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A literature Review on Education in Smart Cities

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Abstract: *India launched an ambitious smart city policy, the Smart Cities Mission (SCM) in 2015. This policy aims to transform 100 cities across the country into smart cities, so in this regard the Present study aims to explore the importance of education in smart cities. The objectives of the study were to Review and Analyze the Education in Smart cities. The study is descriptive and attempts to understand the Education in Smart cities of India. The Importance associated with Education in Smart cities were identified based on previous studies done on similar topics, these studies are conducted in different regions. Qualitative aspects of the research study were taken to consideration and the content analysis process was used in the study, which means the researcher organized and elicited information through various research articles and academic publications were drawn from the collected data. The researcher identified the most studied topics in Education in Smart cities. This study is completely based on the secondary data collected through various sources. From the Review it can be analyzed that Education within smart cities represents a universal challenge that requires a structured and interdisciplinary approach at all levels. Educators need to modify learning methods and environments that enhance the possibility for students to develop each of these human skills by utilizing their personalities. SMART education is conceptualized as 'panacea' that can practically solve all kinds of educational problems, which leaves no choice for teachers but to accept it. The challenges of smart cities that require a major adjustment in higher education, in the relationship between universities and all the mechanisms of lifelong learning with the industry related to smart cities. Despite the existence of sophisticated education systems, they have not yet reached the degree of development that allows them to be tailored to learners' cognitive needs and support them in the absence of face-to-face instruction.*

Key Words: *Smart Cities, Education, Stakeholders, Literature Review.*

1. INTRODUCTION : Background of the study:

Education is a fundamental human right and every nation's citizen should be granted universal access with equal quality to it. Because this goal is yet to be achieved in most countries, in particular in the developing and underdeveloped countries, it is extremely important to find more effective ways to improve education (UNESCO).

The term 'Smart City' has been used now for several years mostly by technology-based companies. However, the broader meaning refers to revamping of urban infrastructure in terms of accessibility to services, buildings, transportation and mobility, energy and water distribution, public safety etc. "Smart Cities are the urban centers of the future, made safe, secure, environmentally green, and efficient because all structures—whether for power, water, transportation, etc.—are designed, constructed, and maintained making use of advanced, integrated materials, sensors, electronics, and networks which are interfaced with computerized systems comprised of databases, tracking, and decision- making algorithms",

Education is a backbone of development. With 100+ smart cities now being developed under India's ambitious 'Smart City' program, smart education has been given great importance so that the next generation can be educated and trained with technology enabled smart learning programs. Skills development of school students with digital learning and

making them future ready has been envisaged under Smart City mission; with emphasis on re-modelling school infrastructure and introducing easy to adopt technological solutions. The skills, value system, knowledge, and application of an education system determine how the owner of this education can manage themselves and the environment. Thus, for a socially and technologically responsive city which operates so much on the ability to access data and apply correct knowledge, we shall require an education which can match these needs. This calls for the adaptation of Smart Education.

2. Objectives of the study:
To Review and Analyze the Education in Smart cities

3. Literature Review:
Scala (2024) conducted a study on Bibliometric Study on the Conceptualization of Smart City and Education. This research maps the knowledge domain of education in smart cities through a Bibliometrics analysis to identify current trends, research networks, and topics of greatest interest. A total of 88 articles, published between 2000 and 2023, were examined using an interdisciplinary approach. The leading countries are mainly located in Europe and North America and include China. Bibliometrics provides an intellectual configuration of knowledge on education in smart cities; a co-word analysis identifies conceptual sub-domains in specific themes. In general, education within smart cities represents a universal challenge that requires a structured and interdisciplinary approach at all levels.

Badshah, Afzal (2023) conducted a study on Smart Education in Smart Cities: Challenges And Solution. Traditional education faces many challenges. Integrating recent technologies (e.g., Artificial Intelligence (AI), Internet of Things (IoT), 5G, etc) into the education system, known as smart education, offers promising solutions. However, the integration of innovative solutions into the traditional system remains limited. The limitations, revealed during the recent COVID-19 pandemic, have now become imperative. This research addresses problems within the traditional system and proposes innovative solutions like smart pedagogy, assessment, classroom, and administration. It explores the shift to smart education and the associated challenges, including computational and social resistance. Innovative education yields concrete benefits, enhancing learner engagement, motivation, attendance, and learning outcomes. Embracing innovative technologies holds the potential to make education more effective and efficient in meeting the evolving needs of learners.

