Mathematical Statistician and Engineering Applications
ISSN: 2094-0343
2326-9865

Smart City as Urban Innovation Management Practice

Dr. Prasad Pathak[1], Dr. Deepali Shahane[2], Ms.Gunjan Behl[3], Mr. Alok Shah[4] and Dr. Shambhu Shankar Rai[5]

[1]Assistant Professor,Dr. Vishwanath Karad MIT World Peace University, Pune
[2]Associate Professor,Dr. Vishwanath Karad MIT World Peace University, Pune
[3]Assistant Professor, BVIMIT, Navi Mumbai
[4]Assistant Professor, Bharati Vidyapeeth (Deemed to be University), Department of Management Studies off-campus, Navi Mumbai
[5]Assistant Professor, BVIMIT, Navi Mumbai
prasad.pathak@mitwpu.edu.in[1], shahanedeepali@gmail.com[2], mailto.gunjan83@gmail.com[3], alok.shah@bharatividyapeeth.edu.in[4] and shambhumca1@gmail.com[5]

Article Info
Page Number: 10081 - 10089
Publication Issue:
Vol 71 No. 4 (2022)

Abstract

This paper views a smart city as an effort by a city to become smarter than it already is. A smart city is a metaphor for urban innovation in management, public policy, and technology. A smart city can be thought of as a contextualized interaction between technical innovation, managerial and organizational innovation, and policy innovation. This is because each city has a certain environment that determines its technological, organizational, and policy features. However, whereas there is a wealth of literature on technological innovation, little research has been done on innovation in management and policy. It is customary to bring up a new stage of urbanization, the establishment of smart cities, while talking about the topic of urban area development.Nowadays, more and more cities are described as "intelligent" or "smart," despite the lack of a precise definition that would outline the requirements that cities must satisfy to be classified in this way. The existing sets of criteria are quite unclear and vary in importance based on the geography, among other things. Determining whether, to what extent, and for what reasons cities may be deemed smart cities is thus immensely essential and valuable. The article's goals are to first determine the extent to which the smart city idea is employed to manage cities generally and, second, to determine whether it is possible to lower operating costs for cities by using the concept.

Article History
Article Received: *15 September 2022*
Revised: *25 October 2022*
Accepted: *14 November 2022*
Publication: *21 December 2022*

Keywords– Management; Performance; Human Factors;Smart city; urban innovation

1. Introduction

There are many difficulties with growing cities. Despite taking up less than two percent of the planet's territory, urban dwellers use more than 80 percent of its natural resources. Rapid urbanization is causing a loss of core functions that make a place livable, such as problems managing trash, resource shortages, air pollution, and health concerns for people, traffic congestion, and inadequate, decaying, and old infrastructures. In addition to technical, physical, and material issues, there are also organizational and social issues. Multiple different stakeholders, high levels of interconnection, conflicting ideals, and social and political complexity are significantly linked to concerns. In this way, issues become complex and nasty by Dorota Sikora et al (2016).

By running cities in an inventive manner, we may stop the crisis of fast urbanization from developing. Making a city smart is a new strategy for urban development as a result. The adage that "crisis is the mother of invention" also holds true for smart cities. The concept of the "smart city" is emerging as a means of resolving complex and challenging issues left over from the current wave of urbanization. The wicked and complex issues of urbanization include social, political, and

organizational, therefore smart city innovation plans must take management and policy into account in addition to technology. While pundits frequently focus on a smart city's technology aspects, its organizational and policy challenges have received less attention by Dorota Sikora et al (2016).
The definition of smartness in an urban or metropolitan context includes both managerial and policy considerations as well as the use of cutting-edge information and communication technologies (ICTs). The smart environment is one of the components that need to be researched to enable a smart city. Establishing a well-managed urban environment is required to enable the creation of a smart city. The goal of this research is to analyse how the city manages its smart urban environment, identify how management of the environment relates to smartness, and determine how management of the environment contributes to the development of smart cities. The study's findings demonstrate how the city's current environmental management has aided in the development of a smart city.For the implementation of the smart city in any city, the local government, private sector, and local community have all played significant roles in achieving environmental management by Taewoo Nam et al (2011).

