

RESEARCH CONFERENCE 2020

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Strategic Initiatives in Hastening Transformation to Ultra Adaptive and Smart Cities

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Abstract

The study on SMART CITY evolution is an ongoing quest for sustainable innovation. A team of international subject matter experts from the disciplines of Computer Science, Informational Technology, Management, and Education undertook this study. The findings and formulated actionable initiatives are customizable and deployable as Knowledge and Strategic Actionable initiatives, specific to making a remarkable difference to smart cities anywhere in the world. The aim is to contribute to innovation, with beneficial ramifications to improvement in the quality of life of urban and rural societies. The possible contribution of this study findings may be to economic growth, city development, entrepreneurship, through laying a foundation for critical thinking, knowledge, and SMART initiatives to flourish from the findings and deployable solutions presented.

Phase 1: Completed
Phase 2: In-progress

SMART CITY

SMART CITY: An urban area that intelligently leverages diverse electronic Internet of things (IoT) data from sensors to optimize efficiencies of human and material resources in delivering quality of life value for residents, reflecting networked competencies with desired outcomes:

- Enhanced strategic collaboration of local government with community: organizations, businesses, institutions, and residents
- Astute policies beneficial to society
 - ✓ Public value “continuously pursued as an essential condition for success” (Suciu & Tudor, 2020)

Focus of Study & Relevance

Involved study of major Indian metros: Mumbai, Delhi, Calcutta, Chennai, Nagpur, Mangalore, Raipur, to study intelligent harnessing of AI/Biometrics for SMART integration into housing colonies, industries, shopping malls, recreation centers, etc.

Results and findings hold potential relevance & applicability to SMART CITY development in advanced and emerging economies worldwide

Application of unique blend of SME of IT (AI, Neural Networks, etc.) with urban town planning, education, management and marketing



Problem

Burgeoning urban populations, stretched and limited resources need solutions to elevate standards of living, by optimizing communication & connectivity between city infrastructure and amenities



Purpose

Using a mixed-methods and phased action research, to explore critical determinants for solutions in enhancing city infrastructure and amenities, using intelligent harness of Management and Information Technology expeditious transformation SMART CITY evolution

Status of Action Research & Next Steps

- Completed design of solutions as presented (Phase I)
- Seek funding for writing of software (Phase II) to further:
 - Present customized & deployable solutions for implementation in US cities in Ohio, etc.
 - Undertake solutions also in higher educational institutions for unique competitive advantage

Study Significance

Quality of Life Is an imperative for contemporary society, with mass urban migratory patterns worldwide, as solutions must :

1. Address increasing populations with commensurate quality of life solutions
2. Optimize human, materials, natural & other resources
3. Elevate standards by improving efficiencies of city infrastructure and amenities
4. Offer quality of life solutions for city & rural inhabitants



Innovation in Determining Parameters for SMART CITY Evolution:

Extensive Data Collection & Analysis for Graphing the Critical Information Technology Pathway:

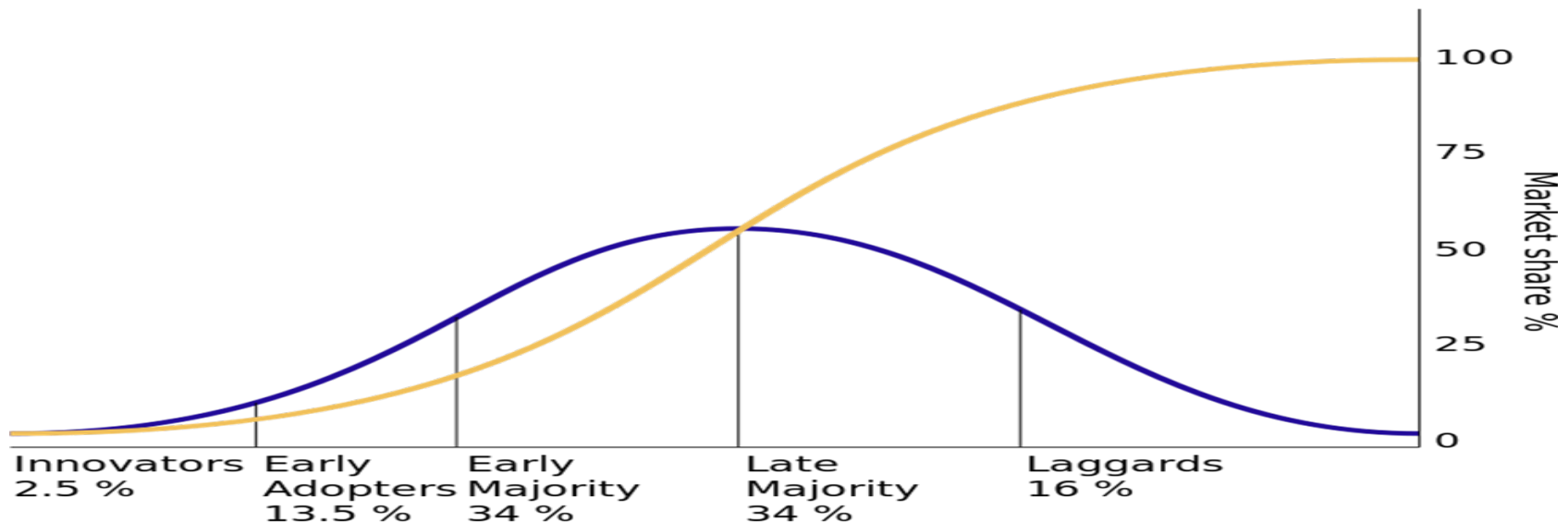
- AI used to find out Geographical Information System of each entity
 - AI depends on Machine Learning
 - Machine Learning depends on Neural Networks
 - Neural Networks depends on Deep Learn
 - The integration of SMART cities is through Internet Of Things, using Biomet
 - Rural Areas are connected by Tele Tech
 - ✓ Examples Tele Education, Tele Medicine

