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Transactional Model of eGovernance: Empirical Evidence from the Healthcare Sector of India

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ABSTRACT

Introduction: A vast array of ICT based eGovernance initiatives are being put into practice in the healthcare sector in India to facilitate the populace and other stakeholders. However, a structural and strong healthcare management system postulates the development of an updated governance model.

Objectives: The paper proposes to develop a Transactional Model governance model for the healthcare sector to augment the efficiency and social influence of eGovernance web portals.

Methods: Twelve dimensions, extracted based on extensive literature review, models, NeSDA and UNDESA methodology and through Exploratory and Confirmatory Factor Analysis (EFA and CFA) have been used. Responses of 600 doctors, healthcare staff and patients have been collected through an in-depth interview and observation checklist. Structural Equation Modeling (SEM) has been applied to develop and propose a transactional model of governance after statistical testing.

Results: The outcome depicts a significant positive impact of identified dimensions on Intention to Use and Service Quality construct of healthcare-related eGovernance services which ultimately improves efficiency thereby leading to social influence.

Conclusion: The paper proposes an integrated and efficient governance model framework to enhance the social influence of eGovernance services in the healthcare sector. The promising outcome evinced that the proposed framework may serve as a roadmap for policy and decision-makers.

Key Words: eGovernance, Efficiency, Corruption, Mismanagement, Resources, Social influence

INTRODUCTION

The coherent elevation and adoption of Information Communication Technology (ICT) driven eGovernance applications in the healthcare sector has transformed the mode of contact, connect and transact between hospitals, administrators, doctors, healthcare supporting staff and patients. The synthesis of the utility of ICT based eGovernance in the healthcare sector in India started with Mission Mode Projects (MMPs) of the National e-Governance Plan (NeGP) initially via using traditional communication technology viz. Electronic Media (Community Radio, and telephone), and gradually elevated to use of state-of-the-art technology viz. Video and Teleconferencing (Telehealth, Tele-medicine and Tele-referrals, on-line video consultations); Internet-enabled Web-based centres (Information kiosks, common service centres, eOffice, eHospital, voice web etc.); and Cloud-based eHealth and

hospital administrative services. The NeGP 2.0, eKranti, and Digital India movement facilitates services like Aadhar based online registration, appointments, payments, access to diagnostic reports, real-time tracking of data and registrations, efficient information management, patient monitoring, medical education and communication, Vaccine Tracker, eRakt Kosh; Online Medical Counseling and Admissions, online continuous medical education courses through webinars and live streaming; Swasth Bharat (Disease, Lifestyle, First Aid), NHP Indradhanush; eHMIS, Ayushman Bharat – Health and Wellness Centre (HWC) portal, Integrated Disease Surveillance Programme (IDSP) Portal, Mera Aspataal – patient Feedback mechanism and many more.¹

The thrust of the National Health Policy (NAP) supported by the Digital India initiative is on augmenting the eGovernance revolution by offering medical facilities through

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the web, mobile, and cloud (MeghRaj) accessible to the populace equitably round the clock.² Ministry of Health and Family Welfare (MoHFW), Government of India is endorsing eHealth to develop an efficient, evidence-based, ethical healthcare system that shall encourage, educate, and empower patients and other stakeholders through information dissemination thereby improving public healthcare delivery.¹ However, the current COVID 19 pandemic situation raised a serious question about our health machinery.

Over the years governments and bureaucrats considered healthcare only as a medical subject and ignored the acute need for a structured health management system for the second largest populated country. India ranked 145 as per Global Healthcare Access and Quality (HAQ) index, ranks lower than Bangladesh, Sri Lanka, Bhutan and Sudan and also slipped to 150th rank in healthcare and survival as per World Economic Forum (WEF).^{3,4} Health staff always remain under stress due to scarcity of infrastructural and human resource i.e. one government doctor on 10,189 residents, one government bed on 2,046 residents and one government hospital on 90,343 residents.⁵