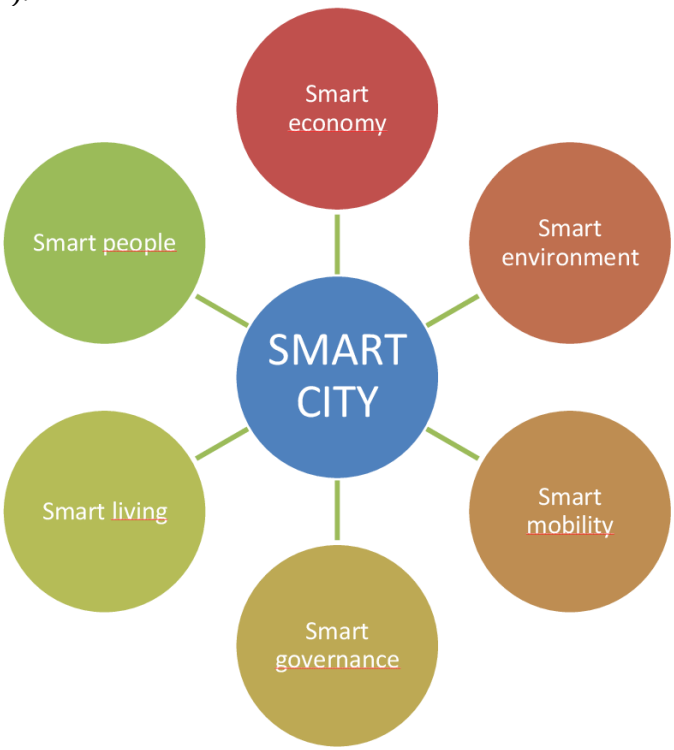

Figure 1- Smart City Structure from Management Point of View

The carefully planned and effectively implemented smart municipal infrastructure is one of the many pillars that support the concept of a smart city. Simply put, it attempts to improve the lives of citizens by utilising the integrated infrastructure of the Internet of Things by Wale Anjali et al (2019) to raise the effectiveness of operations carried out by municipal services and businesses. Effectively implemented solutions that make up the comprehensive concept of a smart city also contribute to the city's increased sustainable growth and the effectiveness of municipal investments.
Many fundamental services available to every person are covered by a single common Smart IoT system that is being implemented in an increasing number of Polish cities. It regulates the measurement of water supply and consumption, energy-saving LED lighting with a management system by PankajHotkar et al (2018), city bike systems, smart monitoring and management of parking spaces by Karale et al (2020), garbage collection and recycling, and/or electricity supply. The aforementioned list can be expanded to include air and water quality sensors as well as so-

called smart benches, which are placed around metropolitan areas to provide Internet access and charge mobile devices like smartphones and tablets using solar energy by PankajHotkar et al (2018).

2. SMART CITY IS INNOVATION

2.1 Definitions of Smart Cities that vary

1. "A city well-performing in a forward-looking way in various characteristics, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens"
2. "A city that monitors and integrates conditions of all of its critical infrastructures"
3. A city "connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city."
4. A city "combining ICT and Web 2.0 technology with other organizational, design and planning efforts to de-materialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability"
5. "The use of Smart Computing technologies to make the critical infrastructure components and services of a city—which include city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient."

2.2Conceptual Building Blocks of Smart Cities-

We need to comprehend the fundamental conceptual components of a smart city before delving into its specifics as an innovation. The definition and conceptualization of the smart city concept are still ongoing as the idea itself is still in its infancy. In those definitions, three major ideas stand out to us. First, the foundation of the idea of a smart city is its infrastructure. A smart city is made possible by technology, but it is not always the most important component. A city cannot be considered smart until its systems and infrastructures are combined, connected, and integrated by Taewoo Nam et al (2011).

Nucleus systems are not discrete; instead, they develop into a complex, multidimensional network of several systems that are linked together in a way that maximises performance. Second, the working definitions place a lot of emphasis on processes—how to make a city smart. A fundamental shift in the way services are provided is a key component of a smart city, and implementing the concept is more about service transformation and improvement than it is about technology. Visions for a better future are also crucial, to finish. Imagine a city that is smart in terms of its administration, mobility, environment, people, and way of life by Taewoo Nam et al (2011).

.

2.3 Smart City Innovation

Simply said, innovation is "novity in action" and "new ideas that work." These succinct explanations frequently highlight a new practise in addition to a novel concept. When we treat a smart city as a city's effort to become clever rather than as a status of how smart a city is, the connotation of a smart city indicates city innovation. The term "smart city" denotes innovation in

solving urban issues brought on by urban agglomerations.A smart city is an urban setting that uses ICT to enable public sector innovation. By leveraging improvements in ICTs and infrastructures, it supports established methods for enhancing operational and managerial effectiveness as well as living qualityby Sujatajoshi (2016).

