Future framework of eGovernance architecture: A structural equitation modeling perspective

Sumeet Gill¹, Priya Vij²

¹ Supervisor, Department of Mathematics, MDU, Rohtak, 124001, India
² Scholar, Department of Computer Sciences and Applications, MDU, Rohtak, 124001, India

Abstract

The present era of eGovernance is considered as technology-driven which enhance productivity along with amplified failure rates. The process, citizens, technology, and resources are the pillars of eGovernance but the emphasis is only upon technology which postulates for the development of updated integrated eGovernance model for accomplishing future requirements. Objectives: The present study endeavors to discover the diverse vital constructs to develop an integrated eGovernance model to augment efficiency and social influence. Methods: The NeSDA and OSI methodology are taken as a basis to extract constructs of eGovernance model and attained constructs and relative relationships ascertained through Exploratory and Confirmatory Factor Analysis (EFA and CFA). Structural Equation Modelling (SEM) is applied to develop and propose an integrated eGovernance model to augment efficiency and social influence. Findings: The empirical outcome illustrate the significant positive impact of eleven accumulated constructs on Intention to Use and Service Quality of the eGovernance initiative which ultimately augments efficiency and social influence of eGovernance initiatives. Novelty: The proposed model makes a significant contribution by integrating vital constructs on the basis of empirical outcomes and applies them to the context of the eGovernance. The suggested model will guide the policymakers and developers of eGovernance systems to focus on identified constructs to maintain and enhance efficiency and social influence.

Keywords: Structural equation modeling; intension to use; social influence; competence; transparency; efficiency

1 Introduction

eGovernance attempts to realize efficient processes and structures by integrating ICT at all levels of governance for augmenting good governance. The coherent elevation of eGovernance applications in assorted sectors transforms the mode of contact, connect, transact and reconnect between administrators and citizens. Technology brings out
new era of enhanced productivity through collaboration of stakeholders\(^1\). The rapid advancement and adoption of eGovernance technologies along with amplified failure rates instigate researchers towards development of diverse models and frameworks related to eGovernance.

Diverse models viz. Critical flow model, Comparative analysis model, Wider/Broadcasting dissemination model, Interactive service model and Mobilization and lobbying model, D&M Model, TAM, TPB, TRA, Gartner’s Model, Layne and Lee Model, UN Model, Onion Ring Model, IBM Model and many more have been applied globally but contrary outcomes are consistently evident due to diverse local requirements and environment.

Knowledge creation, conservation and augmentation is crucial and integral part of eGovernance model development\(^2\) whereas process, citizens, technology and resources are the pillars of eGovernance. Rapid acquaintance of state-of-the-art technology reflects emphasis is upon technology whereas it should have been on discovering and assessing the constructs vital for the success of the models. Literature shows that service vision and attitude of service providers and developers are vital for eGovernance and ultimately facilitate in furthering the objectives of eGovernance Initiatives. Depleted intention of the backend service provider to harness the potential of technology is the prime hurdle in enhancing the efficiency of eGovernance projects. Further, the public services quality also plays an equally important role. Security construct restricts the development of eGovernment systems and most of the models stress upon phases viz. Presence, Adoption, Interaction, Transaction, Transformation, Catalogue, Vertical and Horizontal integration, Publish, Automate and many more\(^3\). The validity and reliability of the constructs of mentioned phases have been neglected. The hindrance of operational implementation and usage of eGovernance should be overcome\(^4\) to enhance the significant effect of the eGovernance on society.

The Gartner, Layne and Lee, United Nations, World Bank, IBM and many more eGovernance models merely guide policymakers in reengineering processes and the same shall not be referred to as standard. eGovernance is not only web based service which refurbishes government functioning with transparency\(^5\) but has larger influence than someone’s revelation. Personal and social factor, proxied to the competencies of governance and may affect performance of the government\(^6\).