On the other hand, the Supreme Court of India has termed patient care as “deplorable” and “pathetic”, as patients are running from pillar to post to get admission to hospitals, whereas a large number of beds are lying vacant in the hospitals.⁶ The problem is not merely inadequate resources i.e. infrastructure and human, but also mismanagement of health institutions. Furthermore, not much attention is being paid to ethical issues related to the adoption of technology and the safety of personal and sensitive information related to patients.⁸ Besides, the most serious ethical crisis i.e. corruption in the healthcare sector is poorly addressed and doctors and hospital staff are key actors behind the same.^{7,8} 20% of health costs in the country is due to corruption and there is corruption in healthcare education as well.⁹ The Organisation for Economic Co-operation and Development (OECD) estimates that 45 % of global citizens believe that the health sector is corrupt or very corrupt. Insufficient regulatory oversight and lack of transparency in governance breed corruption and reduce the quality of healthcare services.¹⁰

Apart from issues related to infrastructural, human resources, mismanagement, poor GDP allocation⁴ and inadequate attention towards governance¹¹ are responsible for the pathetic situation of healthcare in India. The outcome of various research studies has established a significant correlation between poor governance and mismanaged public healthcare services across countries.¹² The gaps are visible between the ground realities and the policies framed to address them.

Many strategies exist for making the healthcare environment conducive, viz. adequate funding to the public healthcare system, remunerating health care workers adequately, ensuring social accountability, etc. but eGovernance is the most

vital and cost-effective strategy for the national healthcare system to work optimally.¹⁰ The induction of web, mobile and cloud-based portals in native languages has enhanced the popularity of healthcare-related eGovernance services among all and the healthcare sector steadily advanced from the eGovernance transactional phase to transformational phase i.e. participation of end-users in decision and policy-making and implementation.¹⁰

With the proliferation of information channels, the expectations of the patients related to the accessibility of public health services in a convenient, integrated, transparent, and cost-effective manner have been boosted. However, the complexity of the eGovernance in the healthcare sector has enhanced with time. The contrary research outcomes and amplified implementation challenges encouraged researchers, governing institutions and research labs towards the development of an eGovernance model viz. “DeLone and McLean IS Success Model (DandM Model), Technology Acceptance (TAM) model, Theory of Planned Behavior (TPB), Gartner’s Four Stage Model, Layne and Lee Four-Stage Model, Heeks Design Reality Gap Model, Theory of Reasoned Action (TRA), Structuration Model of Technology (SMT), United Nations Five-Stage Web Presence Measurement Model, Diffusion of Innovation (DOI), Unified Theory of Acceptance and Use of Technology (UTAUT), and Theory of Planned Behavior (TPB), Heeks Onion Ring Model, EGOVSAT model” and many more to enhance the competence of the eGovernance initiatives. However, a significant gap in the expansion of existing theoretical and technology-oriented models conceptually and practically is evident in research outcomes.¹³ Further, the enormous failure rate of eGovernance initiatives supported by research gaps necessitates rapid and consistent horizontal and vertical assessment from the stakeholders’ perspective.

National e-Governance Service Delivery Assessment 2019 (NeSDA) assessed eGovernance services portals of six sectors (Finance, Labour & Employment, Education, Local Government & Utilities, Social Welfare, Agriculture, Health and Environment) based on seven key constructs i.e. Accessibility, Ease of use, End service delivery, Integrated service delivery, Content Availability, Information security & privacy, and Status & Request tracking, based upon Online Service Index (OSI) of UNDESA eGovernment Survey in 2019 and published survey outcome in February 2020.¹⁴ The low level of stakeholders’ satisfaction evinced in the survey particularly related to health sector demands for development of an integrated model and with this in view, the present paper proposes to develop a transactional model of eGovernance for healthcare sector from stakeholders’ perspective, with emphasis on enhancing efficiency and social influence of eGovernance web portal.

