customer (Manikandan et al. 2024; Vyas et al. 2021). The system should be safeguarded against any cyberattacks, data breaches, and substandard practices. Without strong legal protections, both the patient and service provider

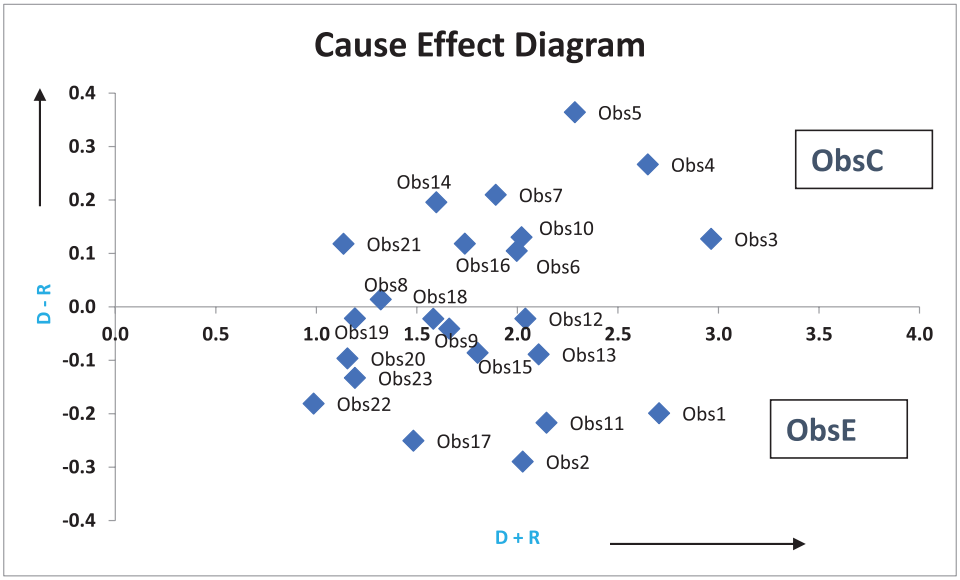

FIGURE 1 | Causal diagram for the obstacles.

will hesitate in involving the AI-driven systems in handling their critical health data which can be manipulated by a hacker or some agency.

Lack of support from top management for "I5.0" adaptation (Obs4) is observed as the third important obstacle. This can be the reason as healthcare is a very sensitive domain and there are already strict norms and practices which they have accustomed to and which are giving them good results. With profitability a prime motive in current private health operators, helping a larger mass with technology takes a backseat. The "I5.0" technologies typically require significant upfront investments and may not yield immediate financial benefits (Alabi 2025). Also, healthcare being a highly regulated sector involves proven data and statistical analysis to get the green signal for any new technology adoption. This risk aversion can result in a cautious approach by top management toward investing in novel technologies, especially if the perceived risks outweigh the anticipated benefits (Laurenza et al. 2018; Acemoglu and Finkelstein 2008). Another reason can be less understanding of "I5.0" technologies compared to traditional medical education, which is still followed in major parts of India. This knowledge gap can lead to uncertainty about how these technologies can be effectively integrated into existing systems and how they align with organizational goals.

Next identified important obstacle in the chronology is the Issues related to privacy and data security of health data (Obs5). As "I5.0" involves utilization of multiple entities (diagnostics centers, healthcare providers, hospitals, insurers, tech companies, health employees, employer, pharma, etc.); any player may compromise for short term gains exposing patient to various risks. Still with safeguards, a patient may hesitate in sharing the health data or utilizing technologies which can disseminate his information on the net worldwide (Joshua et al. 2022). Even with various international regulations in place such as General Data Protection Regulation (GDPR) and Health Insurance Portability and Accountability Act (HIPAA), ensuring compliance across different utilities and technological contexts is cumbersome and demands careful monitoring and use (Barbaria et al. 2025). Not only managing patient consent in a dynamic and interconnected "I5.0" environment is complex, but the healthcare providers hesitate to incorporate data transparency due to stringent legal repercussions in case of any laxity. Indian Government enacted a law on digital personal data protection (DPDA Act 2023) which addresses the concern of breech of data privacy, but still in health sector the confidence building will take a long way.

Related to the issue of privacy, another important obstacle is Fear of loss of control due to increased transparency about medical procedures (Obs11). Implementation of "I5.0" technologies will not only educate the information generator but also the information seeker, as access to data, AI-driven insights, and interconnected systems can invite consultation across borders and may challenge the current solution being provided. It will become like a third empire referral for any disputes. Implementing "I5.0" will involve agreeing to comply with various protocols, managing advanced data management systems, technology integrations, and establishing robust data governance frameworks in sync with regulatory standards (Mbunge et al. 2021). This may generate fear of losing control over the processes and pricing followed by these healthcare providers. So, technology which can be a boon in handling patients can serve as a device to highlight their mistakes, if any.

While exploring the most critical obstacles hindering "I5.0" adoption in the health sector, a common thread observed across all is the issues related to health data management like the complexity of data, integration across technologies, and risk assumptions in sharing among various stakeholders. Also, there are correlations among these obstacles which need to be further exploited (Adegoke et al. 2025). The fuzzy DEMATEL approach helps in identifying these interrelationships by classifying them into causal and effect obstacles. Table 2 presents this classification of challenges into cause and effect group based on $(D-R)$ values. The cause subgroup shown as "ObsC" in Figure 1 contains positive values of $(D-R)$ and consists of

10 obstacles. These can be considered as the most influencing obstacles that restrict the implementation of "I5.0" technologies in the health sector.

Further, the obstacles with negative ($D-R$) values are mentioned as effect subgroup "ObsE" (Figure 1). There were 13 elements in the effect subgroup ObsE and based on their intensity of getting influenced can be ranked as Obs2 > Obs17 > Obs11 > Obs1 > Obs22 > Obs23 > Obs20 > Obs13 > Obs15 > Obs9 > Ob s18 > Obs12 > Obs19 (Table 2). The highly influenced obstacles were poor data quality and integrity issues in healthcare services (Obs2), lack of external inducements for adoption and use of technological innovations in healthcare services (Obs17), fear of loss of control due to increased transparency about medical procedures (Obs11), lack of patient security law and general data protection regulation for healthcare services (Obs1), and reluctance in accessing and adopting resources required for "I5.0" (Obs22). These obstacles are easily influenced by the causal obstacles. To effectively implement "I5.0" in the health sector, these effect obstacles lose impact, moment the correlated causal obstacles are addressed.

DEMATEL approach provides the threshold value to determine the direct relations among the obstacles. Among the most critical causal obstacles, we have lack of integration of pertinent "I5.0" technologies in medical work (Obs3), lack of support from top management for "I5.0" adaptation (Obs4), and issues related to privacy and data security of health data (Obs5). These causal obstacles, if addressed properly, can generate an effect on other obstacles like poor data quality and integrity issues in healthcare services (Obs2), fear of loss of control due to increased transparency about medical procedures (Obs11), lack of patient security law and general data protection regulation for healthcare services (Obs1), and reluctance in accessing and adopting resources required for "I5.0" (Obs23) (Pool et al. 2024; Wiig et al. 2018; Vimalachandran et al. 2016).

Similarly, Complexity in data synchronization and alignment (Obs10), a causal obstacle, can lead to solving many issues like data quality and integration issues (Obs2) if addressed through simplified procedures and transparency in data management. The international standards adoption like Health Level Seven (HL7), Fast Healthcare Interoperability Resources (FHIR), Digital Imaging and Communications in Medicine (DICOM) can provide guidelines for better exchange, integration, sharing, and retrieval of electronic health information. Tools like Talend, Informatica, and Apache Nifi help map and transform data from various sources to a unified format. In this context, the Interoperability issues among age-old and new "I5.0" oriented technological systems (Obs6) and Compatibility issues between "I5.0" offered service with available operating systems and devices (Obs7) are potential obstacles under the cause group which are related to technological complexities and data assimilation across various interfaces. Closing gaps between obsolete and modern systems can be facilitated by using adapters or Application Programming Interfaces (APIs) in conjunction with required component changes. For "I5.0" services to work with modern hardware and operating systems, cross-platform technologies, virtualization, and regular upgrades must be implemented. Platform-neutral technologies, containerization, and vendor collaboration can ensure a seamless integration process, meaning that both modern and legacy systems will be more helpful and have overall functionality and interoperability.

Almost all causal factors relate to standardization, integration, simplification, and regulation aspects of "I5.0" technologies in the healthcare sector. Slow progress due to lack of comprehensive standardization (Obs16) and absence of robust policies for effective redesign for "I5.0" implementation in healthcare (Obs14) further strengthen this proposition. Effect obstacles such as Obs1, Obs18, Obs19, Obs20, and Obs22 are directly linked to repercussions of these causal obstacles. These causal obstacles are the major reasons for inconsistencies in data formats, security risks, operational inefficiencies, and disparate care and redundant systems. Time-taking Approval and certification processes (Obs9) are also the effect of such inefficiencies in the standardization and regulation system of "I5.0" in the health sector. This not only hampers the data utilization for analytics, the most important aspect of "I5.0" implementation but also erodes stakeholders' trust in the system's ability to handle data accurately and securely. This discussion further leads to analyzing another important subgroup of causal factors viz. workflow deficiency in healthcare services (Obs8) and negative outlook toward new technologies (Obs21) in the cause group. Concerns about automation and AI replacing jobs can create reluctance to embrace new technologies, affecting overall adoption rates. Doubts about the tangible benefits of "I5.0" technologies may lead to a lack of enthusiasm and support from staff, slowing down implementation efforts. They also stifle technological advancements by slowing innovation and scalability, create data management challenges like fragmented systems and data silos, and lead to regulatory noncompliance and security vulnerabilities. Furthermore, these issues can result in competitive disadvantages, with organizations lagging in the adoption of modern care solutions, and reduced patient engagement and satisfaction due to inadequate communication and limited access to advanced care options, collectively hindering the effective adoption of "I5.0" technologies. Lack of IT Infrastructure within the country for the proper functioning of "I5.0" supported service (Obs12) arises due to laxity in terms of trained and willing workforce and top management support.

Though the cause-effect relation highlighted in this study helps better formulation of strategies for "I5.0" implementation and reap its benefits to address the larger mass health needs. The studies specific to "I5.0" are still in a nascent stage and understanding this dynamic relationship between the obstacles and stakeholders' capabilities and interests needs deeper exploration. This also demands the effective training programs, conferences, and awareness workshops to make the healthcare providers more accustomed to new technology, proper broadcast of benefits and advantages of "I5.0" to patients, regulatory and standardization efforts from various healthcare organizations and regulatory institutions, vendor involvement and sensitization of data issues. Therefore, the journey is long, but benefits are definite to come if implemented properly.

