E-Governance Parameters Assessment : An AHP Approach

** Monika Arora*
*** Anchal Gupta*

Abstract

E-Governance is a well recognized concept in today's business environment. E-Governance provides flexibility to the citizens of the country by shifting government services from traditional to digital form. In a developing country like India, citizens are also striving for adoption of e-Governance practices. Moreover, Indian government is initiating digitalization rigorously in almost all fields. Any e-governance project moves through three stages i.e. planning, implementation, and adoption by citizens. Usually, e-Governance projects start with discussions with senior government officials after doing deep need analysis and the techniques involved in implementation of e-Governance projects are finally adopted by the citizens of country. E-Governance brings more transparency and accountability in the government system. Many e-Governance projects in developing countries like India are at different stages of progression. The Indian government developed various e-Governance portals as interfaces to provide its services online as well as offline in adoption phase. The objective of this paper is to understand and analyze various parameters which make impact on the assessment of e-Governance portals. E-governance portals are evaluated on attributes such as static appearance, features, and service quality by the citizens. Many parameters were identified from vast literature review and then short-listed with the help of opinion of experts for this study. A framework was developed on the basis of short-listed parameters. Further, aspects and parameters were prioritized by using Analytical Hierarchy Process (AHP). This study identified that the most important aspect for evaluation of e-Governance portal is service quality. The findings of the study will be highly useful for the developers of e-Governance portals. For more successful e-Governance projects, developers and practitioners may adopt these findings at the time of planning, designing, and implementation of e- governance projects.

Keywords: **E-Governance, E-Governance portal, Assessment, Analytical Hierarchy Process**

I. INTRODUCTION

All things and processes are becoming automated, are shifting from manual to digital in today's competitive world. Due to hectic busy schedule, citizens prefer to get served with high quality of services in minimum possible time.

Citizens have started shifting from basic needs to luxuries by making use of plastic money and online transactions in the concept of e- government. Electronic governance (e-Governance) is basically getting government services electronically. Usually, the benefits of e-Governance are availed by public, private agencies, government departments, and businesses in order to disseminate static information, offline/ online transactions and may have participatory framework. The idea of e-Governance is to bring IT to the common public [7]. E-Governance brings transparency, increases efficiency, enforcing accountability, optimizes cost, and reduces time delays.

The Indian Government has initiated many citizen-centric e-Governance projects. On May 2006, the government came up with the National e-Governance Plan (NeGP) which comprises of 27 Mission Mode Projects (MMPs) and eight components. Currently, after revision, 31 MMPs are in process and are running at central and state levels across the country. The state governments have the power to start with any five MMPs specific to their individual needs. In India, many existing or ongoing e-governance projects are at different levels of progression. Many projects which were specifically implemented to serve the needs of urban people like Passport Sewa, online railways ticketing and status updation, filing income tax, e-education, and checking

* *Associate Professor,* Apeejay School of Management, Delhi. E-mail : marora.asm@gmail.com
** *Assistant Professor,* Apeejay School of Management, Delhi. E-mail : gupta_anchal1@yahoo.co.in

availability of doctors and blood at government hospitals etc. to name a few. Similarly, many e-governance projects have been developed and implemented to cater to the requirements of rural people like Agricultural Marketing Information Network (AGMARKNET), Bhoomi (automation of land records), CARD (computer aided administration of registration department) and e-panchayats etc.

The primary delivery models of e-Government can be divided into four categories, i.e., G2C (Government to citizens), G2B (Government to Businessman), G2G (Government to Government) and G2E (Government to Employees). All the e-governance projects are designed to serve and connect the needs of all the associated stakeholders. Any e-governance project progresses through three stages. Firstly, in the planning stage, government officials and top management conceive the idea of any project. Then the idea is further implemented by technicians from private or public organizations in the second stage. At the last stage, the citizens try to adopt the idea electronically. Normally, it has been seen that there is a mismatch between the vision of policy makers for the benefit of end users, understanding of people implementing the project, and perception of final end users about the project.

During the adoption stage, the appearance, availability of information, the quality of services, and overall processes of e-governance portal make huge impact on the satisfaction level of citizens. User friendliness, accuracy and authenticity of content availability with quick feedback generally attracts customers and become reasons for satisfaction from services. In this paper, an attempt was made to identify various parameters required for evaluation of an e-governance portal to make e-governance practices successful. The objective of this study was to prioritize parameters as per their importance in order to have more successful e-governance projects.