Theory

Diffusion Of Innovations Theory (DOI): Rogers (1962: 2003) postulated that innovation spread in varying degrees in a social system

Application of DOI holds utility as invocation of its tenets by multidisciplinary professional & academics have advanced pursuits of innovation:

- “after smart cities is the creation of digital or smart nations” (Kar et al., 2019)
- Used to examine adopters of blockchain, and factors cybersecurity, control of corruption, e-government development, government effectiveness, political stability, and democratic participation (Reddick et al., 2019)



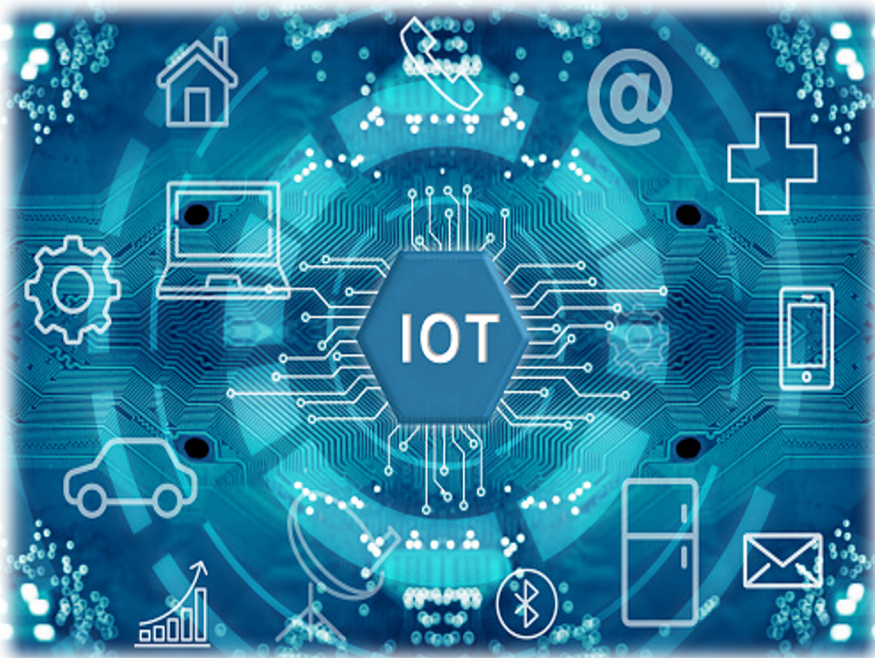
Relevant Scholarship

Increased Digitalization of Cities Worldwide

- Find Smart solutions to rising urban populations (Krishnan et al., 2020)

Innovation vital for SMART CITY Solutions

- Innovation possible between collaboration by experts from “different knowledge domain” (Zuzul, 2019)



Learn, Adapt, Continuously Improve to Customize Solutions to culture/geography

- “Barcelona’s aim was twofold: use new technologies to foster economic growth and improve the well-being of its citizens” (Gasco-Hernandes, 2018)

Pay heed to ethical, legal, privacy & security risks

- “distressingly familiar, with violations of data privacy topping of the list” (Givens & Lam, 2020)

Research Question

What critical determinants and solutions in infrastructure and amenities in Management and Information Technology Pathway can hasten transformation to SMART Cities?