5 | Implications on Managers and Society

The study provides various managerial insights to implement "I5.0" efficiently in the health care sector and addresses the gap between Indian population health needs and supply. It calls for the development of proper mechanisms to integrate data across various healthcare systems and to handle the privacy concerns of the stakeholders. It highlights the need for a better decision-making process by way of data-driven and AI-enhanced analytics, understanding human–machine collaboration, and streamlining workflows for smooth service and product delivery. All these efforts put managerial responsibility of upskilling healthcare workers to interact with advanced technologies like cobots, AI-driven diagnostic tools, and personalized treatment planning systems. In the process, the managers may need to handle the change-management process by soliciting strong top management support and sensitizing healthcare professionals with the benefits of "I5.0," balancing the integration of technology without compromising patient care. This also calls for ethical considerations in handling digitized patient care solutions in comparison to the digital context.

The study also seeks strong intervention from the policy makers and regulators to fully realize the benefits of "I5.0" implementation in the health sector. The integration of various healthcare facilities data is not achieved due to incompatible formats, fear of medicolegal cases, insurance inefficiencies, lack of infrastructure, complex nature of health services, and many times greedy intent of the private players. These are directly linked to behavioral and organizational obstacles like customer awareness, lack of support from top leaders, negative outlook and lesser number of trained workforces. Not only the Government but also the medical associations, and big private players across diverse fields need to come together to come up with a policy framework that can help in the smooth operations of "I5.0" techniques. Indian Government has already taken initiative in this direction by integrating various business transactions through digital network, fintech, and linked various citizen data with unique identity number (AADHAR). Initiatives like (ABDM) launched by the Government of India (GoI) aim to integrate the citizen health data with the digital health infrastructure of the country. Issues related to privacy and data security of health data can be resolved by putting this health data on a blockchain system that provides patients the freedom to share health records at their will and can revoke access to data at any time. Similarly, wearable devices, health monitoring systems, diagnostic reports, health treatment, and any cyber computation/analysis can be linked with a unique identity number with an inscription code of the blockchain system. These causal obstacles provide more guidelines to the policy makers and stakeholders to optimize efforts in meeting the health needs of the Indian population.

Lack of patient security law and general data protection regulation for healthcare services is one of the effect obstacles observed in this study. It requires immediate redressal by way of Government interventions and streamlining of the judicial investigation in tandem with medical practices. In this direction, though a step is taken by the Indian government in the form of DPDA Act (2023), which came into effect on September 1, 2023, aims to safeguard the privacy of individuals, and it applies to all organizations that process personal data of individuals in India. Once the customers gain confidence in the system, they will readily share their health data, and the health care providers will also bring transparency in their working given the data is online. In the initial phases, there will be implementation challenges and resistance, but streamlining regulations and procedures will certainly give a boost to adoption. The same logic goes for the service providers; with "I5.0" implementation progressing in the health sector, the success and failure stories will come out, making the adoption process more understandable and manageable. The deficiency of trained workforce can only be offset by the proper use of technology and training programs. Financial implications of the "I5.0" adoption can be better health service across India, making citizens healthier and contributing more to the Gross Domestic Product (GDP).

The study leads to various societal implications in terms of bridging the economic and geographical divide of the vast population of India via the facilitating role of "I5.0." The new paradigm can result in affordable health services, remote access to experts, instant monitoring of health conditions through apps and IoT devices, and advanced AI-driven diagnostics. However, the issue of data privacy, both from the service provider and service receiver, will be most important, ensuring data is not misused by destructive hands. On the other hand, online data may serve as a mechanism for faster dispute redressal between health care provider and seeker, with "I5.0" system serving like a third-party referral for any disputes. Another challenge can be in terms of building trust in machines or computers compared to human diagnosis, which provides emotional support also. Human emotions, ethics, security, and health care seriousness are to be incorporated in the delivery mechanism. There will be debates about the ethical boundaries of technology in areas like genetic editing, AI-driven surgery, and robotics in caregiving.

6 | Conclusions, Limitations, and Future Research Directions

Indian healthcare scenario presents a range of distinct backgrounds. At one end of the range are the super speciality hospitals serving the urban rich while at the other end are rudimentary structures devoid of even trained medial staff serving large poor and rural population. "I5.0" technologies can help bridge this divide via. affordable advanced analytics to decipher healthcare data, telehealth and other virtual health services for remote and inaccessible places, digital diagnostic tools and technology, smart vans, remote robotics surgery, bioinformatics, digital wearables for tracing and monitoring distant patients, virtual training of medical staff, disseminating medical and hygiene information, and developing affordable tools and medicines (Twinrams 2024). However, the country that boasts of large-scale digitization and being a global software hub faces challenges in utilizing technology to address its diverse needs, especially in the health sector (Bhardwaj 2023). This study investigates such obstacles in adopting "I5.0" practices in the Indian health sector diaspora and provides a guideline to address them. This involved exploring literature like medical articles, research papers, Government announcements, policy documents, and blogs to understand the current state and bottlenecks in realizing "I5.0" implementation in Indian health sector. Literature

confirmed the great divide in terms of accessibility to fair health services and highlighted the redressal of obstacles in implementation of digitized technologies in the healthcare sector to address the human health need. The fuzzy DEMATEL approach was applied, which resulted in ranking and further classification of these obstacles into causal and effect subgroups, calling for addressing first the most critical causal ones.

The findings provide high weightage to the regulatory and legal, and medical organizations role in removing the fear of loss of control on the medical practices' discretion due to transparency and among patients fear of losing sensitive health data. It also confirms that upstream strategic and governance as well as capability-based cause factors are stronger explanatory variables when it comes to cause and effect relations compared to the limited technological constraints on their own. Key causal pathways such as Lack of support from top management for "I5.0" adaptation (Obs4) → Lack of IT Infrastructure within the country for proper functioning of "I5.0" supported service (Obs12) → Poor data quality and integrity issues in healthcare services (Obs2) illustrate how leadership inertia translates into downstream technical and operational weaknesses. Likewise, regulatory ambiguity (Obs14 and Obs16) → weak external incentives and funding (Obs17 and Obs18) → low I5.0 technologies (like AI, tele-consultations, cobot, etc.) adoption underscores the influence of the governmental, institutional, and organizational investment decisions. Capability constraints also enhance such dynamics because the poor digital integration and literacy → either misuse or underuse of systems → negative attitudes of the staff and patients toward the "I5.0" changes highlight the need for stakeholders' alignment. Altogether, these interrelated channels reveal that the effective implementation of "I5.0" will be the issue of leadership adherence, the understanding of policies, and the unceasing capabilities improvement, along with human-inspired workflow redrawing, citizen awareness and confidence building, which places strategic governance and organizational proactiveness as the critical factors in the sustainable digital revolution in healthcare.

Government of India has come up with various regulatory measures for control of digitized information, substantiating the findings of this study. The study highlights the Indian lack of basic infrastructure and mechanisms to handle the magnitude of health needs of a diverse population and synergy with digital medical procedures. The wholistic approach should involve not only developing infrastructure and technologies, but also training the workforce and making citizens aware and assured for better utilization. But there are still cultural and regional differences leading to the Government's hesitation in adopting digital technologies due to the populist philosophy of votes. The collaborative and sensitive efforts from all the stakeholders can maximize the benefits while addressing the challenges of ethical, financial, and operational shifts in the health sector. The study further highlights the need to develop proper mechanisms to ensure cybersecurity, ethical practices, and comfort to all stakeholders.

There are a few limitations to this study. The study took the holistic view of "I5.0" implementation in the Indian health care sector covering diverse technologies like AI, IoT, Block Chain, Robotics, chemo/bioinformatics, big data analytics, etc., but these topics are in itself a big area of research. These domains individually have got specific bottlenecks and implementation challenges. Also, the medical practitioners, diagnostic centers, and the super speciality hospitals contacted were asked questions confined to ROs of this study. But the health sector is like ocean, where any diver can get at least something precious, if he explores. There are various dimensions of "I5.0" implementation than bottlenecks. The present study is just a policy guideline and exploration of digital developments for operational efficiency in health sector. Further the study is based on responses from experts, hospitals and medical institutions professionals from North India, therefore the data' generalizability for the entire India may be having regional bias. Future research can validate or broaden the scope to include healthcare stakeholders from other parts of India to capture regional variation and increase the findings' national applicability of "I5.0" in health sector. Not only other Indian regions, but the study can also be extended to include other emerging nationalities. Another research area can be a comparative study of the West and the emerging economies in the healthcare sector's "I5.0" adoption. In future studies, other MCDM techniques such as fuzzy ANP, fuzzy BWM, and TISM can also be implemented to evaluate the 23 obstacles identified in this research and compare with findings of this study.

Author Contributions

Ajay Jha: conceptualization, literature review, and drafting of the manuscript. **Dindayal Agrawal:** data collection, analysis, and interpretation of results. **Reena Agarwal:** methodology development, case study analysis, and manuscript review. **Anupam Saxena:** data validation, statistical analysis, and visualization. **Ashish Dwivedi:** literature synthesis, discussion writing, and formatting. **Sharfuddin Ahmed Khan:** supervision, project administration, overall guidance, and final manuscript approval. All authors have read and approved the final manuscript.

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Appendix A

TABLE A1 | Linguistic scale for fuzzy DEMATEL.

Linguistic variable	Triangular fuzzy numbers
No influence (No)	(0, 0, 0.25)
Very low influence (VL)	(0, 0.25, 0.50)
Low influence (L)	(0.25, 0.50, 0.75)
High influence (H)	(0.50, 0.75, 1.0)
Very high influence (VH)	(0.75, 1.0, 1.0)

TABLE A2 | Group direct-influence fuzzy matrix.