The present era is considered to be technology driven and organizations advocate the use of cloud based technology in accelerating the transformation of citizen oriented services\(^7\). The cloud computing through SAAS, PAAS and IAAS provides solutions pertaining to eGovernance infrastructure development at lower cost and swiftly\(^8\) though it neglects construct identification at any layer. Nevertheless, it is a fact that technology remains as assisting tool and human and other services related constructs need to be conceived judiciously. Feedback interface guides the institutions to deal with debatable and problematic gaps to enhance the efficiency of the working models\(^9\).

Only few models open avenues for direct participation of individuals in governance processes to bring in greater objectivity and transparency\(^10\) but no model puts forward participation of end users at the time of inception and development to identify the significant constructs which leads to model efficiency enhancement. Being an integrated system eGovernance enables institutions to assess the performance\(^11\) however the gaps of eGovernance models remain unaddressed. Significant gaps in the existing technology oriented eGovernance models evident through research outcomes\(^12\). Melioration of existing eGovernance model is essential for improved coexistence of government and stakeholders\(^13\).

The present study is an attempt to discover the diverse vital constructs to develop integrated eGovernance model to augment efficiency and social influence.

### 2 Materials and Methods

#### 2.1 Statistical Analysis

The model development compass different phases i.e. accumulating eGovernance constructs by referring National eGovernance Service Delivery Assessment 2019 (NeSDA), UNDESA Online Service Index (OSI) eGovernment Survey\(^{14}\), and extensive literature review in first phase. In second phase, twelve accumulated eGovernance constructs were ascertained by applying Exploratory Factor Analysis (EFA) on the basis of responses of respondents. In third stage, extracted constructs and relative relationship confirmed through Confirmatory Factor Analysis (CFA) and in fourth stage, Structural Equation Modelling (SEM) was applied on the basis of extracted constructs and relative relationship to develop integrated eGovernance model to augment efficiency and social influence. The responses were tabulated and analyzed using open source software Jamovi Version 0.9.5.12.

#### 2.1.1 Sample Status

In total, six hundred (600) respondents including software developers, system analysts, front and back end service providers, citizens and end users were selected (using snowball method) and interviewed during February 2019 to December 2019. Only those respondents who were having hands-on knowledge of eGovernance technologies and applications and were ready to interact and participate were included in the study. The respondents were apprised regarding the objective of the research.

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before starting the interview. Further, the respondents were assured that their identity shall not be revealed.

3 Results and Discussion

The Kaiser-Meyer-Olkin (KMO) test value of sampling adequacy (.903) and significant value of Bartlett's Test of Sphericity (0.00) endorse application of EFA [Table 1]. Principle Components Analysis (PCA) technique were applied to execute EFA [Table 2] on 49 statements. All the constructs having Eigen value >1 were extracted and retained for further analysis. 28 statements were extracted due to communality value less than 0.50. Further, data adequacy (KMO .897) and existence of relationship among the 21 remaining statements were also depicted and final EFA was applied [Tables 3 and 4].

Table 1. KMO and Bartlett's test

| Kaiser-Meyer-Olkin measure of sampling adequacy | .903 |
|-----------------------------------------------|------|
| Approx. Chi-Square                            | 4100.306 |
| Df                                             | 138  |
| Sig.                                           | .000 |