The definitional elements of a smart city outlined above are connected via innovation. Infrastructure and operational changes are made to actualize visions in smart cities. Categories or dimensions of innovation are provided by earlier literature on public sector innovation and urban innovation. Innovation could be made in the following areas: position (new contexts), strategy (new goals or purposes), governance (new forms of citizen engagement and democratic institutions), product, service, process (new ways in which organisational processes are designed, and administrative reorganisation into front-office and back-office processes), and rhetoric (new language and new concepts)by Sujatajoshi (2016).

Risks and possibilities are present in any innovation. A smart city project not only promotes innovation but also works to control its risks. A smart city innovation project can add a new layer of complication.The programme goes beyond technology by combining it with people, competence, and a global reach to create systems that are sufficiently sophisticated to give rise to unforeseen emergent features by Taewoo Nam et al (2011).

Technology-driven public sector undertakings end in total failure when high risks are not properly managed. Poor planning, a weak business case, a lack of support from top management, a lack of leadership, a lack of professional skills, a misalignment between organisational goals and project objectives, vulnerability to policy changes, and an excessive amount of enthusiasm for technology are common causes by Taewoo Nam et al (2011).We simply define smart city innovation in terms of technology,organization, and policy as follows:

- Technology innovation is a process for modifying and improving technological tools in order to enhance services and establish environments in which the tools may be used more effectively.
- Organizational innovation is a strategy for developing managerial and organisational skills for the efficient use of technological resources and circumstances.
- A way to solve institutional and non-technical urban issues and establish the prerequisites for a smart city is through policy innovation.

The innovation's background must also be taken into account. Contextual elements change depending on a city's features. Each city's particular situation impacts its technological, organisational, and policy features. A smart city can be thought of as a contextualised interaction between managerial and organisational innovation, policy innovation, and technical innovation.

2.4 Framework

Technology, management, and policy advances all factor into a comprehensive vision of smart city innovation. Further thought should be given to the two non-technical aspects of a smart city—management and policy. A smart city is an innovation that makes use of the transformative power of digital networks including mobile wireless and Wide Area Networks (WANs), cloud computing, and smart technologies (such as instrumentation with intelligent sensors). These technical advancements bring with them problems associated with technology, including incompatibility between old and new systems, a lack of technological expertise, and having too high of expectations for technological viability. In the context of smart cities, interoperability is essential to technological progress.Interoperable services that enable ubiquitous connectivity are offered by smart cities, which revolutionise governmental operations both internally among agencies and externally to residents and businesses. Figure 1 above depicts the framework by Taewoo Nam et al (2011).

Technologies should be easily linked across systems and organisations to make a city smart. Rather than being assumed to follow logically from technical advances, technological performance depends on the skillful management of technological systems and infrastructure. Smart communities are more than just tech deployment and usage tests. Because technological potentials are enabled by organisational and policy innovation, organisational and policy innovation is a prerequisite for technological innovation. Therefore, innovation is a change in management and policy methods to better satisfy a city's technological needs. Complexity and uncertainty are increased by advanced technologies.

3. ORGANIZATIONAL INNOVATION

The organisational and management strategies for smart city innovation are introduced in this section.

3.1 Business (Enterprises) Architecture

Innovation in smart cities can be categorised as an enterprise interoperability project. Enterprise architecture is described as "the organisational logic for fundamental business operations and IT infrastructure reflecting the standardisation and integration of a company's operating model" in the definition above.

Governments also use enterprise architecture, not only businesses. Business process modelling and enterprise architecture are examples of managerial and organisational innovation used to transform outdated bureaucracy. The term "enterprise" refers to the architecture's general scope, designating a separate, interdependent group as a whole made up of a specified network of those companies that share a common policy area and work together to deliver services that no single company could provide on its own.It is regarded as necessary for cross-government cooperation. The term "standards, infrastructure components, applications, technologies, business model and rules for electronic commerce among and between organisations that improves the interaction of the government and enhances group productivity" is used to describe the e-government architecture. Enterprise architecture is essential for creating systems that are in line with business process management, which is defined inside the enterprise architecture as whole of government rather than project-specific. Thus, an essential competency for innovation toward a smart city is the readiness for business models and enterprise architecture by Zbigniew J. (2022).

3.3 Numerous Leadership Roles

The success of innovation is especially dependent on top-management commitment and support for organisational change. The promotion of innovation, the establishment of clear justifications for change, the identification and support of champions, and the creation of a unified set of objectives that people can commit to are all significant roles played by executive and managerial leaders. Chief Executive Officers (CEOs) of major cities are thought to be key enablers of a smart city by Zbigniew J. (2022).