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs1	(0, 0, 0)	(0.5, 0.75, 0.906)	(0.469, 0.688, 0.906)	(0.5, 0.688, 0.813)	(0.531, 0.719, 0.813)	(0.406, 0.563, 0.719)	(0.188, 0.281, 0.531)	(0, 0, 0.25)	(0.219, 0.344, 0.594)	(0.094, 0.188, 0.438)	(0.406, 0.594, 0.781)	(0.156, 0.219, 0.438)	(0.156, 0.219, 0.438)
Obs2	(0.219, 0.313, 0.531)	(0, 0, 0)	(0.563, 0.781, 0.906)	(0.188, 0.281, 0.531)	(0.25, 0.375, 0.625)	(0.281, 0.469, 0.688)	(0.125, 0.219, 0.438)	(0.188, 0.281, 0.531)	(0.344, 0.5, 0.719)	(0.25, 0.375, 0.625)	(0.375, 0.563, 0.813)	(0.25, 0.406, 0.656)	(0.281, 0.438, 0.688)
Obs3	(0.531, 0.75, 0.906)	(0.531, 0.75, 0.844)	(0, 0, 0)	(0.688, 0.938, 1)	(0.563, 0.781, 0.906)	(0.344, 0.563, 0.781)	(0.313, 0.469, 0.688)	(0.25, 0.406, 0.656)	(0.438, 0.625, 0.813)	(0.406, 0.563, 0.719)	(0.313, 0.469, 0.719)	(0.125, 0.188, 0.438)	(0.281, 0.438, 0.656)
Obs4	(0.656, 0.875, 0.906)	(0.469, 0.656, 0.813)	(0.688, 0.938, 0.969)	(0, 0, 0)	(0.375, 0.531, 0.719)	(0.344, 0.5, 0.719)	(0.406, 0.594, 0.813)	(0.219, 0.375, 0.625)	(0.25, 0.406, 0.625)	(0.25, 0.406, 0.625)	(0.406, 0.625, 0.844)	(0.219, 0.313, 0.531)	(0.219, 0.313, 0.531)
Obs5	(0.625, 0.844, 0.906)	(0.719, 0.969, 1)	(0.563, 0.781, 0.875)	(0.344, 0.5, 0.719)	(0, 0, 0)	(0.469, 0.656, 0.813)	(0.406, 0.594, 0.781)	(0.188, 0.25, 0.438)	(0.188, 0.25, 0.438)	(0.375, 0.531, 0.719)	(0.438, 0.625, 0.813)	(0.469, 0.688, 0.875)	(0.344, 0.5, 0.688)
Obs6	(0.219, 0.344, 0.594)	(0.469, 0.656, 0.813)	(0.25, 0.375, 0.625)	(0.219, 0.344, 0.594)	(0.25, 0.406, 0.656)	(0, 0, 0)	(0.531, 0.781, 0.969)	(0.031, 0.063, 0.313)	(0.344, 0.563, 0.781)	(0.313, 0.5, 0.719)	(0.281, 0.406, 0.625)	(0.219, 0.313, 0.531)	(0.344, 0.5, 0.719)
Obs7	(0.313, 0.5, 0.719)	(0.344, 0.563, 0.813)	(0.219, 0.375, 0.625)	(0.375, 0.531, 0.719)	(0.219, 0.344, 0.594)	(0.375, 0.563, 0.781)	(0, 0, 0)	(0, 0, 0.25)	(0.281, 0.469, 0.688)	(0.406, 0.594, 0.813)	(0.281, 0.406, 0.625)	(0.219, 0.313, 0.531)	(0.344, 0.5, 0.719)
Obs8	(0.281, 0.469, 0.688)	(0.156, 0.219, 0.438)	(0.031, 0.063, 0.313)	(0.094, 0.125, 0.344)	(0.094, 0.156, 0.406)	(0.094, 0.125, 0.344)	(0.156, 0.25, 0.469)	(0, 0, 0)	(0.156, 0.281, 0.531)	(0.125, 0.25, 0.5)	(0.156, 0.281, 0.531)	(0.25, 0.375, 0.625)	(0.063, 0.094, 0.344)
Obs9	(0.344, 0.563, 0.781)	(0.219, 0.344, 0.563)	(0.125, 0.188, 0.438)	(0.125, 0.188, 0.406)	(0.188, 0.281, 0.5)	(0.313, 0.438, 0.625)	(0.125, 0.219, 0.438)	(0.188, 0.281, 0.5)	(0, 0, 0)	(0.188, 0.281, 0.531)	(0.094, 0.188, 0.438)	(0.156, 0.281, 0.531)	(0.156, 0.281, 0.531)
Obs10	(0.531, 0.781, 0.969)	(0.156, 0.219, 0.438)	(0.406, 0.563, 0.719)	(0.406, 0.563, 0.719)	(0.156, 0.219, 0.438)	(0.344, 0.5, 0.719)	(0.031, 0.063, 0.313)	(0.094, 0.125, 0.344)	(0.094, 0.125, 0.344)	(0, 0, 0)	(0.531, 0.781, 1)	(0.469, 0.688, 0.906)	(0.469, 0.688, 0.906)
Obs11	(0.469, 0.688, 0.906)	(0.125, 0.188, 0.406)	(0.563, 0.781, 0.906)	(0.406, 0.563, 0.719)	(0.156, 0.219, 0.438)	(0.281, 0.406, 0.625)	(0.031, 0.063, 0.313)	(0.094, 0.125, 0.344)	(0.031, 0.063, 0.313)	(0.469, 0.656, 0.813)	(0, 0, 0)	(0.406, 0.594, 0.813)	(0.406, 0.594, 0.813)
Obs12	(0.406, 0.594, 0.813)	(0.219, 0.344, 0.563)	(0.469, 0.656, 0.781)	(0.438, 0.594, 0.719)	(0.313, 0.438, 0.625)	(0.188, 0.25, 0.438)	(0.125, 0.188, 0.438)	(0.25, 0.344, 0.531)	(0.25, 0.344, 0.531)	(0.375, 0.563, 0.75)	(0.469, 0.656, 0.813)	(0, 0, 0)	(0.438, 0.656, 0.906)

(Continues)

TABLE A2 | (Continued)

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs13	(0.438, 0.625, 0.813)	(0.375, 0.563, 0.781)	(0.438, 0.656, 0.875)	(0.406, 0.594, 0.781)	(0.219, 0.313, 0.531)	(0.125, 0.188, 0.406)	(0.063, 0.094, 0.344)	(0.094, 0.125, 0.344)	(0.344, 0.469, 0.625)	(0.469, 0.656, 0.813)	(0.375, 0.563, 0.75)	(0.375, 0.531, 0.719)	(0, 0, 0)
Obs14	(0.406, 0.594, 0.813)	(0.375, 0.531, 0.719)	(0.375, 0.563, 0.781)	(0.219, 0.313, 0.531)	(0.219, 0.313, 0.531)	(0.188, 0.313, 0.531)	(0.156, 0.25, 0.469)	(0.281, 0.375, 0.531)	(0.219, 0.313, 0.531)	(0.063, 0.094, 0.344)	(0.25, 0.375, 0.625)	(0.281, 0.438, 0.656)	(0.313, 0.469, 0.688)
Obs15	(0.344, 0.5, 0.719)	(0.344, 0.5, 0.719)	(0.594, 0.844, 1)	(0.188, 0.281, 0.531)	(0.063, 0.094, 0.344)	(0.031, 0.063, 0.313)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0.25, 0.375, 0.625)	(0.188, 0.281, 0.531)	(0.469, 0.688, 0.906)
Obs16	(0.469, 0.719, 0.938)	(0.219, 0.313, 0.5)	(0.469, 0.688, 0.906)	(0.313, 0.469, 0.719)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.094, 0.125, 0.344)	(0.031, 0.063, 0.313)	(0, 0, 0.25)	(0.25, 0.375, 0.625)	(0.25, 0.375, 0.625)	(0.375, 0.563, 0.813)
Obs17	(0.406, 0.594, 0.813)	(0.063, 0.094, 0.344)	(0.281, 0.469, 0.719)	(0.188, 0.313, 0.563)	(0, 0, 0.25)	(0, 0, 0.25)	(0.125, 0.188, 0.406)	(0.094, 0.156, 0.406)	(0, 0, 0.25)	(0.094, 0.125, 0.344)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)
Obs18	(0.313, 0.469, 0.719)	(0, 0, 0.25)	(0.313, 0.469, 0.719)	(0.281, 0.438, 0.688)	(0.031, 0.063, 0.313)	(0, 0, 0.25)	(0.188, 0.281, 0.5)	(0.219, 0.313, 0.531)	(0.125, 0.188, 0.406)	(0.094, 0.125, 0.344)	(0.25, 0.406, 0.625)	(0.25, 0.344, 0.531)	(0.125, 0.219, 0.469)
Obs19	(0.094, 0.125, 0.344)	(0.094, 0.125, 0.344)	(0.094, 0.125, 0.344)	(0.063, 0.094, 0.344)	(0.156, 0.219, 0.438)	(0.094, 0.125, 0.344)	(0.188, 0.281, 0.5)	(0.156, 0.219, 0.438)	(0.094, 0.125, 0.344)	(0.094, 0.125, 0.344)	(0.156, 0.219, 0.438)	(0.25, 0.344, 0.531)	(0.094, 0.156, 0.375)
Obs20	(0.094, 0.125, 0.344)	(0.094, 0.125, 0.344)	(0, 0.031, 0.281)	(0.063, 0.094, 0.344)	(0.219, 0.313, 0.531)	(0.156, 0.25, 0.469)	(0.219, 0.313, 0.5)	(0.188, 0.25, 0.438)	(0, 0.031, 0.281)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.031, 0.063, 0.313)
Obs21	(0.188, 0.25, 0.438)	(0.156, 0.219, 0.438)	(0.188, 0.313, 0.531)	(0.188, 0.281, 0.5)	(0.063, 0.094, 0.344)	(0.125, 0.188, 0.406)	(0.031, 0.094, 0.344)	(0, 0, 0.25)	(0.031, 0.063, 0.313)	(0.156, 0.25, 0.5)	(0.094, 0.156, 0.406)	(0.188, 0.25, 0.438)	(0.063, 0.094, 0.344)
Obs22	(0.188, 0.25, 0.438)	(0.125, 0.188, 0.406)	(0.125, 0.188, 0.406)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0.063, 0.125, 0.375)	(0.156, 0.25, 0.469)	(0.188, 0.25, 0.438)	(0.25, 0.375, 0.594)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)
Obs23	(0.25, 0.375, 0.563)	(0.094, 0.125, 0.344)	(0.25, 0.344, 0.531)	(0.313, 0.438, 0.625)	(0.281, 0.406, 0.625)	(0, 0.031, 0.281)	(0.031, 0.063, 0.313)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0.156, 0.219, 0.438)	(0.156, 0.219, 0.438)	(0.156, 0.219, 0.438)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs1	(0.313, 0.438, 0.625)	(0.375, 0.531, 0.688)	(0.25, 0.406, 0.656)	(0.219, 0.344, 0.594)	(0.25, 0.375, 0.625)	(0.281, 0.406, 0.625)	(0.188, 0.281, 0.531)	(0.313, 0.469, 0.719)	(0.25, 0.375, 0.625)	(0.344, 0.469, 0.625)

(Continues)