Table 2. Statements/Items related to eGovernance constructs

| Sr. No. | Statements/items                                                                 | Initial | Extraction |
|---------|----------------------------------------------------------------------------------|---------|------------|
| 1.      | Portal shall accomplish tasks more quickly and improve productivity. Performance Expectancy | 1.000   | .401       |
| 2.      | Portal shall remove redundancy of data.                                          | 1.000   | .773       |
| 3.      | Portal shall provide integrated data related to all departments.                 | 1.000   | .807       |
| 4.      | Portal shall enable data recovery quickly and easy.                               | 1.000   | .437       |
| 5.      | Portal shall be compatible with traditional manual process. Compatibility         | 1.000   | .489       |
| 6.      | Portal G2C services shall be portable with legacy systems.                        | 1.000   | .791       |
| 7.      | Using portal shall not require special training and skills.                       | 1.000   | .674       |
| 8.      | Portal shall be relevant to my job profile. Job Fit                               | 1.000   | .825       |
| 9.      | Portal shall not require significant changes in my existing work routine.         | 1.000   | .309       |
| 10.     | Portal shall supply 24 x 7 anytime and anywhere information to handle citizen quires and backend support | 1.000   | .403       |
| 11.     | Availability of resources required to use portal. Facilitating Conditions          | 1.000   | .661       |
| 12.     | Availability of 24 x 7 high speed internet connectivity.                          | 1.000   | .349       |
| 13.     | Top Down guidance and support as and when required                                 | 1.000   | .664       |
| 14.     | Portal shall improve my skills and competency Intention to Use                   | 1.000   | .717       |
| 15.     | Govt. and HEI Legislation compulsion to work through portal.                      | 1.000   | .329       |
| 16.     | Portal shall save time and cost and enhance convenience.                          | 1.000   | .429       |
| 17.     | Navigation on Portal shall be easy and quick.                                     | 1.000   | .467       |
| 18.     | Using portal shall be more secure as compare to the previous system               | 1.000   | .802       |
| 19.     | Portal shall provide services on time in a given time frame. Reliability          | 1.000   | .706       |
| 20.     | Portal shall performs services correctly every time.                              | 1.000   | .401       |
| 21.     | Online transactions through portal always accurate.                               | 1.000   | .417       |
| 22.     | Citizen's shall rapidly retrieve the real time information as and when required using portal | 1.000   | .466       |
| 23.     | Portal shall provide services promptly Responsiveness                             | 1.000   | .379       |
| 24.     | Portal shall quickly resolves problems as and when encounter.                    | 1.000   | .632       |
| 25.     | Citizen's shall receive prompt responses to my requests by email, SMS or other means. | 1.000   | .387       |
| 26.     | The Front and Back-End of portal shall be able to handle the problems as and when arise. Competence | 1.000   | .829       |
| 27.     | The Front and Back-End of portal shall have knowledge to answer my quires.        | 1.000   | .406       |
| 28.     | Citizen's shall not encounter online jam in searching for information.            | 1.000   | .462       |
| 29.     | Portal shall be quik and easy to complete transaction and access results          | 1.000   | .392       |
| 30.     | Portal shall require Low Loading Time and maintain Low Queuing Time                | 1.000   | .776       |
| 31.     | The organisation and structure of online content available on portal shall be easy to follow. Easy to Use | 1.000   | .298       |
| 32.     | Portal shall requires low effort and technical knowledge to assess and operate.    | 1.000   | .654       |
| 33.     | Navigating and search desired information on portal shall be easy.                | 1.000   | .701       |
| 34.     | User Interface of the portal shall be well organized and appealing appearance      | 1.000   | .703       |

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Table 2 continued

| Sr. No. | Statements/items                                                                 | Initial | Extraction |
|---------|----------------------------------------------------------------------------------|---------|------------|
| 35.     | Citizen’s shall feel confident while working on computer even if there is no one around to tell me what to do. | 1.000   | .401       |
| 36.     | Portal shall provide wide ranges of services. Product Portfolio                   | 1.000   | .327       |
| 37.     | The services offered through Portal shall be as per requirement.                | 1.000   | .819       |
| 38.     | The Portal shall provide many useful free services (e.g. message board, eMail, eLinks, eResources, Dashboard etc.) | 1.000   | .393       |
| 39.     | Portal shall not misuse citizen’s personal information. Security                 | 1.000   | .768       |
| 40.     | Citizen’s shall feel secure operating Portal for online transactions.            | 1.000   | .414       |
| 41.     | Citizen’s shall feel secure in sharing sensitive information (e.g. bank details, phone no etc.) during online transactions through portal. | 1.000   | .476       |
| 42.     | The portal shall have well defined Privacy Policy.                              | 1.000   | .842       |
| 43.     | When some transaction error occur on portal citizen’s shall feel secure          | 1.000   | .436       |
| 44.     | Citizen’s shall feel the risk associated with online transactions using portal in low. | 1.000   | .414       |
| 45.     | The online services offered by Portal shall save time and cost and also enhance convenience. Usefulness | 1.000   | .726       |
| 46.     | Portal shall provide 24x7 anytime, anywhere online services and support.        | 1.000   | .465       |
| 47.     | Web Content shall be available in Local Language on Portal.                     | 1.000   | .644       |
| 48.     | Govt. and HEI Legislation forced me to use website.                             | 1.000   | .401       |
| 49.     | Portal Services shall be useful in diverse ways.                               | 1.000   | .417       |