Cross-organizational leadership demonstrates a range of managerial and leadership skills. A network and enterprise of organisations are included in the exercise of leadership, which extends beyond a particular agency, department, or team.This is not to say that central leadership is irrelevant, but rather that network-based coordination among many players, as opposed to hierarchical command and control, is encouraged through organisational structural changes driven by ICT. Therefore, executives should hone their network leadership capabilities. Strong leadership is necessary for the successful implementation of a smart city plan. City leaders can create a social infrastructure that will enable groups to work together across sectors and jurisdictional barriers by Zbigniew J. (2022).

4. POLICY INNOVATION

Technology is a tool, but policy innovation may help us use the tool wisely. Because government cannot innovate without a normative impetus, innovative government emphasises changes in policy. Innovation in technology can be seen and is generally accepted, but innovation in policy is less clear-cut.

4.1 Integration of Policy

Urban policy has a significant impact on how cities are connected to one another on a regional, national, and even international scale. Innovation in a city depends critically on the coordination of policies at all levels of governance, across a range of spatial scales, and across organisationalpractises. Particularly urban areas receive a wide range of policies from various organisations, but these policies from various levels of government are frequently ill-coordinated, fragmented, overlap, or even clash, leading to unfavourable results. Integration encompasses rules as well as technology, systems, infrastructure, services, and information. Successful innovation requires "packages of policy," not single-focused efforts. The majority of urban regions are controlled by numerous municipalities that cooperate and exchange resources.The coordination between various levels of government—typically the federal (central or national), state (provincial or regional), local (or municipal), and international context—is referred to as vertical integration.

Greater policy integration can be attained by developing a comprehensive vision for a metropolitan area. While several smart city visions may compete with one another, successful modern cities blend various views. For instance, improving transit accessibility might have a negative impact on urban environments, but better air quality might limit accessibility. Maintaining economic growth, remaining accessible, and enhancing quality of life all at once is a problem for that city. In many Indian cities, there is currently a lot of effort being done on smart transportation systems.This approach is built by means of IoT or AI by MachhaBabitha et al (2022).

4.2 Marketing with Branding

A brand is also a promise made in public by a municipal administration to its citizens as well as to outsiders. Because a well-known brand makes a city well-known to the outside world, image making is not a minor problem but rather crucial to the shift to a smart city. Cities, not nations, are now in competition with one another for talent, ideas, and resources, and a city's intelligence is increasingly viewed as a key selling point. Cities that serve as magnets to draw in fresh talent, resources, and investments require city marketing. A city brand should highlight its unique selling points. The risk of calling a city "smart" or using a similar nickname carries the same danger as calling it "hype," "illusion," "fad," or "empty rhetoricContrarily, there are certainly compelling instances where ferocious language supports positive policy advancements. The points are currently being begun in several cities with the captions LOVE PUNE, LOVE MUMBAI, etc. for branding purposes.

4.3 Demand-focused Initiative

Successful smart cities have well-balanced policies that are either demand-driven as opposed to supply-driven. The gap between supply and demand takes into consideration not only economic activity but also a discrepancy between state support for the smart city effort and non-governmental groups' participation in it. A fully citizen-centric approach to operations and services is the foundation of wiser government. Government-driven supply-side strategies must be complemented with demand-side measures in order to be effective. Smart city strategies should promote diversity, social networks, and cross-sector innovation while striking a balance with more emphasis on the demand side. Key stakeholders are frequently involved in the creation of successful innovations.Demand-driven policies could result in improved governance. The ability to accomplish

goals in the face of complexity, disagreement, and social change is what is known as governance. It is a form of coordinated activity by a number of people. The interaction between ICTs and governance procedures is known as ICT-enabled governance. As a result of the strength of digital networks, hierarchical structures are giving way to frameworks that are better understood in terms of the negotiated participation of several public and commercial players functioning at various sizes. In order to combat fragmentation, policies for a smart city programme should encourage collaboration and engagement with important players.

Demand-side policies also support and encourage civic engagement and network governance that is oriented on the needs of the people.Every resident must be able to participate more simply and productively in a smart city initiative's community. Engagement of citizens has the ability to strengthen residents' sense of pride in their city, increase the local government's understanding of their needs, and eventually transform the relationship between citizens and the state.

5. PROPOSITIONS-

In conclusion, the following ideas are what we want government officials and smart city experts to know.