The paper is structured as follows: section II covers literature review of e-governance and identified parameters. In section III, the research methodology and Analytical Hierarchy Process (AHP) are discussed. The evaluations have been done using AHP in section IV. The findings and conclusions are discussed in section V which is followed by conclusion in section VI.

II. LITERATURE REVIEW

Many studies defined e-governance as an emerging field in developing countries, which can be seen through clearly recognizable benefits to the people of the country. Heeks [12] defined e-governance as making use of information, communication, and technology to deliver government services in a more convenient manner. According to Schwester [27], the basic idea with which e-governance concept starts is to disseminate information by converting offline to online but later e-governance becomes an interactive platform through which an individual can make online transactions and can develop participatory framework.

Three main contributions of e-governance are to improve government processes (e-administration), to connect citizens (e-citizens), and to create awareness (e-services). E-governance brings comfort and more accountability to the citizens of the country. Various frameworks of e-governance have been developed by many authors and reflect the same understanding on good governance. Many models have been developed in order to study the acceptance of e-governance by the end users [26].

TABLE I
PARAMETERS FOR EVALUATION OF E-GOVERNANCE PORTAL

S.No.	Parameter	Definition	Sources
1.	Outlook	Visual appearance of e-Governance website	[20], [11]
2.	User-friendly	Simple and comfortable to use	Park and Gretzel (2007), [11]
3.	Design	Available features and options in website	[10], [6], [3]
4.	Navigation	Correct directions to user for browsing	[8], [28]
5.	Relevant information	Appropriateness of data and information provided to user	[18], [14], [6]
6.	Content quality	Correctness and authenticity of information	[5], [21], [4]
7.	Query handling	Managing and responding to user problems	Park and Gretzel (2007), [23]
8.	FAQ	Frequently asked questions by users	[1]
9.	Accountability	Ownership and responsibility of administration.	[15], [16]
10.	Responsiveness	Quick reactions to query of users	[9], [22]
11.	Accuracy	Degree of correctness of information	[19], [29]
12.	Security/ Privacy	Protection of personal information of user.	[2], [10], [13], [17], [27]

The citizens are more involved at the adoption stage of any e-governance project. It is very important for developers and implementers to understand the exact needs of citizens while using any e-governance portal. 25 parameters were identified from the vast literature review and after discussing with experts, 12 parameters were finalized by combining common ones and ignoring less important parameters. Then these parameters were categorized into three categories namely, static appearance, features, and service quality of e-governance portal. All the parameters are discussed in detail along with their references in table I.

III. RESEARCH METHODOLOGY

Multi-criteria decision making method known as Analytical Hierarchical Process (AHP) was developed by Saaty [24]. Analytical hierarchy process is a flexible and structured technique to manage complex decisions. It provides a broad and intelligent approach for structuring the problem and quantifying the elements related to the objectives of the problem. It also helps in evaluating alternative solutions of the problem. AHP is used in various fields such as government, commerce, health, industry, and education [25]. It has been used in many decisions in the field of management, economy, energy, environmental, industry, transport, agriculture, and military. AHP method is a decision making model based on flexibility of situations, it clarifies the problems which have several potential solutions. AHP uses the expert method which is mathematical. It divides the main problem into sets of possibility and go to more detailed alternatives.

The decision by AHP method can be subdivided into three different levels i.e. hierarchy, priorities, and consistency.

Hierarchy: The hierarchy structure was designed for the decision process in consultation with the group of experts considering their criteria and alternatives. A tree structure was prepared.

Priorities: After literature review and getting comments of experts, criteria were finalized and established in a hierarchical structure at all levels of assessment, and also various alternatives or criteria of assessment are considered. The result is given by the weight in proportion to the scale of alternatives and criteria are examined using AHP.

Weight allocation: The correct determination of the individual sub-scales of assessment criteria is one of the key tasks in solving multi-criteria problems. It is, therefore, necessary to know the issue well and also know the importance and impact of the criteria used to evaluate the result achieved.

AHP is a well-defined and structured process. It helps in dealing with both quantitative and qualitative techniques. AHP evaluates on a set of criteria, it takes the final decision of selecting the best alternative among all the alternatives taken for study. AHP methodology is attuned to the numeric scale for the measurement of quantitative as well as qualitative performances. The scale ranges from 1 to 9 as shown in table II.