Tham (2023) conducted a study on Smart Education in Smart Cities: Layered Implications for Networked and Ubiquitous Learning. The development of smart cities worldwide is bringing about new processes and methods for enhancing teaching and learning in a networked age. As smart cities rely on analytics and digital capabilities to connect people and everyday activities so as to improve the quality of life, they can bring new layers of concerns for schools and educational institutions engaging the next-gen learning environment. Drawing from cases from around the world and specifically from developing smart cities, this research calls attention to key implications of smart cities and smart education design on networked learning. Research Focus on layers of design ethics, data practices, roles, and delivery afforded by new learning infrastructures in smart cities, then proposing a “stack” analogy for designing ubiquitous learning**.**

Raymond Godwin (2023) conducted a study on developing smart people in smart cities through education: The study relates Human Skills to graduate attributes as developed by BINUS University, called BINUS Graduate Attributes (BGA) and identifies the role of personality as an access point for developing those skills. Using questionnaires distributed through BINUS Maya and the Lumina Spark online system, we collected 2,014 participants from various majors at the undergraduate level. Out of the 24 personality qualities measured in the Lumina Spark model, Adaptable and Cautious are qualities that do not significantly correlate with those skills. Through regression analysis, it was shown that several qualities have a role in predicting each skill. The result of this study can be used for educators to modify learning methods and environments that enhance the possibility for students to develop each of these Human skills b y utilizing their Personalities.

Putinceva (2023) conducted a study on Revision of Modern Education Strategies as the Basis for the Development of Sustainable Smart Cities. The aim of the research is to analyse and systematize the problems of smart cities, and to highlight the obstacles that the implementation of the smart city concept facing under modern conditions. The researcher admits that smart cities offer their citizens enormous opportunities for a comfortable life and personal growth. Criticism of the smart city is associated with the increasing use of unverified technologies and shifting responsibility for decisions

regarding urban projects from people to artificial intelligence. The failure of smart cities to create conditions for taking into account citizens' opinions, and growing social inequality, exacerbated by digital inequality, complicates the situation. Inability to ensure the confidentiality of personal data of citizens and companies, and some technological, environmental, and economic restrictions make smart cities not a safe place to live. Based on the results of the analyses and systematization of the problems, the researcher elaborated the suggestions on the revision of the basic principles of modern educational strategies. Implementation of these ideas will allow developing sustainable cities with active civil society and to increase the involvement of citizens in the implementation of urban projects.

Lee, S (2023) conducted a study on Smart teachers in smart schools in a smart city: teachers as adaptive agents of educational technology reforms. This research critically examines the significance of SMART education as dominant discourse to shed light on the formation of smart teachers. The results show that SMART education is conceptualized as 'panacea' that can practically solve all kinds of educational problems, which leaves no choice for teachers but to accept it. The researcher also analyse teachers' perceptions and practices by drawing on interviews conducted in a Korean smart city, where the SMART education was first enacted. It is argued that smart teachers are supposed to be 'adaptive' to survive by proving themselves as 'compatible'.

O. Embarak (2022) conducted a study on an adaptive paradigm for smart education systems in smart cities using the internet of behaviour (IoB) and explainable artificial intelligence. This study presents a paradigm for smart education based on the integration of XAI and IoB technologies. The research uses data acquired on students' behaviours to determine whether or not the current education systems respond appropriately to learners' requirements. Despite the existence of sophisticated education systems, they have not yet reached the degree of development that allows them to be tailored to learners' cognitive needs and support them in the absence of face-to-face instruction. The study collected data on 41 learner's behaviours in response to academic activities and assessed whether the running systems were able to capture such behaviours and respond appropriately or not; the study used evaluation methods that demonstrated that there is a change in students' academic progression concerning monitoring using IoT/IoB to enable a relative response to support their progression

Ahmed Muayad Younus (2022) conducted a study on AI-Based Smart Education System for a Smart City Using an Improved Self-Adaptive Leap-Frogging Algorithm. Smart cities have become a popular issue all around the world in the information and communication technology (ICT) age. In brief, a smart city is a place where networks and services are more adaptable, efficient, and sustainable as a result of the integration of the latest 5G, Internet-of-Things (IoT), and artificial intelligence (AI) technology to improve operations and provide an entirely new horizon of living and working environment for its residents. The use of AI in the development of smart education systems is gaining traction in India as a means of revolutionizing the educational system. To improve students' learning experiences, schools are beginning to change from traditional teaching approaches to smart education. This research builds a smart education system model based on AI techniques using the improved self-adaptive leap-frogging algorithm (ISALFA) for model optimization. The performance of the students is evaluated using the logical decision tree algorithm (LDTA). Students are 96.44% satisfied with this instructional technique, according to the findings. We have also compared the proposed system with other conventional systems to prove the efficacy of our model.