1. *A smart city is a concept that encompasses socioeconomic growth as well as technology.*

A smart city must undoubtedly have technology, but inhabitants' perceptions of the notion centre on the growth of urban civilization and improved quality of life. Modern technology adoption alone does not ensure the success of smart city programmes. A city becomes more livable through innovation in management methods and policy direction. Technology or technical capital do not determine the success of smart city projects. Leadership and inter-organizational collaboration are essential for success. Innovation is not aided by technology in and of itself by Taewoo Nam et al (2011).

2: A smart city is service-oriented rather than system-driven.

The ultimate objective of a smart city is to raise the standard of all provided services. Establishing an integrative system is a means to a goal, not a destination, for the delivery of services and the exchange of knowledge. For a smart city, organisational and policy innovation is needed to manage services well and take into account service demands discovered through governanceby Taewoo Nam et al (2011)..

3. A smart city movement is not just a local phenomena but also a national or international one.

Today's world-famous cities exist in the midst of global competition. These cities are developing strategies for marketing a city brand through smart city innovation programmes. A smart city has both local and global effectsby Taewoo Nam et al (2011)..

4. A smart city is a multi-sectoral notion rather than a mono-sectoral one.

A smart city initiative's reach extends beyond a particular industry or organisation. A smart city is a novel idea in partnership and governance created by electronic linking of all non-governmental players, including businesses, organisations, and residentsby Taewoo Nam et al (2011).

5: A smart city is progress rather than revolution.

A cursory glimpse at contemporary examples of smart cities by commentators conjures up an impression of revolutionary upheaval. A smart city's perception becomes revolutionary if just its technological components are taken into account. That's just partially accurate, though. It's possible to mix up seemingly revolutionary low hanging fruit with long-term tactics.

Innovation is not a short-term fix, but rather a long-term plan. The long-term evolutionary paths of innovation should be monitored. While technology advances quickly, management and even policy change more gradually. In light of this, we contend that a city can continue to develop into a smarter one through innovation by Taewoo Nam et al (2011).

6. A smart city is a balance between the real and virtual worlds, not the replacement of physical structures.

The notion that a smart city will transcend temporal and spatial boundaries is deceptive because the physical environment of place and geography still affects people's way of life and how businesses operate.However, it is true that a smart city has the ability to significantly alter our lives by reducing travel time and distance. A city in the not too distant future should be able to realise its goals by smoothly integrating the physical and digital worlds by Taewoo Nam et al (2011).

6. DISCUSSIONS-

In order to create a balanced perspective between already heavily debated technological issues and relatively little-discussed managerial and policy issues, the discussion up to this point has explicitly focused on smart city initiatives as managerial and policy innovation. We can see that the vast majority of researches on smart cities are technology-focused and upbeat about their prospects. We provide a more thorough analysis of the smart city phenomenon because, while their conclusions are not incorrect in and of themselves, they are constrained and lacking. This examination of the substantial literature on urban innovation, public sector innovation, and e-government projects offers arguments in opposition to prevalent (and occasionally false) notions of a smart city. In conclusion, the following ideas are what we want government officials and smart city experts to know.Implementing projects based on readily accessible resources, frequently IT, as well as tried-and-true management projects is a key component of smart management in cities and communities. It indicates that certain technologies that make it possible to diagnose issues and accomplish goals more quickly and effectively have been employed. The first aspect of the studies of development policies was evaluating their provisions in terms of whether they made explicit references to the idea of a smart city. The study focused on the strategic documents' contents, separating diagnoses-related clauses from pieces defining ideal future states, which are typically expressed as development visions, goals, directions, or endeavours.