TABLE A2 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs2	(0, 0, 0.25)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0.156, 0.281, 0.531)	(0, 0, 0.25)
Obs3	(0.25, 0.406, 0.625)	(0.5, 0.688, 0.813)	(0.438, 0.625, 0.813)	(0.531, 0.75, 0.875)	(0.406, 0.594, 0.813)	(0.344, 0.5, 0.719)	(0.313, 0.5, 0.719)	(0.313, 0.5, 0.719)	(0.313, 0.5, 0.719)	(0.25, 0.406, 0.625)
Obs4	(0.156, 0.219, 0.438)	(0.344, 0.5, 0.719)	(0.344, 0.5, 0.719)	(0.438, 0.625, 0.813)	(0.5, 0.719, 0.906)	(0.344, 0.5, 0.719)	(0.406, 0.594, 0.813)	(0.25, 0.406, 0.625)	(0.25, 0.406, 0.625)	(0.313, 0.5, 0.719)
Obs5	(0.188, 0.25, 0.438)	(0.219, 0.344, 0.594)	(0.25, 0.375, 0.625)	(0.281, 0.438, 0.688)	(0.25, 0.375, 0.625)	(0.188, 0.281, 0.531)	(0.125, 0.188, 0.438)	(0, 0, 0.25)	(0.156, 0.219, 0.438)	(0.219, 0.313, 0.531)
Obs6	(0, 0, 0.25)	(0.219, 0.344, 0.594)	(0.25, 0.375, 0.625)	(0.25, 0.375, 0.625)	(0.25, 0.375, 0.625)	(0.188, 0.281, 0.531)	(0.156, 0.219, 0.438)	(0, 0, 0.25)	(0, 0, 0.25)	(0.031, 0.063, 0.313)
Obs7	(0, 0, 0.25)	(0.219, 0.344, 0.594)	(0.25, 0.375, 0.625)	(0.281, 0.406, 0.625)	(0.25, 0.375, 0.625)	(0.188, 0.281, 0.531)	(0, 0, 0.25)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0.094, 0.156, 0.406)
Obs8	(0, 0, 0.25)	(0.25, 0.375, 0.625)	(0.188, 0.281, 0.531)	(0.25, 0.375, 0.625)	(0.063, 0.094, 0.344)	(0, 0, 0.25)	(0.031, 0.063, 0.313)	(0, 0, 0.25)	(0, 0, 0.25)	(0.094, 0.156, 0.406)
Obs9	(0, 0, 0.25)	(0.25, 0.375, 0.625)	(0.219, 0.344, 0.594)	(0.281, 0.438, 0.688)	(0.125, 0.188, 0.438)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0, 0, 0.25)	(0, 0, 0.25)	(0.094, 0.156, 0.406)
Obs10	(0.375, 0.563, 0.813)	(0.25, 0.375, 0.625)	(0.188, 0.281, 0.531)	(0.281, 0.406, 0.625)	(0.063, 0.094, 0.344)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0, 0, 0.25)	(0.063, 0.125, 0.375)	(0.094, 0.156, 0.406)
Obs11	(0.188, 0.281, 0.531)	(0.063, 0.094, 0.344)	(0.094, 0.188, 0.438)	(0.156, 0.281, 0.531)	(0.125, 0.188, 0.438)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0, 0, 0.25)	(0, 0, 0.25)	(0.125, 0.188, 0.438)
Obs12	(0.281, 0.438, 0.688)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)	(0.094, 0.156, 0.406)
Obs13	(0.281, 0.438, 0.688)	(0.156, 0.25, 0.5)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0.188, 0.25, 0.438)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0, 0, 0.25)	(0.125, 0.188, 0.438)
Obs14	(0, 0, 0)	(0.094, 0.156, 0.406)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0.125, 0.188, 0.438)	(0.313, 0.438, 0.625)	(0, 0, 0.25)	(0.125, 0.188, 0.406)
Obs15	(0.094, 0.156, 0.406)	(0, 0, 0)	(0.125, 0.188, 0.438)	(0.281, 0.406, 0.625)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.188, 0.281, 0.531)	(0.063, 0.094, 0.344)	(0.125, 0.188, 0.438)	(0.063, 0.094, 0.344)
Obs16	(0.063, 0.094, 0.344)	(0.594, 0.844, 1)	(0, 0, 0)	(0.063, 0.094, 0.344)	(0.25, 0.375, 0.625)	(0.063, 0.094, 0.344)	(0.125, 0.188, 0.438)	(0.031, 0.063, 0.313)	(0.156, 0.25, 0.5)	(0.094, 0.156, 0.406)
Obs17	(0.125, 0.188, 0.406)	(0.094, 0.125, 0.344)	(0.063, 0.094, 0.344)	(0, 0, 0)	(0.188, 0.281, 0.531)	(0.063, 0.094, 0.344)	(0.125, 0.188, 0.438)	(0, 0, 0.25)	(0.125, 0.188, 0.438)	(0.094, 0.125, 0.344)
Obs18	(0.125, 0.219, 0.469)	(0.188, 0.281, 0.469)	(0.344, 0.5, 0.719)	(0.063, 0.094, 0.344)	(0, 0, 0)	(0, 0, 0.25)	(0.125, 0.188, 0.438)	(0, 0, 0.25)	(0.125, 0.188, 0.438)	(0.063, 0.094, 0.344)

(Continues)

TABLE A2 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs19	(0.156, 0.219, 0.438)	(0.125, 0.188, 0.406)	(0.125, 0.188, 0.406)	(0.031, 0.094, 0.344)	(0.125, 0.219, 0.438)	(0, 0, 0)	(0, 0, 0.25)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)
Obs20	(0.125, 0.188, 0.406)	(0.063, 0.094, 0.344)	(0.094, 0.125, 0.344)	(0, 0.031, 0.281)	(0.125, 0.188, 0.406)	(0.125, 0.188, 0.406)	(0, 0, 0)	(0.031, 0.063, 0.313)	(0.094, 0.156, 0.406)	(0.063, 0.094, 0.344)
Obs21	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.063, 0.094, 0.344)	(0.25, 0.344, 0.531)	(0.156, 0.219, 0.438)	(0.156, 0.25, 0.469)	(0.188, 0.281, 0.5)	(0, 0, 0)	(0.031, 0.063, 0.313)	(0.031, 0.063, 0.313)
Obs22	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0.094, 0.125, 0.344)	(0, 0, 0)	(0.031, 0.063, 0.313)
Obs23	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0.188, 0.25, 0.438)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0.25)	(0, 0, 0)

TABLE A3 | Normalized direct-influence fuzzy matrix.

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs1	(0, 0, 0)	(0.03, 0.045, 0.055)	(0.028, 0.042, 0.055)	(0.03, 0.042, 0.049)	(0.032, 0.043, 0.049)	(0.025, 0.034, 0.043)	(0.011, 0.017, 0.032)	(0, 0, 0.015)	(0.013, 0.021, 0.036)	(0.006, 0.011, 0.026)	(0.025, 0.036, 0.047)	(0.009, 0.013, 0.026)	(0.009, 0.013, 0.026)
Obs2	(0.013, 0.019, 0.032)	(0, 0, 0)	(0.034, 0.047, 0.055)	(0.011, 0.017, 0.032)	(0.015, 0.023, 0.038)	(0.017, 0.028, 0.042)	(0.008, 0.013, 0.026)	(0.011, 0.017, 0.032)	(0.021, 0.03, 0.043)	(0.015, 0.023, 0.038)	(0.023, 0.034, 0.049)	(0.015, 0.025, 0.04)	(0.017, 0.026, 0.042)
Obs3	(0.032, 0.045, 0.055)	(0.032, 0.045, 0.051)	(0, 0, 0)	(0.042, 0.057, 0.06)	(0.034, 0.047, 0.055)	(0.021, 0.034, 0.047)	(0.019, 0.028, 0.042)	(0.015, 0.025, 0.04)	(0.026, 0.038, 0.049)	(0.025, 0.034, 0.043)	(0.019, 0.028, 0.043)	(0.008, 0.011, 0.026)	(0.017, 0.026, 0.04)
Obs4	(0.04, 0.053, 0.055)	(0.028, 0.04, 0.049)	(0.042, 0.057, 0.058)	(0, 0, 0)	(0.023, 0.032, 0.043)	(0.021, 0.03, 0.043)	(0.025, 0.036, 0.049)	(0.013, 0.023, 0.038)	(0.015, 0.025, 0.038)	(0.015, 0.025, 0.038)	(0.025, 0.038, 0.051)	(0.013, 0.019, 0.032)	(0.013, 0.019, 0.032)
Obs5	(0.038, 0.051, 0.055)	(0.043, 0.058, 0.06)	(0.034, 0.047, 0.053)	(0.021, 0.03, 0.043)	(0, 0, 0)	(0.028, 0.04, 0.049)	(0.025, 0.036, 0.047)	(0.011, 0.015, 0.026)	(0.011, 0.015, 0.026)	(0.023, 0.032, 0.043)	(0.026, 0.038, 0.049)	(0.028, 0.042, 0.053)	(0.021, 0.03, 0.042)
Obs6	(0.013, 0.021, 0.036)	(0.028, 0.04, 0.049)	(0.015, 0.023, 0.038)	(0.013, 0.021, 0.036)	(0.015, 0.025, 0.04)	(0, 0, 0)	(0.032, 0.047, 0.058)	(0.002, 0.004, 0.019)	(0.021, 0.034, 0.047)	(0.019, 0.03, 0.043)	(0.017, 0.025, 0.038)	(0.013, 0.019, 0.032)	(0.021, 0.03, 0.043)
Obs7	(0.019, 0.03, 0.043)	(0.021, 0.034, 0.049)	(0.013, 0.023, 0.038)	(0.023, 0.032, 0.043)	(0.013, 0.021, 0.036)	(0.023, 0.034, 0.047)	(0, 0, 0)	(0, 0, 0.015)	(0.017, 0.028, 0.042)	(0.025, 0.036, 0.049)	(0.017, 0.025, 0.038)	(0.013, 0.019, 0.032)	(0.021, 0.03, 0.043)
Obs8	(0.017, 0.028, 0.042)	(0.009, 0.013, 0.026)	(0.002, 0.004, 0.019)	(0.006, 0.008, 0.021)	(0.006, 0.009, 0.025)	(0.006, 0.008, 0.021)	(0.009, 0.015, 0.028)	(0, 0, 0)	(0.009, 0.017, 0.032)	(0.008, 0.015, 0.03)	(0.009, 0.017, 0.032)	(0.015, 0.023, 0.038)	(0.004, 0.006, 0.021)
Obs9	(0.021, 0.034, 0.047)	(0.013, 0.021, 0.034)	(0.008, 0.011, 0.026)	(0.008, 0.011, 0.025)	(0.011, 0.017, 0.03)	(0.019, 0.026, 0.038)	(0.008, 0.013, 0.026)	(0.011, 0.017, 0.03)	(0, 0, 0)	(0.011, 0.017, 0.032)	(0.006, 0.011, 0.026)	(0.009, 0.017, 0.032)	(0.009, 0.017, 0.032)
Obs10	(0.032, 0.047, 0.058)	(0.009, 0.013, 0.026)	(0.025, 0.034, 0.043)	(0.025, 0.034, 0.043)	(0.009, 0.013, 0.026)	(0.021, 0.03, 0.043)	(0.002, 0.004, 0.019)	(0.006, 0.008, 0.021)	(0.006, 0.008, 0.021)	(0, 0, 0)	(0.032, 0.047, 0.06)	(0.028, 0.042, 0.055)	(0.028, 0.042, 0.055)
Obs11	(0.028, 0.042, 0.055)	(0.008, 0.011, 0.025)	(0.034, 0.047, 0.055)	(0.025, 0.034, 0.043)	(0.009, 0.013, 0.026)	(0.017, 0.025, 0.038)	(0.002, 0.004, 0.019)	(0.006, 0.008, 0.021)	(0.002, 0.004, 0.019)	(0.028, 0.04, 0.049)	(0, 0, 0)	(0.025, 0.036, 0.049)	(0.025, 0.036, 0.049)
Obs12	(0.025, 0.036, 0.049)	(0.013, 0.021, 0.034)	(0.028, 0.04, 0.047)	(0.026, 0.036, 0.043)	(0.019, 0.026, 0.038)	(0.011, 0.015, 0.026)	(0.008, 0.011, 0.026)	(0.015, 0.021, 0.032)	(0.015, 0.021, 0.032)	(0.023, 0.034, 0.045)	(0.028, 0.04, 0.049)	(0, 0, 0)	(0.026, 0.04, 0.055)