MATERIALS AND METHODS

The process of model development encompasses various phases, exploring the dimensions of eGovernance using EFA by collecting responses from 600 doctors, healthcare staff and patients through in-depth interview related to twelve dimensions i.e. “Performance Expectancy, Compatibility, Job Fit, Facilitating Conditions, Intention to Use, Ease of Use, Competence, Reliability, Usefulness, Responsiveness, Product Portfolio, and Security dimensions” extracted based on extensive literature review, models, NeSDA and UNDESA survey methodology. The extracted dimensions and their relationship were affirmed using CFA.

The healthcare staff involved in governance projects serving at Central and State-funded Post Graduate Institutions of Medical Sciences (PGIMS) and patients were considered as sample unit and 600 respondents were selected based on Judgment sampling. The doctors and healthcare staff having more than three years of experience in eGovernance activities and patients possessing Smartphone with hands-on knowledge, ready to interact and participate were included in the study.

The respondents were contacted through Snowball Approach and responses were recorded on Likert Seven Point Summative Scale (SD (1) to SA (7)) through an in-depth interview and observation checklist. The data were tabulated and statistically analyzed using open source software “Jamovi” Version 0.9.5.12 and EFA, CFA, SEM was applied. The respondents were apprised regarding the objectives of the research before starting the interview. Further, the respondents were assured that their identity shall not be revealed.

RESULTS AND DISCUSSION

The value of the Kaiser-Meyer-Olkin (KMO) test of Sampling Adequacy was 0.907 and the P Value of Bartlett’s Test of Sphericity was less than 0.05, which endorse the application of EFA (Tables 1 and 2). The principle Components Analysis (PCA) method was applied to execute EFA. All extracted factors having Eigenvalue >1 were retained for further analysis.

Tables 3 and 4 explained extraction of 28 statements due to communality value less than 0.50, data adequacy and existence of relationship among the 21 remaining statements on which final EFA was applied. The cumulative percentage of variance was 70.546 that inferring 70 per cent of eGovernance portal efficiency is explained by these twelve dimensions. Further, CFA was applied for overall construct validation and statements falling in each of the factors derived from EFA were tabulated in Table 5.

CFA was applied on twelve dimensions and model fit indices/summary (Table 6) and GFI, CFI, NFI and RMSEA val-

ues tabulated in Table 7. CFI value of 0.9 and above testifies strong unidimensionality; GFI value of more than 0.9 shows the best fit of the model, and value of RMSEA 0.079 also makes the model acceptable. The relationships between the statements and factors were strong and significant (Figure 1). All the relevant assumptions of SEM were satisfied and the transactional model of eGovernance for the healthcare sector proposed in Figure 2.

CONCLUSIONS

The outcome depicts the significant positive impact of “Performance Expectancy”, “Compatibility”, “Job Fit”, “Facilitating Conditions”, “Ease of Use”, “Competence”, “Reliability”, “Usefulness”, “Responsiveness”, “Product Portfolio”, and “Security” on Intention to Use and Service Quality constructs of eGovernance which ultimately improves the efficiency of the eGovernance in the healthcare sector and efficiency leads to positive social influence. The proposed transactional model of governance will guide the policymakers to focus on identified constructs to enhance and maintain efficiency and social influence. The suggested model may be tested after integrating it with new constructs based on empirical outcomes for an update. However, the masses will not be benefited unless administrative, social and political measures ensure equitable access to all.

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Table 1: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.901
Bartlett's Test of Sphericity	Approx. Chi-Square	4110.312
	Df	136
	Sig.	.000

Table 2: Statements/Items related to eGovernance Model for Healthcare Sector

Sr. No.	Statements/items	Initial	Extraction
	Portal shall enable me to accomplish tasks more quickly and improve productivity.	1.000	.432
	Performance Expectancy		
	Portal shall remove the redundancy of data.	1.000	.771
	Portal shall provide integrate data related to all departments.	1.000	.802
	Portal shall enable Data recovery quickly and easy.	1.000	.354
	Portal shall be compatible with the traditional manual process.	1.000	.444
	Compatibility		
	Portal G2C services shall be portable with legacy systems.	1.000	.786
	Using the portal shall not require special training and skills.	1.000	.674
	The portal shall be relevant to my job profile.	1.000	.831
	Job Fit		
	Portal shall not require significant changes in my existing work routine.	1.000	.307
	Portal shall supply 24 x 7 anytime and anywhere information to handle citizen choirs and backend support	1.000	.409
	Availability of resources required to use the portal.	1.000	.659
	Facilitating Conditions		