Adiego (2021) conducted a study on Training competences in smart cities: an online program for higher education students. Purpose this research aims to explain the development of an online training curriculum to enable students to acquire the transversal competences needed to work on smart cities projects. In this curriculum, a modern approach to the teaching-learning process was applied, suitable for the interdisciplinary and multinational learning challenges that smart cities impose, but within the framework of a university-industry European partnership. Design/methodology/approach to develop the curriculum, the competences needed for smart cities, common to all disciplines and fields, had to be researched. In addition, real smart cities projects also had to be selected for work following a project-based learning methodology. For both, this study applied the Delphi method, selecting the most relevant ones based on the data obtained by performing a multi-criteria decision analysis. Findings the procedure followed for the identification of transversal competences in a field, the design of an innovative online training program and the results of the first edition of the program are discussed. Research limitations/implications the processes that were developed, both to detect the most relevant transversal competences and to design the online training program, could be extrapolated to other areas. Moreover, it is very likely that the competences detected in this work could also be extrapolated, for the most part, to interdisciplinary teams. Originality/value to date, there is no European initiative

addressing the challenges of smart cities that requires a major adjustment in higher education, in the relationship between universities and all the mechanisms of lifelong learning with the industry related to smart cities. This work is a pioneer in this regard.

Andreea Molnar (2021) conducted a study on Smart cities education: An insight into existing drawbacks. Smart cities aim to increase citizens' quality of life by employing technology. Education is one of the areas of focus in smart cities and in this context, smart education is a term used to refer to education provided by smart cities. As research in this area has expanded recently as shown by the number of literature reviews in a smart city context, a review could help summarize existing directions focusing in this case on education in the smart cities context. As our understanding on negative consequences is limited, this research will address this knowledge gap by concentrating on challenges and difficulties when it comes to education in smart cities. Three themes were identified: shortcomings on the existing educational initiatives to address the needs of smart cities, negative consequences of smart city education in other areas and problems that arise as a result of employing untrained people handling technology in education.

Patricia Ikouta Mazza (2021) conducted a study on Education & Smart Cities: The Role of the Goals of Agenda 2030 for Sustainable Development of Smart Cities**.** Digitalization is one of several megatrends, including globalization, demographic change and climate change that are reshaping policies from the ground up. For two decades, digital innovation has been at the heart of discourse around "Smart Cities" to build more efficient and liveable urban environments. The concept of "Smart City" has been developed to promote the Sustainable Development of a city. Smart city is defined as an enhanced learning and innovative small society, based in digital tools and services of high quality for its citizens. The European Union (EU), in order to achieve economic growth and its dominance on the global market, has prepared a comprehensive development program, which initially was the Lisbon Strategy, then the Strategy Europe 2020 and now is the agenda 2030. In these programs, there has been given a strong emphasis on Smart growth, which was mainly achieved through the transition of cities to the digital era with the concept of Smart City and promoting quality education to all citizens. Quality education (SDG-4) is the 4th goal of the Sustainable Development Goals (SDGs) of Agenda 2030, which demonstrates the interaction of education with Sustainable Development and consequently with the promotion of the concept of the Smart City. The role of education for sustainable development goals (SDGs) is explored as well as whether this goal can achieve the transition of a city to a smart one.

Teira-Lafuente (2020) conducted a study on Philosophical Approaches to Smart Education and Smart Cities. The impact of technology affects the educational field in an extraordinary way. The effect of technology must be treated from the educational method itself as well as its horizon in the new paradigm of citizen in this smart environment. This work proposes a revision of the immediate future of education and citizenship, as determined by the exponential impact of technology, based on relevant issues of classic philosophy and specially along the history and didactic program of the Trivium (Grammar, Rhetoric and Logic).The research analyses firstly the perspective of the transformation of current education towards a smart education. This transition is determined by the development of Artificial Intelligence (AI), and the reflection on the competences of the 21st century, as something intrinsically related to the issues of citizenship as well as smart cities; secondly, we review the strategic and methodological proposals in accordance with this transformation, based on the theory of generative learning and on computational and algorithmic thinking; thirdly, from the point of view of contents, we analyse the importance of digital skills and, as a fundamental element of these, programming skills. Our proposal is to recover and update the contents of the Trivium, as a renewing and revitalizing element of the methodology and contents of education in the 21st century. This proposal is based on the assumption of the epistemological unity of these disciplines and on the integral anthropological vision that supports them. Both ideas acquire special relevance in the current context marked by the impact of technology as a determining element of the medium (smart education), of the methodology (generative learning, computational thinking) and of the contents (digital skills and programming).