(Continues)

TABLE A3 | (Continued)

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs13	(0.026, 0.038, 0.049)	(0.023, 0.034, 0.047)	(0.026, 0.04, 0.053)	(0.025, 0.036, 0.047)	(0.013, 0.019, 0.032)	(0.008, 0.011, 0.025)	(0.004, 0.006, 0.021)	(0.006, 0.008, 0.021)	(0.021, 0.028, 0.038)	(0.028, 0.04, 0.049)	(0.023, 0.034, 0.045)	(0.023, 0.032, 0.043)	(0, 0, 0)
Obs14	(0.025, 0.036, 0.049)	(0.023, 0.032, 0.043)	(0.023, 0.034, 0.047)	(0.013, 0.019, 0.032)	(0.013, 0.019, 0.032)	(0.011, 0.019, 0.032)	(0.009, 0.015, 0.028)	(0.017, 0.023, 0.032)	(0.013, 0.019, 0.032)	(0.004, 0.006, 0.021)	(0.015, 0.023, 0.038)	(0.017, 0.026, 0.04)	(0.019, 0.028, 0.042)
Obs15	(0.021, 0.03, 0.043)	(0.021, 0.03, 0.043)	(0.036, 0.051, 0.06)	(0.011, 0.017, 0.032)	(0.004, 0.006, 0.021)	(0.002, 0.004, 0.019)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0.015, 0.023, 0.038)	(0.011, 0.017, 0.032)	(0.028, 0.042, 0.055)
Obs16	(0.028, 0.043, 0.057)	(0.013, 0.019, 0.03)	(0.028, 0.042, 0.055)	(0.019, 0.028, 0.043)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.006, 0.008, 0.021)	(0.002, 0.004, 0.019)	(0, 0, 0.015)	(0.015, 0.023, 0.038)	(0.015, 0.023, 0.038)	(0.023, 0.034, 0.049)
Obs17	(0.025, 0.036, 0.049)	(0.004, 0.006, 0.021)	(0.017, 0.028, 0.043)	(0.011, 0.019, 0.034)	(0, 0, 0.015)	(0, 0, 0.015)	(0.008, 0.011, 0.025)	(0.006, 0.009, 0.025)	(0, 0, 0.015)	(0.006, 0.008, 0.021)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)
Obs18	(0.019, 0.028, 0.043)	(0, 0, 0.015)	(0.019, 0.028, 0.043)	(0.017, 0.026, 0.042)	(0.002, 0.004, 0.019)	(0, 0, 0.015)	(0.011, 0.017, 0.03)	(0.013, 0.019, 0.032)	(0.008, 0.011, 0.025)	(0.006, 0.008, 0.021)	(0.015, 0.025, 0.038)	(0.015, 0.021, 0.032)	(0.008, 0.013, 0.028)
Obs19	(0.006, 0.008, 0.021)	(0.006, 0.008, 0.021)	(0.006, 0.008, 0.021)	(0.004, 0.006, 0.021)	(0.009, 0.013, 0.026)	(0.006, 0.008, 0.021)	(0.011, 0.017, 0.03)	(0.009, 0.013, 0.026)	(0.006, 0.008, 0.021)	(0.006, 0.008, 0.021)	(0.009, 0.013, 0.026)	(0.015, 0.021, 0.032)	(0.006, 0.009, 0.023)
Obs20	(0.006, 0.008, 0.021)	(0.006, 0.008, 0.021)	(0, 0.002, 0.017)	(0.004, 0.006, 0.021)	(0.013, 0.019, 0.032)	(0.009, 0.015, 0.028)	(0.013, 0.019, 0.03)	(0.011, 0.015, 0.026)	(0, 0.002, 0.017)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.002, 0.004, 0.019)
Obs21	(0.011, 0.015, 0.026)	(0.009, 0.013, 0.026)	(0.011, 0.019, 0.032)	(0.011, 0.017, 0.03)	(0.004, 0.006, 0.021)	(0.008, 0.011, 0.025)	(0.002, 0.006, 0.021)	(0, 0, 0.015)	(0.002, 0.004, 0.019)	(0.009, 0.015, 0.03)	(0.006, 0.009, 0.025)	(0.011, 0.015, 0.026)	(0.004, 0.006, 0.021)
Obs22	(0.011, 0.015, 0.026)	(0.008, 0.011, 0.025)	(0.008, 0.011, 0.025)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0.004, 0.008, 0.023)	(0.009, 0.015, 0.028)	(0.011, 0.015, 0.026)	(0.015, 0.023, 0.036)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)
Obs23	(0.015, 0.023, 0.034)	(0.006, 0.008, 0.021)	(0.015, 0.021, 0.032)	(0.019, 0.026, 0.038)	(0.017, 0.025, 0.038)	(0, 0.002, 0.017)	(0.002, 0.004, 0.019)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0.009, 0.013, 0.026)	(0.009, 0.013, 0.026)	(0.009, 0.013, 0.026)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs1	(0.019, 0.026, 0.038)	(0.023, 0.032, 0.042)	(0.015, 0.025, 0.04)	(0.013, 0.021, 0.036)	(0.015, 0.023, 0.038)	(0.017, 0.025, 0.038)	(0.011, 0.017, 0.032)	(0.019, 0.028, 0.043)	(0.015, 0.023, 0.038)	(0.021, 0.028, 0.038)

(Continues)

TABLE A3 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs2	(0, 0, 0.015)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0.009, 0.017, 0.032)	(0, 0, 0.015)
Obs3	(0.015, 0.025, 0.038)	(0.03, 0.042, 0.049)	(0.026, 0.038, 0.049)	(0.032, 0.045, 0.053)	(0.025, 0.036, 0.049)	(0.021, 0.03, 0.043)	(0.019, 0.03, 0.043)	(0.019, 0.03, 0.043)	(0.019, 0.03, 0.043)	(0.015, 0.025, 0.038)
Obs4	(0.009, 0.013, 0.026)	(0.021, 0.03, 0.043)	(0.021, 0.03, 0.043)	(0.026, 0.038, 0.049)	(0.03, 0.043, 0.055)	(0.021, 0.03, 0.043)	(0.025, 0.036, 0.049)	(0.015, 0.025, 0.038)	(0.015, 0.025, 0.038)	(0.019, 0.03, 0.043)
Obs5	(0.011, 0.015, 0.026)	(0.013, 0.021, 0.036)	(0.015, 0.023, 0.038)	(0.017, 0.026, 0.042)	(0.015, 0.023, 0.038)	(0.011, 0.017, 0.032)	(0.008, 0.011, 0.026)	(0, 0, 0.015)	(0.009, 0.013, 0.026)	(0.013, 0.019, 0.032)
Obs6	(0, 0, 0.015)	(0.013, 0.021, 0.036)	(0.015, 0.023, 0.038)	(0.015, 0.023, 0.038)	(0.015, 0.023, 0.038)	(0.011, 0.017, 0.032)	(0.009, 0.013, 0.026)	(0, 0, 0.015)	(0, 0, 0.015)	(0.002, 0.004, 0.019)
Obs7	(0, 0, 0.015)	(0.013, 0.021, 0.036)	(0.015, 0.023, 0.038)	(0.017, 0.025, 0.038)	(0.015, 0.023, 0.038)	(0.011, 0.017, 0.032)	(0, 0, 0.015)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0.006, 0.009, 0.025)
Obs8	(0, 0, 0.015)	(0.015, 0.023, 0.038)	(0.011, 0.017, 0.032)	(0.015, 0.023, 0.038)	(0.004, 0.006, 0.021)	(0, 0, 0.015)	(0.002, 0.004, 0.019)	(0, 0, 0.015)	(0, 0, 0.015)	(0.006, 0.009, 0.025)
Obs9	(0, 0, 0.015)	(0.015, 0.023, 0.038)	(0.013, 0.021, 0.036)	(0.017, 0.026, 0.042)	(0.008, 0.011, 0.026)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0, 0, 0.015)	(0, 0, 0.015)	(0.006, 0.009, 0.025)
Obs10	(0.023, 0.034, 0.049)	(0.015, 0.023, 0.038)	(0.011, 0.017, 0.032)	(0.017, 0.025, 0.038)	(0.004, 0.006, 0.021)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0, 0, 0.015)	(0.004, 0.008, 0.023)	(0.006, 0.009, 0.025)
Obs11	(0.011, 0.017, 0.032)	(0.004, 0.006, 0.021)	(0.006, 0.011, 0.026)	(0.009, 0.017, 0.032)	(0.008, 0.011, 0.026)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0, 0, 0.015)	(0, 0, 0.015)	(0.008, 0.011, 0.026)
Obs12	(0.017, 0.026, 0.042)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)	(0.006, 0.009, 0.025)
Obs13	(0.017, 0.026, 0.042)	(0.009, 0.015, 0.03)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0.011, 0.015, 0.026)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0, 0, 0.015)	(0.008, 0.011, 0.026)
Obs14	(0, 0, 0)	(0.006, 0.009, 0.025)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0.008, 0.011, 0.026)	(0.019, 0.026, 0.038)	(0, 0, 0.015)	(0.008, 0.011, 0.025)
Obs15	(0.006, 0.009, 0.025)	(0, 0, 0)	(0.008, 0.011, 0.026)	(0.017, 0.025, 0.038)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.011, 0.017, 0.032)	(0.004, 0.006, 0.021)	(0.008, 0.011, 0.026)	(0.004, 0.006, 0.021)
Obs16	(0.004, 0.006, 0.021)	(0.036, 0.051, 0.06)	(0, 0, 0)	(0.004, 0.006, 0.021)	(0.015, 0.023, 0.038)	(0.004, 0.006, 0.021)	(0.008, 0.011, 0.026)	(0.002, 0.004, 0.019)	(0.009, 0.015, 0.03)	(0.006, 0.009, 0.025)
Obs17	(0.008, 0.011, 0.025)	(0.006, 0.008, 0.021)	(0.004, 0.006, 0.021)	(0, 0, 0)	(0.011, 0.017, 0.032)	(0.004, 0.006, 0.021)	(0.008, 0.011, 0.026)	(0, 0, 0.015)	(0.008, 0.011, 0.026)	(0.006, 0.008, 0.021)
Obs18	(0.008, 0.013, 0.028)	(0.011, 0.017, 0.028)	(0.021, 0.03, 0.043)	(0.004, 0.006, 0.021)	(0, 0, 0)	(0, 0, 0.015)	(0.008, 0.011, 0.026)	(0, 0, 0.015)	(0.008, 0.011, 0.026)	(0.004, 0.006, 0.021)