Table 2: (Continued)

Sr. No.	Statements/items	Initial	Extraction
	Availability of round the clock high-speed internet connectivity.	1.000	.402
	Top-Down guidance and support as and when required	1.000	.609
	Portal shall improve my skills and competency	1.000	.791
	Intention to Use		
	Govt. and HEI Legislation compulsion to work through the portal.	1.000	.306
	Portal shall save time and cost and enhance convenience.	1.000	.417
	Navigation on Portal shall be easy and quick.	1.000	.390
	Using portal shall be more secure as compare to the previous system	1.000	.860
	Portal shall provide services on time in a given time frame.	1.000	.787
	Reliability		
	Portal shall perform services correctly every time.	1.000	.454
	Online transactions through the portal shall always accurate.	1.000	.407
	I shall rapidly retrieve the real-time information as and when required using the portal	1.000	.434
	Portal shall provide services promptly	1.000	.401
	Responsiveness		
	Portal shall quickly resolve problems as and when encounter.	1.000	.665
	I shall receive prompt responses to my requests by email, SMS or other means.	1.000	.309
	The Front and Back-End of the portal shall be able to handle the problems as and when arise.	1.000	.878
	Competence		
	The Front and Back-End of the portal shall know to answer my choirs.	1.000	.404
	I shall not encounter online jam in searching for information.	1.000	.493
	Portal shall be quick and easy to complete transaction and access results	1.000	.376
	Portal shall require Low Loading Time and maintain Low Queuing Time	1.000	.765
	The organisation and structure of online content available on the portal shall be easy to follow.	1.000	.401
	Easy to Use		
	Portal shall require low effort and technical knowledge to assess and operate.	1.000	.609
	Navigating and search desired information on the portal shall be easy.	1.000	.706
	The user interface of the portal shall be the well organized and appealing appearance	1.000	.709
	I shall feel confident while working on the computer even if there is no one around to tell me what to do.	1.000	.402
	Portal shall provide wide ranges of services.	1.000	.398
	Product Portfolio		
	The services offered through Portal shall be as per requirement.	1.000	.877
	The Portal shall provide many useful free services (e.g. message board, eMail, links, resources, Dashboard etc.)	1.000	.340
	Portal shall not misuse my personal information.	1.000	.709
	Security		
	I shall feel secure operating Portal for online transactions.	1.000	.443
	I shall feel secure in sharing sensitive information (e.g. bank details, phone no etc.) during online transactions through the portal.	1.000	.403
	The portal shall have well defined Privacy Policy.	1.000	.874

Table 2: (Continued)

Sr. No.	Statements/items	Initial	Extraction
	When some transaction error occurs on the portal I shall feel secure	1.000	.409
	I shall feel the risk associated with online transactions using the portal in low.	1.000	.445
	The online services offered by Portal shall save time and cost and also enhance convenience.	1.000	.704
	Usefulness		
	Portal shall provide 24x7 anytime, anywhere online services and support.	1.000	.498
	Web Content shall be available in Local Language on Portal.	1.000	.645
	Govt and HEI Legislation forced me to use the website.	1.000	.359
	Portal Services shall be useful in diverse ways.	1.000	.476

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	3723.181
	Df	113
	Sig.	.000