Procedures

Used Panel of 5 Experts in town planning, city administration, IT, and management to develop semi-structured Interview Guide (IG) and Survey

Derived dominant parameter classification through data from Interviews & surveys, for graphing parameters and formulating strategic initiatives to transform to ultra adaptive & SMART CITY.



Participants & Data Collection

Purposive sampling: Interviews of 20 professionals (town planners, administrators, developers, architects, engineers), academicians, and city inhabitants from 7 Indian cities

Random Sampling: Administered survey to 500 professionals (denoted above), academicians, and city inhabitants from 7 Indian cities

Analysis

Outcomes of data analysis (thematic analysis of interviews and descriptive & inferential statistics of surveys & AI:

Stage I: SWOT analysis/AI for blueprint for actionable initiative prioritization and implementation.

Stage II: Procurement of Funding for software development, pilot testing, phased implementation in cities

Findings

The anticipated solutions from unique approach are in judicious improvement to the following:

- Natural resource utilization, Water Supply, Cleanliness, Sanitation, Diversification of Economy, IT Services, Knowledge and Health Care
 - Methodologies and design used, serve to advantageously exploit Information Technology as the Pathway to Smart Cities, by developing the City Profile, from Citizen's opinions, using Invariant Ratios pertaining to the basic blocks of infrastructure.
- SMART CITY outcomes from the implementation of IT solutions are evident in multiple settings worldwide.

Limitations

Limitations & Constraints using a TOWS Matrix (Weihrich, 1982), with Solutions & Limited to Cities Studied:

- **Threats:** Lack of Economic Opportunities, Causing Migration of Educated and Skilled Talent, Pollution, Degradation of Environment, & Climate Change
- **Opportunities:** Improving the following Connectivity, the Economy, Natural resources, Cultural Heritage Awareness, Tourism, Urban Form, Infrastructure.
- **Weaknesses:** Related to Connectivity, Urban Form, Infrastructure, Environment and Tourism
- **Strengths:** Educated Populations, Increasing Affluence, Strong IT Competencies, Strong English Language Skills

Interpretation

SMART CITY Pathway Discernment Involved using invariant ratios from basic blocks of infrastructure

- Graphing dominant parameters of Infrastructure Derived using principal Component Analysis, Support Vector Machines and Risk Parameters. If there are n classes, representing features, the SWOT parameters, were used, as n classes, and the probabilities were, with data placed into correct brackets. The classifiers used depended on Supervised and Unsupervised Learning. Neural Networks, Deep Learning techniques, to find mediators and classify the data

Conclusion: SMART Cities are Linearly Separable, as a line is enough to separate all the parameters. The aim was to find all parameters, then systematically engage in data classification to undertake design and implementation of the Critical Information Technology Expressway to the SMART CITY transformation, beneficial to society

Pre-requisites to Next Steps in Action Research:

- Present in conferences
- Present city transformative model to Cities in USA, Canada, India
- Seek contracts to offer/implement solutions in cities business/academic, organizations SMART transformation
- Implement Workforce and Educational infrastructure developmental solutions for Unique Competitive Advantage
- Proffer Innovative Solutions with Practical Realities and Theoretical Underpinnings

Recommendations

Implement SMART CITY initiatives, steeped in critical thinking and informed decision-making from data/intelligence

- Map Existing City Infrastructure using interviews, surveys, and audits in city, educational, & commercial institutions
- Determine deficits & opportunities for culturally, regionally, specific, economically smart, for viable actionable, phased and prioritized solution implementation
- Design Customized Solutions using AI: Supervised and Unsupervised Learning. Neural Networks, Deep Learning
- Implement Phased Implementation & Monitor Milestones
- Adapt, Evolve and Research/Learn Continuously as SMART CITY Evolution is not Static

Social Change Implications

Critical Information Technology Expressway to the SMART CITY transformation: Benefits to society entails harness & optimization of human & technology attributes for expeditious, scientific, & intelligent SMART CITY Evolution.

Other Exceptional Benefits:

Spur critical and responsible actions and informed thinking in all sections of society

Foster constant innovation, ongoing learning and continuous improvement, integrated into workforce and educational infrastructure development



Acronym Resource Key

Artificial Intelligence (AI): The in-tandem configuration of different technologies to deliver human-like levels of intelligence in output

Subject Matter Expertise (SME): Multidisciplinary knowledge applied in this presentations from disciplines of Architectural Design/Town Planning, Management, Marketing, Information Technology

Neural Networks: Machine learning infused algorithm to mimic human brain capabilities, producing intuitive and learning potential interpretations and expressions from new data

TOWS Matrix: An offshoot variant of the SWOT (Internal Strengths and Weaknesses of an organization and the External Opportunities and Threats) Current, Anticipated and Impending for Organizations developed by the American international business professor Heinz Weirich

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