(Continues)

TABLE A3 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs19	(0.009, 0.013, 0.026)	(0.008, 0.011, 0.025)	(0.008, 0.011, 0.025)	(0.002, 0.006, 0.021)	(0.008, 0.013, 0.026)	(0, 0, 0)	(0, 0, 0.015)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)
Obs20	(0.008, 0.011, 0.025)	(0.004, 0.006, 0.021)	(0.006, 0.008, 0.021)	(0, 0.002, 0.017)	(0.008, 0.011, 0.025)	(0.008, 0.011, 0.025)	(0, 0, 0)	(0.002, 0.004, 0.019)	(0.006, 0.009, 0.025)	(0.004, 0.006, 0.021)
Obs21	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.004, 0.006, 0.021)	(0.015, 0.021, 0.032)	(0.009, 0.013, 0.026)	(0.009, 0.015, 0.028)	(0.011, 0.017, 0.03)	(0, 0, 0)	(0.002, 0.004, 0.019)	(0.002, 0.004, 0.019)
Obs22	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0.006, 0.008, 0.021)	(0, 0, 0)	(0.002, 0.004, 0.019)
Obs23	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0.011, 0.015, 0.026)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0.015)	(0, 0, 0)

TABLE A4 | Fuzzy total relation matrix.

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs1	(0.012, 0.03, 0.112)	(0.039, 0.068, 0.146)	(0.04, 0.071, 0.163)	(0.039, 0.064, 0.143)	(0.039, 0.061, 0.13)	(0.031, 0.051, 0.125)	(0.017, 0.033, 0.108)	(0.004, 0.011, 0.08)	(0.019, 0.036, 0.112)	(0.012, 0.029, 0.108)	(0.033, 0.058, 0.143)	(0.017, 0.032, 0.114)	(0.017, 0.034, 0.119)
Obs2	(0.021, 0.039, 0.121)	(0.006, 0.016, 0.075)	(0.04, 0.064, 0.14)	(0.018, 0.033, 0.108)	(0.02, 0.035, 0.103)	(0.022, 0.041, 0.107)	(0.011, 0.023, 0.087)	(0.014, 0.024, 0.083)	(0.025, 0.041, 0.104)	(0.02, 0.036, 0.104)	(0.028, 0.049, 0.126)	(0.02, 0.037, 0.109)	(0.022, 0.04, 0.115)
Obs3	(0.047, 0.082, 0.184)	(0.043, 0.074, 0.158)	(0.015, 0.039, 0.129)	(0.052, 0.084, 0.17)	(0.042, 0.068, 0.149)	(0.029, 0.056, 0.142)	(0.026, 0.047, 0.13)	(0.02, 0.038, 0.114)	(0.033, 0.056, 0.137)	(0.032, 0.055, 0.138)	(0.03, 0.057, 0.157)	(0.017, 0.036, 0.129)	(0.027, 0.052, 0.147)
Obs4	(0.052, 0.086, 0.178)	(0.039, 0.066, 0.151)	(0.054, 0.089, 0.179)	(0.012, 0.029, 0.108)	(0.031, 0.053, 0.135)	(0.029, 0.051, 0.134)	(0.031, 0.053, 0.133)	(0.018, 0.035, 0.109)	(0.022, 0.042, 0.122)	(0.023, 0.045, 0.129)	(0.034, 0.064, 0.158)	(0.022, 0.041, 0.129)	(0.022, 0.043, 0.135)
Obs5	(0.05, 0.082, 0.169)	(0.053, 0.083, 0.155)	(0.047, 0.079, 0.166)	(0.032, 0.057, 0.142)	(0.009, 0.021, 0.087)	(0.036, 0.059, 0.133)	(0.03, 0.052, 0.125)	(0.016, 0.027, 0.093)	(0.018, 0.033, 0.106)	(0.03, 0.052, 0.128)	(0.036, 0.064, 0.15)	(0.036, 0.061, 0.142)	(0.03, 0.054, 0.138)
Obs6	(0.022, 0.045, 0.137)	(0.035, 0.057, 0.132)	(0.024, 0.046, 0.137)	(0.02, 0.04, 0.123)	(0.02, 0.038, 0.113)	(0.006, 0.015, 0.076)	(0.036, 0.058, 0.125)	(0.005, 0.012, 0.078)	(0.025, 0.046, 0.115)	(0.024, 0.045, 0.118)	(0.024, 0.043, 0.126)	(0.019, 0.035, 0.112)	(0.027, 0.047, 0.127)
Obs7	(0.028, 0.054, 0.145)	(0.027, 0.052, 0.132)	(0.023, 0.047, 0.138)	(0.03, 0.051, 0.13)	(0.018, 0.035, 0.11)	(0.028, 0.048, 0.121)	(0.004, 0.012, 0.07)	(0.003, 0.009, 0.074)	(0.021, 0.041, 0.11)	(0.03, 0.05, 0.123)	(0.024, 0.044, 0.127)	(0.019, 0.035, 0.112)	(0.027, 0.047, 0.127)
Obs8	(0.021, 0.041, 0.117)	(0.013, 0.023, 0.089)	(0.007, 0.018, 0.094)	(0.01, 0.018, 0.086)	(0.008, 0.017, 0.08)	(0.008, 0.015, 0.076)	(0.011, 0.021, 0.079)	(0.001, 0.004, 0.044)	(0.011, 0.023, 0.083)	(0.01, 0.023, 0.085)	(0.013, 0.027, 0.098)	(0.018, 0.031, 0.096)	(0.007, 0.016, 0.084)
Obs9	(0.027, 0.05, 0.131)	(0.018, 0.034, 0.104)	(0.014, 0.029, 0.11)	(0.013, 0.025, 0.098)	(0.015, 0.027, 0.092)	(0.022, 0.036, 0.099)	(0.01, 0.022, 0.084)	(0.013, 0.022, 0.078)	(0.003, 0.009, 0.058)	(0.015, 0.027, 0.094)	(0.01, 0.025, 0.101)	(0.013, 0.028, 0.098)	(0.014, 0.029, 0.102)
Obs10	(0.042, 0.072, 0.159)	(0.018, 0.034, 0.112)	(0.035, 0.06, 0.144)	(0.033, 0.055, 0.131)	(0.016, 0.03, 0.102)	(0.026, 0.045, 0.117)	(0.007, 0.016, 0.089)	(0.009, 0.017, 0.08)	(0.011, 0.021, 0.091)	(0.006, 0.016, 0.076)	(0.039, 0.067, 0.148)	(0.034, 0.057, 0.133)	(0.035, 0.059, 0.138)
Obs11	(0.037, 0.064, 0.148)	(0.015, 0.03, 0.103)	(0.042, 0.069, 0.146)	(0.032, 0.053, 0.124)	(0.016, 0.028, 0.096)	(0.022, 0.038, 0.106)	(0.006, 0.015, 0.083)	(0.009, 0.016, 0.075)	(0.007, 0.016, 0.084)	(0.033, 0.053, 0.117)	(0.007, 0.019, 0.084)	(0.03, 0.049, 0.121)	(0.03, 0.051, 0.126)
Obs12	(0.034, 0.06, 0.145)	(0.021, 0.04, 0.114)	(0.037, 0.063, 0.141)	(0.034, 0.055, 0.125)	(0.025, 0.042, 0.108)	(0.017, 0.031, 0.098)	(0.012, 0.023, 0.092)	(0.018, 0.029, 0.087)	(0.02, 0.034, 0.098)	(0.028, 0.049, 0.116)	(0.035, 0.058, 0.133)	(0.006, 0.016, 0.077)	(0.032, 0.056, 0.133)

(Continues)

TABLE A4 | (Continued)