Singh, H. Miah (2020) conducted a study on Smart education literature: A theoretical analysis. The aim of this research was to describe the current state of smart education research as a theoretical substance for introducing an initial innovative approach called Students Career Assistance System (SCAS). A total of 40 selected sample articles were qualified through a selection criterion developed to identify the most relevant existing studies in the smart education domain. Content analysis technique was used for processing the meta-details as key findings. The key findings suggest that smart education is a rapidly evolving research field that complements applications of a range of latest technologies. Combining them, a new innovative framework of smart education artifact is introduced as a case demonstration, which

is mainly a mobile-based SCAS enabling student to manage both their learning and career development for a better future.

Molnar, Andreea (2019) Conducted a Study On Education In Smart Cities: Practices And Challenges. Education is one of the main services offered by the government. Within the advent of smart cities, smart education is defined as the education strategy for smart cities and the concept is becoming more popular with the advent of smart cities. This research aims to address the role of education in smart cities context by providing an overview of the current practices and discussing some of the challenges that exist in delivering education within this context. The following challenges have been identified: advocating for technology, the risk of increasing the rural-urban divide, multidisciplinary of the field and the existence of different definitions of what a smart city is.

Gomede, E (2018) conducted a study on Application of Computational Intelligence to Improve Education in Smart Cities. This research presents a model based on the application of computational intelligence (data mining and data science) that leads to the development of the student's knowledge profile and that can help educators in their decision making for best orienting their students. This model also tries to establish key performance indicators to monitor objectives' achievement within individual strategic planning assembled for each student. The model uses random forest for classification and prediction, graph description for data structure visualization and recommendation systems to present relevant information to stakeholders. The results presented were built based on the real dataset obtained from a Brazilian private k-9 (elementary school). The obtained results include correlations among key data, a model to predict student performance and recommendations that were generated for the stakeholders.

Muh. NadzirinAnshari Nur, (2018) conducted study on Concept of Smart City for Education: A Case Study in Kendari, Southeast Sulawesi. One of the aspects of a smart city is smart education. Presently, several cities have been implementing the concept of smart city to improve the quality of life of the society, including in the field of education. The educational system is currently heading to the collaboration between information technology and communication. Concepts of education are, therefore, required in the implementation of a smart city. The purpose of the research was to come up with smart city concepts in educational sector. There were two aspects playing an important role in the implementation of smart city. The aspects were educational system and educational technology. These concepts allowed the government to create educational programs in accordance with smart city such as (1) the aspect of education system by establishing ICT centre in every school that is connected to the education agency, (2) aspect of education technology by creating education information system, e-learning, online new student enrolment, computer base examination, application of Smartphone for learning, student monitoring system for parents, smart library, and e-academic record. The research was limited to the primary and junior high schools. The research generated concepts of smart city for education that are acceptable in other cities where smart city has been implemented.

Sharma (2017) conducted study on Role of E-Training in Building Smart Cities. Procedia Computer Science**.** Recently, the concepts of building smart cities have come up which enforces urban development to build intelligent and digital cities. Smart cities are also known as digital cities that use ICT practices. This framework offers a linkage between Information and Communication Technology and Urban planning and development (Wolfram, 2012). The linkage has surged for the development of innovative practices and capacity building. Smart cities have been defined in various forms from digital cities to wireless cities and now to smart cities. This research brief mainly concentrates of administration, people and knowledge creation for developing organization's e-training platform helping in building smart cities with digital enterprise, administration and people or smart citizens. This research tries to put forward the concept and designing of e-learning platform to provide instant training and education for shaping the new generation citizens.