TABLE II
SCALE FOR QUANTITATIVE COMPARISON OF PARAMETERS

Option	Numerical value(s)
Equal	1
Marginally strong	3
Strong	5
Very strong	7
Extremely strong	9
Intermediate values to reflect fuzzy inputs	2, 4, 6, 8
Reflecting dominance of second alternative compared with the first	Reciprocals

The decision maker can express his preference between each pair of elements verbally as equally important, marginally strong, strong, very strong, and extremely strong. These descriptive preferences are then translated into numerical values 1, 3, 5, 7, 9 respectively, with 2, 4, 6, and 8 as intermediate values for comparisons between two successive qualitative judgments. Reciprocals of these values are used for the corresponding transposed judgments.

Some key and basic steps involved in this methodology are:

1. Problem definition statement.
2. Decide the broad categories or consider all actors who define the objectives of the categories.
3. Discuss the criteria that defines the broad categories.
4. Structure the problem in a hierarchy of different levels constituting goal, criteria, and alternatives.
5. Compare each element in the corresponding level and calibrate it on the numerical scale. This requires n(n -1)/2 comparisons, where n is the number of elements with the considerations that diagonal elements are equal or '1' and the other elements will simply be the reciprocals of earlier comparisons.

6. Perform calculations to find the maximum eigen value, consistency index(CI), consistency ratio (CR), and normalized values for each criteria/alternative.

$$CI = (\lambda_{max} - n) / (n - 1)$$

Where, λ max is the maximum eigenvalue of the judgement matrix.

This CI can be compared with that of a random matrix, RI. The ratio derived, CI/RI, is termed the consistency ratio, CR. Saaty [25] suggested the value of CR should be less than 0.10.

TABLE III
RI VALUES

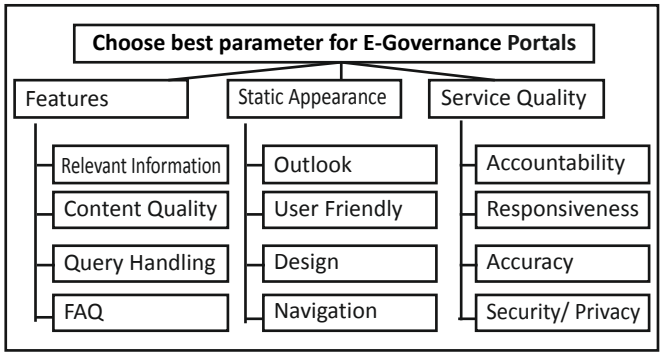
RI values	N	2	3	4	5	6	7	8	9	10
	RI	0.00	0.58	0.90	1.12	0.12	1.32	1.41	1.45	1.51

7. If the maximum Eigen value, CI, and CR are satisfactory then decision is taken based on the normalized values; else the procedure is repeated till these values lie in a desired range.

IV. PROPOSED FRAMEWORK

There are three major reasons for a user to access a website or portal. From literature review, it can be said that features, static appearance, and service quality are the three broad categories for selection. Further, from past scholarly articles, it has been observed that there are three deciding factors for attracting and retaining customers for long term. These are relevant information, content quality, query handling and FAQs that are responsible for evaluating features of any e-governance portal. The parameters outlook, user friendly, design, and navigation are responsible for static appearance of the portal. After discussing with experts and from literature, it was found that accountability, responsiveness, accuracy, and security/privacy are important features under service quality. These have worked as order winners rather than order qualifiers. Organizations usually give utmost preference to serve customers with the best quality. These are the main parameters which should be included in service quality, as justified from past studies also.

Fig. 1. Proposed framework for selection of best parameter for e-Governance portals



V. FINDINGS AND RESULTS

In this analysis, the identified parameters from literature i.e. features, static appearance, and service quality are prioritized by using AHP methodology as discussed in section III. The data for the study was collected from 100 consumers. The findings of the evaluation done by using AHP are shown in this section. In table IV the pair wise comparison matrix of three major categories required for selection of best e-governance portal is shown. in table IV.