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs13	(0.036, 0.061, 0.145)	(0.03, 0.052, 0.127)	(0.036, 0.063, 0.147)	(0.032, 0.055, 0.129)	(0.019, 0.034, 0.104)	(0.014, 0.027, 0.096)	(0.008, 0.017, 0.087)	(0.009, 0.016, 0.077)	(0.025, 0.041, 0.103)	(0.034, 0.054, 0.119)	(0.03, 0.053, 0.13)	(0.028, 0.047, 0.118)	(0.007, 0.018, 0.082)
Obs14	(0.032, 0.055, 0.137)	(0.029, 0.048, 0.118)	(0.03, 0.053, 0.134)	(0.02, 0.035, 0.109)	(0.018, 0.032, 0.099)	(0.016, 0.032, 0.098)	(0.013, 0.025, 0.089)	(0.019, 0.029, 0.083)	(0.017, 0.03, 0.094)	(0.009, 0.019, 0.088)	(0.021, 0.038, 0.116)	(0.022, 0.039, 0.109)	(0.024, 0.042, 0.115)
Obs15	(0.028, 0.048, 0.131)	(0.026, 0.045, 0.117)	(0.043, 0.069, 0.146)	(0.018, 0.033, 0.108)	(0.009, 0.018, 0.087)	(0.006, 0.015, 0.084)	(0.003, 0.009, 0.076)	(0.003, 0.007, 0.067)	(0.004, 0.01, 0.077)	(0.004, 0.012, 0.081)	(0.02, 0.037, 0.115)	(0.015, 0.028, 0.101)	(0.033, 0.053, 0.127)
Obs16	(0.036, 0.063, 0.148)	(0.02, 0.036, 0.108)	(0.036, 0.062, 0.146)	(0.025, 0.045, 0.123)	(0.009, 0.019, 0.09)	(0.008, 0.018, 0.089)	(0.007, 0.015, 0.084)	(0.008, 0.015, 0.075)	(0.006, 0.015, 0.083)	(0.005, 0.012, 0.084)	(0.021, 0.039, 0.119)	(0.019, 0.035, 0.109)	(0.028, 0.048, 0.125)
Obs17	(0.028, 0.047, 0.12)	(0.007, 0.015, 0.081)	(0.021, 0.039, 0.113)	(0.015, 0.028, 0.095)	(0.003, 0.008, 0.069)	(0.003, 0.007, 0.068)	(0.01, 0.017, 0.074)	(0.007, 0.014, 0.066)	(0.002, 0.007, 0.065)	(0.008, 0.014, 0.073)	(0.007, 0.015, 0.084)	(0.006, 0.012, 0.077)	(0.006, 0.013, 0.08)
Obs18	(0.025, 0.045, 0.126)	(0.005, 0.013, 0.084)	(0.025, 0.044, 0.123)	(0.022, 0.04, 0.112)	(0.006, 0.014, 0.08)	(0.004, 0.01, 0.076)	(0.014, 0.024, 0.086)	(0.015, 0.025, 0.079)	(0.01, 0.02, 0.081)	(0.009, 0.017, 0.081)	(0.019, 0.037, 0.109)	(0.019, 0.03, 0.096)	(0.012, 0.025, 0.097)
Obs19	(0.01, 0.019, 0.089)	(0.009, 0.016, 0.077)	(0.01, 0.019, 0.088)	(0.007, 0.015, 0.079)	(0.012, 0.02, 0.076)	(0.008, 0.014, 0.07)	(0.013, 0.022, 0.076)	(0.011, 0.017, 0.065)	(0.008, 0.013, 0.067)	(0.008, 0.014, 0.071)	(0.013, 0.022, 0.086)	(0.018, 0.028, 0.085)	(0.009, 0.018, 0.079)
Obs20	(0.009, 0.017, 0.086)	(0.009, 0.015, 0.075)	(0.003, 0.011, 0.081)	(0.006, 0.013, 0.076)	(0.015, 0.024, 0.079)	(0.011, 0.021, 0.076)	(0.015, 0.024, 0.075)	(0.012, 0.018, 0.064)	(0.002, 0.007, 0.062)	(0.006, 0.011, 0.069)	(0.006, 0.013, 0.078)	(0.006, 0.012, 0.072)	(0.004, 0.01, 0.073)
Obs21	(0.016, 0.027, 0.098)	(0.013, 0.022, 0.085)	(0.016, 0.03, 0.101)	(0.015, 0.026, 0.091)	(0.007, 0.013, 0.073)	(0.01, 0.018, 0.077)	(0.004, 0.012, 0.07)	(0.002, 0.005, 0.057)	(0.004, 0.01, 0.068)	(0.012, 0.022, 0.082)	(0.009, 0.019, 0.087)	(0.014, 0.022, 0.082)	(0.007, 0.014, 0.08)
Obs22	(0.013, 0.021, 0.084)	(0.009, 0.016, 0.073)	(0.009, 0.016, 0.08)	(0.002, 0.005, 0.064)	(0.005, 0.01, 0.063)	(0.005, 0.012, 0.065)	(0.011, 0.018, 0.067)	(0.012, 0.017, 0.059)	(0.016, 0.026, 0.075)	(0.001, 0.004, 0.058)	(0.002, 0.005, 0.065)	(0.001, 0.004, 0.06)	(0.001, 0.004, 0.063)
Obs23	(0.019, 0.033, 0.098)	(0.009, 0.017, 0.076)	(0.019, 0.031, 0.096)	(0.022, 0.035, 0.093)	(0.02, 0.031, 0.085)	(0.003, 0.009, 0.065)	(0.004, 0.01, 0.064)	(0.002, 0.004, 0.053)	(0.002, 0.006, 0.06)	(0.003, 0.007, 0.064)	(0.013, 0.022, 0.083)	(0.012, 0.02, 0.077)	(0.012, 0.02, 0.08)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs1	(0.023, 0.037, 0.105)	(0.029, 0.048, 0.123)	(0.02, 0.038, 0.115)	(0.019, 0.036, 0.114)	(0.021, 0.037, 0.113)	(0.021, 0.034, 0.101)	(0.015, 0.027, 0.097)	(0.021, 0.036, 0.101)	(0.018, 0.032, 0.1)	(0.024, 0.039, 0.103)

(Continues)

TABLE A4 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs2	(0.003, 0.008, 0.071)	(0.004, 0.012, 0.082)	(0.007, 0.016, 0.082)	(0.004, 0.012, 0.079)	(0.004, 0.01, 0.076)	(0.002, 0.007, 0.066)	(0.002, 0.007, 0.067)	(0.006, 0.011, 0.067)	(0.011, 0.023, 0.081)	(0.003, 0.008, 0.069)
Obs3	(0.02, 0.039, 0.117)	(0.038, 0.063, 0.145)	(0.033, 0.055, 0.137)	(0.039, 0.065, 0.144)	(0.031, 0.054, 0.136)	(0.025, 0.042, 0.117)	(0.024, 0.043, 0.119)	(0.022, 0.039, 0.11)	(0.023, 0.042, 0.116)	(0.02, 0.038, 0.115)
Obs4	(0.015, 0.027, 0.103)	(0.029, 0.051, 0.135)	(0.027, 0.047, 0.128)	(0.033, 0.056, 0.136)	(0.036, 0.06, 0.137)	(0.025, 0.042, 0.114)	(0.029, 0.047, 0.121)	(0.018, 0.033, 0.102)	(0.019, 0.036, 0.108)	(0.024, 0.043, 0.117)
Obs5	(0.016, 0.028, 0.098)	(0.021, 0.04, 0.121)	(0.021, 0.038, 0.116)	(0.023, 0.043, 0.122)	(0.021, 0.038, 0.115)	(0.015, 0.028, 0.097)	(0.012, 0.022, 0.093)	(0.003, 0.009, 0.076)	(0.013, 0.024, 0.092)	(0.018, 0.031, 0.1)
Obs6	(0.003, 0.01, 0.078)	(0.018, 0.035, 0.111)	(0.019, 0.034, 0.106)	(0.02, 0.035, 0.109)	(0.019, 0.034, 0.106)	(0.014, 0.024, 0.089)	(0.012, 0.021, 0.085)	(0.002, 0.005, 0.068)	(0.003, 0.008, 0.073)	(0.005, 0.012, 0.079)
Obs7	(0.004, 0.01, 0.078)	(0.018, 0.035, 0.111)	(0.019, 0.034, 0.106)	(0.021, 0.037, 0.109)	(0.019, 0.034, 0.106)	(0.014, 0.025, 0.089)	(0.003, 0.008, 0.075)	(0.004, 0.01, 0.071)	(0.004, 0.012, 0.076)	(0.009, 0.018, 0.085)
Obs8	(0.002, 0.006, 0.062)	(0.018, 0.03, 0.094)	(0.013, 0.023, 0.083)	(0.017, 0.029, 0.09)	(0.006, 0.012, 0.072)	(0.001, 0.004, 0.058)	(0.003, 0.008, 0.063)	(0.001, 0.003, 0.054)	(0.001, 0.004, 0.058)	(0.007, 0.014, 0.069)
Obs9	(0.002, 0.007, 0.068)	(0.019, 0.033, 0.101)	(0.016, 0.029, 0.093)	(0.02, 0.035, 0.1)	(0.01, 0.019, 0.083)	(0.006, 0.011, 0.069)	(0.006, 0.011, 0.07)	(0.001, 0.004, 0.059)	(0.002, 0.006, 0.063)	(0.008, 0.016, 0.075)
Obs10	(0.027, 0.045, 0.112)	(0.021, 0.037, 0.113)	(0.016, 0.028, 0.1)	(0.022, 0.037, 0.108)	(0.009, 0.018, 0.09)	(0.003, 0.009, 0.073)	(0.007, 0.015, 0.081)	(0.003, 0.008, 0.069)	(0.007, 0.015, 0.08)	(0.009, 0.02, 0.086)
Obs11	(0.015, 0.028, 0.091)	(0.009, 0.02, 0.091)	(0.01, 0.022, 0.09)	(0.014, 0.029, 0.098)	(0.012, 0.023, 0.09)	(0.005, 0.012, 0.073)	(0.005, 0.012, 0.074)	(0.003, 0.007, 0.065)	(0.003, 0.008, 0.068)	(0.011, 0.02, 0.083)
Obs12	(0.021, 0.036, 0.101)	(0.009, 0.02, 0.092)	(0.008, 0.017, 0.086)	(0.007, 0.017, 0.087)	(0.006, 0.016, 0.084)	(0.005, 0.012, 0.074)	(0.005, 0.012, 0.075)	(0.004, 0.011, 0.07)	(0.004, 0.011, 0.073)	(0.009, 0.019, 0.082)
Obs13	(0.021, 0.036, 0.101)	(0.015, 0.029, 0.101)	(0.005, 0.012, 0.081)	(0.009, 0.019, 0.089)	(0.015, 0.026, 0.091)	(0.003, 0.008, 0.07)	(0.007, 0.014, 0.077)	(0.006, 0.013, 0.072)	(0.003, 0.008, 0.07)	(0.011, 0.021, 0.084)
Obs14	(0.003, 0.008, 0.056)	(0.01, 0.021, 0.091)	(0.004, 0.01, 0.076)	(0.004, 0.011, 0.079)	(0.004, 0.01, 0.076)	(0.003, 0.007, 0.067)	(0.01, 0.018, 0.078)	(0.021, 0.032, 0.084)	(0.002, 0.006, 0.066)	(0.01, 0.019, 0.078)
Obs15	(0.009, 0.018, 0.08)	(0.015, 0.028, 0.088)	(0.011, 0.02, 0.086)	(0.02, 0.034, 0.099)	(0.007, 0.015, 0.081)	(0.006, 0.012, 0.071)	(0.014, 0.024, 0.084)	(0.006, 0.012, 0.068)	(0.01, 0.018, 0.077)	(0.006, 0.013, 0.074)
Obs16	(0.007, 0.015, 0.079)	(0.04, 0.063, 0.128)	(0.004, 0.01, 0.064)	(0.008, 0.017, 0.087)	(0.019, 0.032, 0.1)	(0.006, 0.013, 0.074)	(0.01, 0.019, 0.081)	(0.004, 0.01, 0.069)	(0.012, 0.022, 0.083)	(0.009, 0.018, 0.08)
Obs17	(0.009, 0.016, 0.069)	(0.008, 0.015, 0.075)	(0.006, 0.012, 0.07)	(0.002, 0.007, 0.051)	(0.013, 0.023, 0.081)	(0.005, 0.01, 0.062)	(0.009, 0.016, 0.069)	(0.002, 0.004, 0.054)	(0.009, 0.016, 0.067)	(0.007, 0.013, 0.064)
Obs18	(0.01, 0.02, 0.079)	(0.015, 0.028, 0.09)	(0.023, 0.038, 0.099)	(0.007, 0.015, 0.079)	(0.003, 0.008, 0.057)	(0.002, 0.006, 0.063)	(0.01, 0.017, 0.075)	(0.002, 0.005, 0.059)	(0.009, 0.017, 0.073)	(0.006, 0.012, 0.07)