Table 3. KMO and Bartlett’s test

| Kaiser-Meyer-Olkin measure of sampling adequacy | .880 |
|-----------------------------------------------|------|
| Bartlett’s Test of Sphericity                  |      |
| Approx. Chi-Square                            | 3700.017 |
| Df                                             | 113  |
| Sig.                                           | .000 |

Table 4. Statements/Items related to eGovernance constructs

| Sr. No. | Statements/items                                                                 | Initial | Extraction |
|---------|----------------------------------------------------------------------------------|---------|------------|
| 1.      | Portal shall remove redundancy of data. Performance Expectancy                    | 1.000   | .773       |
| 2.      | Portal shall provide integrate data related to all departments.                  | 1.000   | .807       |
| 3.      | Portal G2C services shall be portable with legacy systems. Compatibility         | 1.000   | .791       |
| 4.      | Using portal shall not require special training and skills.                      | 1.000   | .674       |
| 5.      | Portal shall be relevant to my job profile. Job Fit                              | 1.000   | .825       |
| 6.      | Availability of resources required to use portal. Facilitating Conditions        | 1.000   | .661       |
| 7.      | Top Down guidance and support as and when required                               | 1.000   | .664       |
| 8.      | Portal shall improve my skills and competency Intention to Use                   | 1.000   | .717       |
| 9.      | Using portal shall be more secure as compare to the previous system              | 1.000   | .802       |
| 10.     | Portal shall provide services on time in a given time frame. Reliability         | 1.000   | .706       |
| 11.     | Portal shall quickly resolves problems as and when encounter. Responsiveness     | 1.000   | .632       |
| 12.     | The Front and Back-End of portal shall be able to handle the problems as and when arise. Competence | 1.000   | .829       |
| 13.     | Portal shall require Low Loading Time and maintain Low Queuing Time              | 1.000   | .776       |
| 14.     | Portal shall requires low effort and technical knowledge to assess and operate. Easy to Use | 1.000   | .654       |
| 15.     | Navigating and search desired information on portal shall be easy.               | 1.000   | .701       |
| 16.     | User Interface of the portal shall be well organized and appealing appearance     | 1.000   | .703       |
| 17.     | The services offered through Portal shall be as per requirement. Product Portfolio | 1.000   | .819       |
| 18.     | Portal shall not misuse my personal information. Security                        | 1.000   | .768       |
| 19.     | The portal shall have well defined Privacy Policy.                               | 1.000   | .842       |
| 20.     | The online services offered by Portal shall save time and cost and also enhance convenience. Usefulness | 1.000   | .726       |
| 21.     | Web Content shall be available in Local Language on Portal.                     | 1.000   | .644       |