TABLE IV
EVALUATION OF WEIGHTS FOR THREE MAIN CATEGORIES

	Features	Static Appearance	Service Quality	Weighted Sum
Features	0.16	0.27	0.15	3.04
Static Appearance	0.05	0.09	0.11	3.01
Service Quality	0.79	0.64	0.74	3.14
			Lambda =	3.07

CR is 0.057 for table IV, which is acceptable. According to our findings, service quality (3.14) is the most important factor for selection of e-commerce websites. This is followed by features (3.04) and then by static appearance (3.01). The results are in line with past studies. It can be easily validated from past studies and also by looking at e-governance citizen centric trends it

TABLE V
EVALUATION OF WEIGHTS FOR PARAMETERS UNDER FEATURES

Features	Relevant information	Content quality	Query Handling	FAQ	Weighted sum
Relevant information	0.38	0.20	0.51	0.33	4.30
Content quality	0.13	0.07	0.02	0.05	4.45
Query handling	0.05	0.20	0.07	0.14	4.09
FAQ	0.05	0.07	0.02	0.05	4.20
				Lambda =	4.26

TABLE VI
EVALUATION OF WEIGHTS FOR PARAMETERS UNDER OUTLOOK

Static appearance	Outlook	User friendly	Design	Navigation	Weighted Sum
Outlook	0.10	0.05	0.13	0.07	4.03
User Friendly	0.30	0.15	0.13	0.21	4.08
Design	0.50	0.75	0.66	0.64	4.29
Navigation	0.10	0.05	0.07	0.07	4.06
				Lambda =	4.12

can be seen that users give first preference to service quality, then to features, and they give the last preference to static appearance to portals.

TABLE VII
EVALUATION OF PARAMETERS UNDER SERVICE

Service Quality	Accoun-tability	Respon-siveness	Accuracy	Security/ Privacy	Weighted Sum
Accountability	0.13	0.19	0.05	0.10	4.08
Responsiveness	0.38	0.58	0.75	0.50	4.66
Accuracy	0.38	0.12	0.15	0.30	4.20
Security/ Privacy	0.13	0.12	0.05	0.10	4.13
				Lambda =	4.27

CR is 0.096 for table V, which is acceptable. According to our findings, content quality (4.45) is the most important parameter for selection of e-governance portal in the category **features**. As shown in table V, relevant information, FAQ, and query handling have weights 4.30, 4.20, and 4.09 respectively.

TABLE VIII
LOCAL AND GLOBAL WEIGHTS WITH RANKING OF ALL PARAMETERS

Parameters	Local weights	Weightage	Global weights	Rank
Responsiveness	4.66	3.14	14.63	1
Content quality	4.45	3.04	13.96	2
Design	4.29	3.01	13.48	3
Relevant information	4.30	3.04	13.52	4
Accuracy	4.20	3.14	13.21	5
FAQ	4.20	3.04	13.19	6
Security/ privacy	4.13	3.14	12.97	7
User friendly	4.08	3.01	12.83	8
Accountability	4.08	3.14	12.81	9
Navigation	4.06	3.01	12.76	10
Query handling	4.09	3.04	12.85	11
Outlook	4.03	3.01	12.65	12

CR is 0.043 for table VI, which is acceptable According to our findings, design (4.29) is the most important parameter for selection of e-commerce website in the category **static appearance**. As shown in table VI, user friendliness, navigation, and outlook have weights 4.08, 4.06, and 4.03 respectively.

CR is 0.099 for table VII, which is acceptable, according to our findings by using AHP, responsiveness (4.66) is the most important parameter for selection of e-commerce website in the category **service quality**. As shown in table VII, accuracy, security/privacy and accountability have weights 4.20, 4.20, and 4.08 respectively.

In table VIII, the local and global weights of all parameters in all the categories are shown in decreasing order of their weights. From the analysis, it is found that responsiveness is the most important parameter which users consider while selecting e-governance portal/website for citizens of India. Content quality is the second most important component considered. Design, relevant information, accuracy, and FAQ are the next important parameters prioritized by business professionals at the time of selection. The ranking of all the 12 parameters are evaluated and shown in table VIII.

VI. CONCLUSION

Analytical Hieratical Process is a multidimensional criteria technique that is the most suitable for this study. The parameters for selection of e-governance websites were identified after literature review. Based on discussions with experts, 12 parameters were finalized in three categories. **Features, static appearance, and service quality** are the three broad categories which impact the final decision of selection of e-Governance websites. The pair wise comparison matrices for all categories and parameters were generated on the basis of expert opinion. Then, by using AHP, the local and global weights for all parameters were calculated. Based on the results, service quality was found to be the most important category among all. Responsiveness was found to be most important parameter considered while selecting e-governance website. Content quality was the second important criteria desired by users. Users also consider design, relevant information, accuracy, and FAQ. This study can be very useful for decision makers in planning and designing their websites as per the ranking shown in results. This study can be extended by considering more categories and parameters.