Pallavi (2017) Conducted a Study On Smart Education Leads To A Smart City. Smart education leads to smart cities is a prevailing aspect which is inter related to each other, wherein smart education deals with the development of new technologies that enables us o learn more effectively, efficiently, flexibly and comfortably. Smart education is a concept that describes learning in digital era, has gained increased attention. Hence, using the concept of smart education, we are moving forth for the development of smart cities. Smart cities, on the other hand are cities which are well planned and provides the cost-efficient services, environmental services and technological sound services. This research focuses on the smart education and the measures to be taken for the implementation of smart education through the latest technology such as the IOT which gives the way for the development of smart cities.

4. Methodology:

The study is descriptive and attempts to understand the Education in Smart cities of India. The Importance associated with Education in Smart cities were identified based on previous studies done on similar topics, these studies are conducted in different regions. Qualitative aspects of the research study were taken to consideration and the content analysis process was used in the study, which means the researcher organized and elicited information through various research articles and academic publications were drawn from the collected data. The researcher identified the most studied topics in Education in Smart cities. This study is completely based on the secondary data collected through various sources.

5. Results/ findings of the study: ***From the Review it can be analysed that***

- Education within smart cities represents a universal challenge that requires a structured and interdisciplinary approach at all levels.
- Innovative education yields concrete benefits, enhancing learner engagement, motivation, attendance, and learning outcomes. Embracing innovative technologies holds the potential to make education more effective and efficient in meeting the evolving needs of learners.
- Focus on layers of design ethics, data practices, roles, and delivery afforded by new learning infrastructures in smart cities.
- Educators need to modify learning methods and environments that enhance the possibility for students to develop each of these Human Skills by utilizing their personalities.
- Developing sustainable cities with active civil society and to increase the involvement of citizens in the implementation of urban projects.
- SMART education is conceptualized as ‘panacea’ that can practically solve all kinds of educational problems, which leaves no choice for teachers but to accept it.
- Despite the existence of sophisticated education systems, they have not yet reached the degree of development that allows them to be tailored to learners' cognitive needs and support them in the absence of face-to-face instruction.
- The use of AI in the development of smart education systems is gaining traction in India as a means of revolutionizing the educational system. To improve students’ learning experiences, schools are beginning to change from traditional teaching approaches to smart education.
- The challenges of smart cities requires a major adjustment in higher education, in the relationship between universities and all the mechanisms of lifelong learning with the industry related to smart cities.
- Education is one of the areas of focus in smart cities
- The role of education for sustainable development goals (SDGs) is explored as well as whether this goal can achieve the transition of a city to a smart one.
- The impact of technology affects the educational field in an extraordinary way. The effect of technology must be treated from the educational method itself as well as its horizon in the new paradigm of citizen in this smart environment
- smart education is a rapidly evolving research field that complements applications of a range of latest technologies
- Advocating for technology, the risk of increasing the rural-urban divide.
- Aspect of education system by establishing ICT centre in every school that is connected to the education agency
- Concept and designing of e-learning platform to provide instant training and education for shaping the new generation citizens.
- Smart education and the measures to be taken for the implementation of smart education through the latest technology such as the IOT which gives the way for the development of smart cities.

6. Conclusion and Suggestions:

Smart cities are not just a trend; they have become a tendency of development of living and social environment. Green energy, coexistence with the nature, better and technologically supported living environment is the foundation of Smart cities. Smart cities are broader and more complex social projects to changing the life we live. One of the elements of Smart cities project is also "smart education". Strong impetus for development of Smart cities has to come from development of Smart Education environment. For Smart Cities the need for educating all citizens is the basis element of development. Only continually educated (lifelong learners) citizens will be able to make this step. The development of new technologies enables learners to learn more effectively, efficiently, flexibly and comfortably. Learners utilize smart devices to access digital resources through wireless network and to immerse in both personalized and seamless

learning. Smart education, a concept that describes learning in digital age, has gained increased attention. Today's education and its organization and implementation are not sufficient for the future of smart cities. The development of smart education encompasses the use of different educational technologies and access to technology in education. Creating a new technological environment provides new approaches to education of all regardless of their age. Current educational approaches will not be able to support the needs of education. ICT infrastructure is changing, which will directly affect the existing approaches and technology in education. The future of education is smart education. Are we ready for new changes. Smart education research has been rapidly developed for transforming education systems leading to engage and empower students, educators and administrators more effectively. Despite decades of the adoption of new technologies in improving education systems, approaches are frequently criticized for lacking appropriate theoretical and technological basis.

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