(Continues)

TABLE A4 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23
Obs19	(0.011, 0.017, 0.068)	(0.01, 0.018, 0.075)	(0.009, 0.016, 0.07)	(0.004, 0.011, 0.068)	(0.009, 0.018, 0.072)	(0.001, 0.003, 0.039)	(0.001, 0.003, 0.055)	(0.005, 0.008, 0.056)	(0.005, 0.009, 0.058)	(0.005, 0.01, 0.061)
Obs20	(0.009, 0.014, 0.064)	(0.006, 0.011, 0.069)	(0.007, 0.012, 0.065)	(0.002, 0.007, 0.063)	(0.009, 0.016, 0.068)	(0.009, 0.014, 0.061)	(0.001, 0.003, 0.038)	(0.003, 0.006, 0.052)	(0.006, 0.012, 0.061)	(0.005, 0.009, 0.059)
Obs21	(0.006, 0.011, 0.065)	(0.006, 0.013, 0.074)	(0.006, 0.012, 0.069)	(0.017, 0.027, 0.082)	(0.012, 0.019, 0.074)	(0.011, 0.019, 0.069)	(0.013, 0.021, 0.072)	(0.001, 0.003, 0.038)	(0.003, 0.008, 0.059)	(0.003, 0.008, 0.061)
Obs22	(0.001, 0.002, 0.05)	(0.001, 0.004, 0.058)	(0.001, 0.003, 0.055)	(0.002, 0.004, 0.056)	(0.001, 0.003, 0.054)	(0.001, 0.002, 0.048)	(0.001, 0.002, 0.049)	(0.006, 0.009, 0.051)	(0.001, 0.002, 0.033)	(0.003, 0.006, 0.053)
Obs23	(0.002, 0.005, 0.056)	(0.002, 0.006, 0.064)	(0.002, 0.005, 0.06)	(0.002, 0.006, 0.061)	(0.002, 0.006, 0.06)	(0.013, 0.019, 0.064)	(0.002, 0.004, 0.053)	(0.001, 0.003, 0.049)	(0.001, 0.004, 0.052)	(0.002, 0.005, 0.04)

TABLE A5 | De-fuzzified total relation matrix.

Code	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Obs8	Obs9	Obs10	Obs11	Obs12	Obs13
Obs1	0.0451	0.0797	0.0841	0.0767	0.0723	0.0643	0.0468	0.0239	0.0500	0.0438	0.0719	0.0474	0.0500
Obs2	0.0538	0.0271	0.0766	0.0472	0.0477	0.0526	0.0353	0.0350	0.0526	0.0486	0.0623	0.0500	0.0536
Obs3	0.0953	0.0860	0.0547	0.0953	0.0809	0.0700	0.0620	0.0517	0.0698	0.0691	0.0733	0.0529	0.0681
Obs4	0.0977	0.0793	0.0999	0.0436	0.0674	0.0653	0.0669	0.0485	0.0567	0.0597	0.0784	0.0569	0.0595
Obs5	0.0937	0.0925	0.0908	0.0711	0.0335	0.0716	0.0644	0.0392	0.0470	0.0654	0.0772	0.0745	0.0678
Obs6	0.0611	0.0701	0.0624	0.0550	0.0522	0.0264	0.0691	0.0242	0.0582	0.0579	0.0584	0.0490	0.0616
Obs7	0.0692	0.0658	0.0627	0.0649	0.0491	0.0609	0.0226	0.0204	0.0531	0.0629	0.0587	0.0490	0.0615
Obs8	0.0548	0.0357	0.0320	0.0311	0.0289	0.0266	0.0316	0.0105	0.0341	0.0342	0.0404	0.0430	0.0284
Obs9	0.0641	0.0471	0.0441	0.0389	0.0394	0.0479	0.0333	0.0328	0.0175	0.0396	0.0392	0.0408	0.0428
Obs10	0.0848	0.0487	0.0738	0.0679	0.0433	0.0581	0.0299	0.0284	0.0344	0.0273	0.0792	0.0697	0.0723
Obs11	0.0771	0.0437	0.0806	0.0653	0.0412	0.0508	0.0281	0.0268	0.0290	0.0643	0.0311	0.0622	0.0644
Obs12	0.0736	0.0537	0.0753	0.0672	0.0539	0.0434	0.0361	0.0401	0.0457	0.0607	0.0708	0.0273	0.0688
Obs13	0.0749	0.0651	0.0762	0.0676	0.0473	0.0401	0.0304	0.0278	0.0523	0.0652	0.0661	0.0599	0.0294
Obs14	0.0686	0.0606	0.0667	0.0489	0.0446	0.0440	0.0371	0.0395	0.0420	0.0321	0.0525	0.0516	0.0550
Obs15	0.0628	0.0577	0.0808	0.0468	0.0309	0.0277	0.0211	0.0176	0.0225	0.0245	0.0511	0.0416	0.0661
Obs16	0.0763	0.0491	0.0756	0.0590	0.0325	0.0311	0.0283	0.0259	0.0275	0.0256	0.0533	0.0486	0.0616
Obs17	0.0598	0.0274	0.0526	0.0410	0.0192	0.0183	0.0278	0.0232	0.0169	0.0249	0.0277	0.0242	0.0256
Obs18	0.0593	0.0265	0.0585	0.0528	0.0265	0.0221	0.0361	0.0349	0.0311	0.0292	0.0501	0.0429	0.0382
Obs19	0.0322	0.0276	0.0317	0.0267	0.0301	0.0244	0.0322	0.0259	0.0231	0.0249	0.0340	0.0388	0.0292
Obs20	0.0297	0.0262	0.0238	0.0245	0.0345	0.0309	0.0333	0.0266	0.0166	0.0217	0.0249	0.0230	0.0218
Obs21	0.0403	0.0340	0.0436	0.0386	0.0243	0.0293	0.0224	0.0136	0.0203	0.0333	0.0315	0.0336	0.0262
Obs22	0.0326	0.0268	0.0283	0.0153	0.0194	0.0214	0.0273	0.0247	0.0353	0.0132	0.0153	0.0135	0.0142
Obs23	0.0451	0.0277	0.0434	0.0457	0.0416	0.0190	0.0192	0.0121	0.0153	0.0171	0.0333	0.0305	0.0313
R	1.4518	1.158	1.4182	1.1911	0.9607	0.9461	0.8412	0.6533	0.851	0.945	1.1808	1.0308	1.0973

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23	*D*
Obs1	0.0498	0.0618	0.0524	0.0507	0.0509	0.0470	0.0406	0.0479	0.0449	0.0509	1.2528
Obs2	0.0195	0.0248	0.0280	0.0242	0.0219	0.0172	0.0174	0.0208	0.0335	0.0186	0.8683
Obs3	0.0530	0.0765	0.0693	0.0772	0.0679	0.0560	0.0566	0.0522	0.0553	0.0522	1.5453
Obs4	0.0416	0.0655	0.0617	0.0695	0.0727	0.0551	0.0605	0.0461	0.0491	0.0561	1.4577
Obs5	0.0417	0.0544	0.0526	0.0573	0.0522	0.0408	0.0356	0.0210	0.0366	0.0440	1.3249
Obs6	0.0223	0.0490	0.0478	0.0489	0.0474	0.0366	0.0327	0.0164	0.0193	0.0248	1.0508
Obs7	0.0228	0.0492	0.0478	0.0506	0.0476	0.0368	0.0204	0.0208	0.0234	0.0308	1.0510
Obs8	0.0154	0.0423	0.0343	0.0408	0.0226	0.0134	0.0177	0.0116	0.0133	0.0243	0.6671
Obs9	0.0179	0.0457	0.0409	0.0473	0.0315	0.0217	0.0221	0.0135	0.0156	0.0266	0.8100
Obs10	0.0569	0.0512	0.0420	0.0507	0.0315	0.0203	0.0271	0.0187	0.0273	0.0319	1.0754
Obs11	0.0395	0.0330	0.0351	0.0420	0.0353	0.0228	0.0236	0.0172	0.0186	0.0322	0.9640
Obs12	0.0484	0.0335	0.0303	0.0304	0.0282	0.0231	0.0237	0.0214	0.0224	0.0308	1.0088
Obs13	0.0484	0.0423	0.0248	0.0322	0.0384	0.0192	0.0259	0.0235	0.0190	0.0326	1.0084
Obs14	0.0163	0.0338	0.0219	0.0237	0.0218	0.0177	0.0294	0.0416	0.0167	0.0299	0.8960
Obs15	0.0293	0.0389	0.0322	0.0462	0.0271	0.0229	0.0352	0.0218	0.0290	0.0241	0.8579

(Continues)

TABLE A5 | (Continued)

Code	Obs14	Obs15	Obs16	Obs17	Obs18	Obs19	Obs20	Obs21	Obs22	Obs23	*D*
Obs16	0.0266	0.0736	0.0197	0.0300	0.0452	0.0241	0.0309	0.0208	0.0338	0.0293	0.9283
Obs17	0.0260	0.0261	0.0226	0.0141	0.0338	0.0195	0.0256	0.0126	0.0252	0.0219	0.6161
Obs18	0.0309	0.0395	0.0493	0.0267	0.0167	0.0157	0.0280	0.0143	0.0272	0.0230	0.7797
Obs19	0.0268	0.0283	0.0264	0.0216	0.0279	0.0088	0.0121	0.0165	0.0174	0.0187	0.5852
Obs20	0.0235	0.0216	0.0217	0.0166	0.0252	0.0227	0.0082	0.0137	0.0206	0.0178	0.5291
Obs21	0.0207	0.0238	0.0221	0.0373	0.0295	0.0283	0.0306	0.0086	0.0169	0.0177	0.6264
Obs22	0.0097	0.0132	0.0121	0.0128	0.0116	0.0098	0.0095	0.0162	0.0064	0.0141	0.4025
Obs23	0.0134	0.0162	0.0148	0.0157	0.0152	0.0274	0.0123	0.0110	0.0119	0.0102	0.5293
R	0.7004	0.9439	0.8101	0.8666	0.8021	0.6068	0.6255	0.5084	0.5836	0.6624	

TABLE A6 | Expert details.

Experts	Domain	Experience
Experts 1, 2	Healthcare policy makers	> 20 years
Experts 3–7	Academicians	> 12 years
Experts 8, 9	Medical administrators	> 15 years
Experts 10–12	Medical practitioners	> 10 years