VII. IMPLICATIONS & FUTURE SCOPE OF STUDY

In today's business environment, digitalization, movement towards more use of plastic money and buying and selling of all products through e-commerce websites are almost becoming mandatory for survival and progress. Therefore, people are shifting from manual to digital and to serve that purpose, organizations are also molding themselves from direct selling into online/offline selling. It is very important for government and private organizations to closely understand the assessment parameters of any e-governance or e-commerce website. In this paper, various parameters were extracted from literature and then prioritized on the basis of inputs given by experts of the same field. This study can help government officials in developing and implementing their e-governance websites and can increase the probability of success of any e-governance initiative. However, this study can be extended by taking few specific e-governance projects or comparison between assessment parameters of different countries can be considered.

REFERENCES

[1] R. Agarwal and V.Venkatesh, "Assessing a firm's web presence: a heuristic evaluation procedure for the measurement of usability," *Information Systems Research*, vol. 13, no. 2, pp. 168-186, 2002.

[2] M. Alshehri and S. J. Drew, "E-government principles: implementation,advantages and challenges," *International Journal of Electronic Business*, vol. 10, no.10, pp.1-17, 2010.doi: http://dx.doi.org/10.1504/IJEB.2011.042545

[3] S. Bhatnagar, "E-government: Lessons from implementation in developing countries,"*Regional Development Dialogue*, vol. 24, UNCRD, Autumn, 2002.

[4] M. Chae, J. Kim, H. Kim, and H. Ryu, "Information quality for mobile internet services: a theoretical model with empirical validation," *Electronic Markets*, vol. 12, no. 1, pp. 38-46, 2002.

[5] K. D. Wulf, N. Schillewaert, S. Muylle, and D. Rangarajan, "The role of pleasure in web site success,"*Information &Management*," vol. 43, no. 4, pp. 434-446, 2006.

[6] H. N. Delopoulos, "Barriers and opportunities for the adoption of e-governance services", Word Academy of Science, Engineering and Technology, *International Journal of Social, Behavioural, Educational, Economic and Industrial Engineering*, vol.4, no. 6, 2011.

[7] Y. K. Dwivedi, K. Yogesh, N. P. Rana, and A.C. Simintiras, "E-government :potential and challenges," *Governance and Technology, YOJANA*, November 2013, pp.30-33, 2013

[8] C. Flavian, R.Gurrea, and C.Orús, "Web design: A key factor for the website success,"*Journal of Systems and Information Technology*, vol. 11, no. 2, pp. 168-184, 2009.

[9] D. Gefen, "Customer loyalty in e-commerce," *Journal of the Association for Information Systems*, vol. 3, pp. 27-51, 2002.

[10] D. Gilbert, P.Balestrini, and D. Littleboy, "Barriers and benefits in the adoption of e-government," *International Journal of Public Sector Management*, vol.17, no. 4, pp. 286–301, 2004.doi: http://dx.doi.org/10.1108/09513550410539794

[11] A.V. Hausman and J.S. Siekpe,"The effect of web interface features on consumer online purchase intentions," *Journal of Business Research*, In Press, Corrected Proof, pp. 1-9, Available: March 4, 2008.doi: http://dx.doi.org/10.1016/j.jbusres.2008.01.018

[12] R. Heeks, "Information systems and developing countries: Failure, success and local improvisations," *The Information Society*, vol. 18, no. 2, pp. 101-112, 2001.doi: http://dx.doi.org/10.1080/01972240290075039

[13] K. R. E. Huizingh and J. C.Hoekstra," Why do consumers like websites?" *Journal of Targeting, Measurement and Analysis for Marketing*, vol. 11, no. 4, pp. 350-361, 2003.doi: 10.1057/palgrave.jt.5740090

[14] A.Iqbal, and R. K. Bagga, "E-Governance: Issues in implementation", 2006, Available: academia.edu.