Extraction Method: Principal Component Analysis
Cumulative percentage of variance (70.407) inferred that 70 percent of eGovernance portals efficiency is explained by accumulated twelve eGovernance constructs during the second and third stage. The factor wise statements accrued through EFA were tabulated and CFA was applied for overall construct validation [Table 5] on twelve dimensions and twenty-one (21) statements. The outcome of CFA is exhibited via Figure 1. The model fit indices [Table 6] and GFI, CFI, NFI and RMSEA values are incorporated in Table 7. The value of CFI (0.9) testified strong unidimensionality and GFI (0.904) reflected best fit of model, and RMSEA value (.080) were also makes the model acceptable. The inter relationships among statements and constructs found significant and strong. Further, all the relevant assumptions of SEM were satisfied and framework of eGovernance architecture was proposed at Figure 2 using SEM.

| Sr. No. | Factor | Coding | Statements/items | Factor Loading |
|---------|---------|--------|-----------------|---------------|
| 1.      | Performance Expectancy | PE1 | Portal shall provide integrate data related to all departments. | .848 |
|         |         | PE2 | Portal shall remove redundancy of data. | .805 |
| 2.      | Compatibility | C1 | Portal G2C services shall be portable with legacy systems. | .796 |
|         |         | C2 | Using Portal shall not require special training and skills. | .709 |
| 3.      | Job Fit | JF1 | Portal shall be relevant to my job profile. | .867 |
| 4.      | Facilitating Conditions | FC1 | The HEI shall provide all necessary resources required to use portal. | .807 |
|         |         | FC2 | The HEI shall provide Top Down guidance and support as and when required | .765 |
| 5.      | Intention to Use | IU1 | Using Portal shall be more secure as compare to the previous system | .890 |
| 6.      | Reliability | REL1 | Portal shall provide services on time in a given time frame. | .746 |
| 7.      | Responsiveness | RES1 | Portal shall quickly resolves problems as and when encounter. | .790 |
| 8.      | Competence | COM1 | Portal shall require Low Loading Time and maintain Low Queuing Time | .810 |
|         |         | COM2 | The Front and Back-End of portal shall be able to handle the problems as and when arise. | .798 |
| 9.      | Easy to Use | EU1 | User Interface of the portal shall be well organized and appealing appearance | .790 |
|         |         | 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 |
| 10.     | Product Portfolio | PP1 | The services offered through portal shall be as per requirement. | .817 |
| 11.     | Security | SEC1 | The portal shall have well defined privacy policy. | .890 |
|         |         | SEC2 | Portal shall not misuse my personal information. | .864 |
| 12.     | Usefulness | USE1 | The online services offered by portal shall save time and cost and convenience. | .837 |
|         |         | USE2 | Web Content shall be available in Local Language on Portal. | .784 |

| Model               | NPAR | CMIN  | DF  | P       | CMIN/DF |
|---------------------|------|-------|-----|---------|---------|
| Default model       | 35   | 277.806 | 85  | .000    | 3.269   |
| Saturated model     | 120  | .000  | 0   |         |         |
| Independence model  | 15   | 3884.553 | 105 | .000    | 36.997  |
Table 7. Model Fit Indices

| Model          | GFI  | CFI  | NFI  | RMSEA |
|----------------|------|------|------|-------|
| Default model  | .904 | .950 | .929 | .080  |

(GFI: Goodness of Fit Index; CFI: Comparative Fit Index; NFI: Normed Fit Index; RMSEA: Root Mean Square Error of Approximation)

The outcome depicts significant positive impact of eleven accumulated eGovernance constructs “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 which ultimately augment efficiency and social influence of eGovernance.

Fig 1. Confirmatory factor analysis model outcome
4 Conclusion

The availability of diverse eGovernance related technologies and related impact on efficiency of eGovernance projects have come up with opportunity for research. This study focused on discovering the diverse vital constructs to develop integrated eGovernance model to augment efficiency and social influence. The proposed model makes significant contribution by integrating vital constructs on the basis of empirical outcomes and applying them to the context of the eGovernance. The model shall impart significant transformation at development as well as implementation level and bring in a new era for end users and service providers. The suggested model will guide the policy makers and developers of eGovernance systems to focus on identified constructs to maintain and enhance efficiency and social influence.

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