Table 4: Statements/Items related to HEIs G2C eGovernance Model

Sr. No.	Statements/items	Initial	Extraction
	Portal shall remove the redundancy of data. Performance Expectancy	1.000	.771
	Portal shall provide integrate data related to all departments.	1.000	.802
	Portal G2C services shall be portable with legacy systems. Compatibility	1.000	.786
	Using the portal shall not require special training and skills.	1.000	.674
	The portal shall be relevant to my job profile. Job Fit	1.000	.831
	Availability of all necessary resources required to use the portal. Facilitating Conditions	1.000	.659
	Top-Down guidance and support as and when required	1.000	.609
	Portal shall improve my skills and competency. Intention to Use	1.000	.791
	Using portal shall be more secure as compare to the previous system	1.000	.860
	Portal shall provide services on time in a given time frame. Reliability	1.000	.787
	Portal shall quickly resolve problems as and when encounter. Responsiveness	1.000	.665
	The Front and Back-End of the portal shall be able to handle the problems as and when arise. Competence	1.000	.878
	Portal shall require Low Loading Time and maintain Low Queuing Time	1.000	.765
	Portal shall require low effort and technical knowledge to assess and operate. Easy to Use	1.000	.609
	Navigating and search desired information on the portal shall be easy.	1.000	.706
	The user interface of the portal shall be the well organized and appealing appearance	1.000	.709
	The services offered through the portal shall be as per requirement. Product Portfolio	1.000	.877

Table 4: (Continued)

Sr. No.	Statements/items	Initial	Extraction
	Portal shall not misuse my personal information. Security	1.000	.709
	The portal shall have well defined Privacy Policy.	1.000	.874
	The online services offered by the portal shall save time and cost and also enhance convenience. Usefulness	1.000	.704
	Web Content shall be available in Local Language on the portal.	1.000	.645
Extraction Method: Principal Component Analysis			

Table 5: Coding of Statements and Factor Loading eGovernance Model

Sr. No.	Factor	Coding	Statements/items	Factor Loading
	Performance Expectancy	PE1	Portal shall provide integrate data related to all departments.	.848
		PE2	Portal shall remove the redundancy of data.	.805
	Compatibility	C1	Portal G2C services shall be portable with legacy systems.	.796
		C2	Using Portal shall not require special training and skills.	.707
	Job Fit	JF1	The portal shall be relevant to my job profile.	.867
	Facilitating Conditions	FC1	Availability of necessary resources required to use Portal.	.805
		FC2	Top-Down guidance and support as and when required	.765
	Intention to Use	IU1	Using portal shall be more secure as compare to the previous system	.890
		IU2	Portal shall improve my skills and competency.	.805
	Reliability	REL1	Portal shall provide services on time in a given time frame.	.744
	Responsiveness	RES1	Portal shall quickly resolve problems as and when encounter.	.788
	Competence	COM1	Portal shall require Low Loading Time and maintain Low Queuing Time	.808
		COM2	The Front and Back-End of the portal shall be able to handle the problems as and when arise.	.798
	Easy to Use	EU1	User Interface of the portal shall be well organized and appealing appearance	.788
		EU2	Navigating and search desired information on Portal shall be easy.	.757
		EU3	Portal shall requires low effort and technical knowledge to assess and operate.	.719
	Product Portfolio	PP1	The services offered through portal shall be as per requirement.	.817
	Security	SEC1	The portal shall have well defined Privacy Policy.	.887
		SEC2	Portal shall not misuse my personal information.	.864
	Usefulness	USE1	The online services offered by Portal shall save time and cost and also enhance convenience.	.837
		USE2	Web Content shall be available in Local Language on Portal.	.784

Table 6: Model Fit Indices

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	35	277.805	85	.000	3.268
Saturated model	120	.000	0		
Independence model	15	3884.552	105	.000	36.996

Table 7: Model Fit Indices

Model	The goodness of fit (GFI)	Comparative Fit Index (CFI)	Normed Fit Index (NFI)	Root Mean Square Error of Approximation (RMSEA)
Default Model	.907	.947	.932	.076

Figure 1 : CFA Outcome.

Figure 2: Transactional Model of eGovernance for Healthcare Sector.