[15] D.Jothimani and S. P. Sarmah, "Supply chain performance measurement for third party logistics," *Benchmarking: An International Journal*, vol. 21, no. 6, pp. 944-963, 2014.doi: http://dx.doi.org/10.1108/BIJ-09-2012-0064

[16] R.Kaynak and S. B. Avci, "Logistics services accountabilities and their effects on service buyer's trust," *Procedia- Social and Behavioral Sciences*, vol. 111, pp. 731-740, 2014.doi:10.1016/j.sbspro.2014.01.107

[17] P. K. Korgaonkar, L. D. Wolin, "A multivariate analysis of web usage, journal of advertising research," March-April, vol. 39, no. 2, pp. 53-68, 1999.

[18] Liang T-P., Lai H-J,"Effect of store design on consumer purchases: an empirical study of on-line bookstores," *Information & Management*, vol.39, pp.431-444, 2002.doi: http://dx.doi.org/10.1016/S0378-7206(01)00129-X

[19] S. Markovic, "Expected service quality measurement in tourism higher education," *NaseGospodarstvo*, vol. 52, no. 1/2 , pp. 86-95, 2006.

[20] Y.A. Park, and U. Gretzel, "Success factors for destination marketing web sites: A qualitative meta-analysis," *Journal of Travel Research*, vol. 46, No. 1, pp. 46-63, 2007.doi: 10.1177/0047287507302381

[21] N. P. Rana,Y. K. Dwivedi, and M.D. Williams, "Analyzing challenges, barriers and CSF of egovadoption," *People, Process and Policy*, vol. 7, no. 2, pp. 177-198,2011.doi: http://dx.doi.org/10.1108/17506161311325350

[22] R. Reix, "Evaluation des sites Web: nouvellespratiques,

anciennesthéories, 8ème colloque de l'AIM Grenoble," 23 et 24 mai, pp. 1-12, 2003.
[23] W. R. Rose, G. G. Grant,"Critical issues pertaining to the planning and implementation of e-government initiatives," *Government Information Quarterly*, vol. 27, pp. 26-33, 2010.doi: 10.1016/j.giq.2009.06.002
[24] T.L. Saaty, *The Analytic Hierarchy Process*. McGrawHill, 1980.
[25] A. M. A. Bahurmoz, "The analytic hierarchy process: A methodology," *Win- Win Management JKAU: Econ. & Adm*., vol. 20, no. 1, pp. 3-16 , 2006.
[26] K. B. C. Saxena, "Towards excellence in e-governance", *International Journal of Public Sector Management*, vol. 18, no. 6, pp. 498-513, 2006. http://dx.doi.org/10.1108/09513550510616733
[27] R. Schwester, "Examining the barriers to e-government adoption," *Electronic Journal of e-Government*, vol.7, no.1, pp. 113-122, 2009.
[28] T. Unwin, "ICTs, citizens, and the state: Moral philosophy and development practices," *The Electronic Journal on Information Systems in Developing Countries*, vol. 44, no. 1, pp. 1-16.
[29] K.Yeung, H. Zhou, A. C. L. Yeung, and T. C. E. Cheng, "The impact of third –party logistics providers' capabilities on exporters' performance", *International Journal of Production Economies*, vol. 135, pp. 741-753, 2012.

About the Authors

Ms. Anchal Gupta is an Assistant Professor in the area of Quantitative and Operations at Apeejay School of Management, Dwarka, New Delhi.

She has over 10 years of experience in teaching and research. She is pursuing Ph.D. from Delhi Technological University (DTU). She had done M.Phil. in Operations Research from Delhi University. She had also done M.Sc(O.R.) and B.Sc.(Mathematical Sciences) from Delhi University. She has authored over 10 papers in national, international conference, national and international Journals.

Her area of interest in the field of optimization techniques, supply chain management and e-governance.

Dr. Monika Arora is an Associate Professor and Head of Department of IT and Operations at Apeejay School of Management, Dwarka, New Delhi.

She has completed her Masters in Computer Application from Govt. Gitanjali Girls College, Bhopal and Ph.D. in Computer Science from MPBHOU, Bhopal. She has over 18 years of experience in industry, teaching, and research. She has authored over 75 papers in national, international conference, national and international Journals. She played a role as reviewer in International Journal of Indian Culture and Business Management (IJICBM) and Benchmarking, an International Journal. She is also co-chair and chair of various conferences in Delhi Region.

Her research area is in the field of intelligent and efficient data retrieval in semantic web, search engines, social network analysis, database system, knowledge management systems, business analytics, and e-commerce.