REFERENCES-

1. Dorota Sikora, Fernandez,DanutaStawasz, “The Concept Of Smart City In The Theory And Practice Of Urban Development Management”, *Romanian Journal Of Regional Science*,2016,Vol 10, pp. 86-99
2. Wale Anjali D., RokadeDipali, SamadhanAdsul, K. Kazi, “Smart Agriculture System using IoT”, *International Journal of Innovative Research In Technology*, 2019, Vol 5, Issue 10, pp.480-483.
3. Taewoo Nam, Theresa A. Pardo, “Smart City As Urban Innovation: Focusing On Management, Policy, And Context”, *Icegov2011: Proceedings Of The 5th International Conference On Theory And Practice Of Electronic Governance, September 26–28, 2011*, Doi: 10.1145/2072069.2072100
4. Dr.JSirisha Devi, Mr. B. Sreedhar, et al, “A path towards child-centric Artificial Intelligence based Education”, *International journal of Early Childhood special Issue*, 2022, Vol 14, Issue 03, pp. 9915-9922.
5. Pankaj R Hotkar, Vishal Kulkarni, PranayKamble, K S Kazi**, “**Implementation of Low Power and area efficient carry select Adder,” *International Journal of Research in Engineering, Science and Management*, 2018, Vol 2, Issue 4, pp. 183-184.
6. Sujatajoshi,tanvigodbole, shreya, “Developing Smart Cities: An Integrated Framework”, *Procedia Computer Science*,2016, Vol 93**,** pp. 902-909
7. Karale Nikita, JadhavSupriya, HeenaRafiq Shaikh, et al, “ Design of Vehicle system using CAN Protocol”, *International Journal of Research in Applied science and Engineering Technology*, 2020, Vol 8, issue V, pp. 1978-1983, http://doi.org/10.22214/ijraset.2020.5321.

8. Zbigniew J. Makieła, Magdalena M. Stuss, Karolina Mucha-Ku´S, GrzegorzKinelski, MarcinBudzi ´ Nski And JanuszMichałek, “Smart City 4.0: Sustainable Urban Development In The Metropolis Gzm” ,*Sustainability*2022, Vol14, 3516. Https://Doi.Org/10.3390/Su14063516
9. MsMachhaBabitha, C Sushma, et al, “Trends of Artificial Intelligence for online exams in education”, *International journal of Early Childhood special Issue*, 2022, Vol 14, Issue 01, pp. 2457-2463.
10. Jadhav, H.M., Mulani, A. and Jadhav, M.M. (2022). Design and Development of Chatbot Based on Reinforcement Learning. In Machine Learning Algorithms for Signal and Image Processing (eds D. Ghai, S.L. Tripathi, S. Saxena, M. Chanda and M. Alazab). https://doi.org/10.1002/9781119861850.ch12
11. V. B. Utpat, Dr. K. J. Karande, Dr. A. O. Mulani, “Grading of Pomegranate Using Quality Analysis”, International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 10 Issue II Feb 2022.
12. J. P. Patale et al. “Python Algorithm to Estimate Range of Electrical Vehicle”, Telematique, Volume 21, No. 1, 2022.
13. Jayshri Prakash Patale, A. B. Jagadale, A. O. Mulani, and Anjali Pise. “A Systematic Survey on Estimation of Electrical Vehicle”. Journal of Electronics,Computer Networking and Applied Mathematics(JECNAM) ISSN : 2799-1156, vol. 3, no. 01, Dec. 2022, pp. 1-6, doi:10.55529/jecnam.31.1.6.
14. Kashid, M.M., Karande, K.J., Mulani, A.O. (2022). IoT-Based Environmental Parameter Monitoring Using Machine Learning Approach. In: Kumar, A., Ghinea, G., Merugu, S., Hashimoto, T. (eds) Proceedings of the International Conference on Cognitive and Intelligent Computing. Cognitive Science and Technology. Springer, Singapore. https://doi.org/10.1007/978-981-19-2350-0_5
15. SwapnilTakale, and Dr. AltaafMulani. “DWT-PCA Based Video Watermarking”. Journal of Electronics,Computer Networking and Applied Mathematics(JECNAM) ISSN : 2799-1156, vol. 2, no. 06, Nov. 2022, pp. 1-7, doi:10.55529/jecnam.26.1.7.
16. Rahul Shinde and A. O. Mulani, “Analysis of Biomedical Image using Wavelet Transform”, International Journal of Innovations in Engineering Research and Technology (IJIERT), July 2015
17. A. O. Mulani and P. B. Mane, "Area optimization of cryptographic algorithm on less dense reconfigurable platform,"2014 International Conference on Smart Structures and Systems (ICSSS), Chennai, 2014, pp. 86-89
18. A.O.Mulani, M. M. Jadhav and Mahesh Seth, “Painless Non-invasive blood glucose concentration level estimation using PCA and machine learning” in the CRC Book entitled Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications, 2022.
19. Kamble, Akshata, and A. O. Mulani. "Google Assistant based Device Control." Int. J. of Aquatic Science 13.1 (2022): 550-555.
20. Pathan, Atik N., et al. "Hand Gesture Controlled Robotic System." Int. J. of Aquatic Science 13.1 (2022): 487-493.
21. Kolekar, Supriya D., et al. "Password Based Door Lock System." Int. J. of Aquatic Science 13.1 (2022): 494-501.