A SYSTEMATIC LITERATURE REVIEW PROTOCOL FOR BLOCKCHAIN REVOLUTIONIZING ARENAS OF SMART CITY

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Abstract

The transformation of the Internet of Things (IoT) is changing numerous ideas, making them "Smartest". It has upset numerous territories of reality. Smart City is one of the key ideas of this revolution. In spite of the fact that urban areas are carefully and digitally changed, it still has hindrances en route. In this paper, we have dissected various productions for our Systematic Literature Review Protocol (SLRP). This study highlights the zones where the blockchain is utilized and decides the advantages of utilizing blockchain. The principle commitment is to investigate and recognize the hindrances and obstacles in Smart City Domain and how these obstacles are relieved by the blockchain innovation. This Systematic Study additionally addresses various difficulties and issues, for example, security, changelessness, interoperability, decentralization, protection, and trust in the advancement of Smart Cities. An overview of the precise research is likewise introduced that would help distinguish the most and least examined concerns tended to in this examination. This paper targets investigating how blockchain innovation is utilized in various SmartCity plans of action, what are the highlights of blockchain that could believe it to be utilized past digital currencies. We trust that this investigation can motivate enthusiasm for hypothesis and exercise to substitute conversations here in this area to adhere to these confines.
Keywords: Blockchain, Decentralization, immutability, Security, Smart City, Systematic Literature Review Protocol (SLRP),

I. Introduction

The idea of cryptocurrency (Bitcoin) by Satoshi Nakamoto in 2008 introduced a new concept in the form of blockchain to the world. Blockchain was initially proposed for the cryptocurrency. Bitcoin is considered to be instigated to provide a replacement to the financial gadget, which many human beings mirror as a major reason for the economic crisis round 2008. Through investigating the capacity of blockchain, it's been identified as the spine for the areas in which the term “smart” is related. It gives a decentralized approach, where no centralized supply holds the manipulate. Where the facts are in no way erased as a result imparting immutability. There had been amplified emphasis of reviewing the submission of blockchain in a complete sort of packages, including in solutions serving identification privacy and transaction safekeeping by way of a decentralized structure through diverse settlement methods (e.g. proof-of-work) amongst numerous geo-placed IoT devices in our progressively digitalized subculture e.g. smart city [XXV]. Blockchain gives actual-existence implementations with dependable, transparent, strong, and decentralized surroundings. Blockchain gives excellent help which smart cities can leverage to make bigger the fee of existence, administrative approaches, and environmental sustainability. Blockchain gives services like decentralization, security, privacy-preserving, immutability, and authenticity. The concept and necessity of smart cities have attracted a variety of interest due to its practical and applied background. The recognition of Smart Cities is intently destined to the IoT perspective [XVIII]. A smart city practices information technology to assimilate and reap physical, social, and industrial setups for you to provide better offerings to its occupants even as preserving well-organized and top-quality exploitation of existing possessions [XIV]. A scientific Literature overview Protocol (SLRP) is offered in this paper following the guidelines of [I].

The primary contributions of this study are

i) To identify the blockchain implemented areas.

ii) Awareness about the limitations and hindrances in the smart city domain.

iii) To impart the motivation of blockchain technology implementation.

The rest of the paper is properly-prepared as follows: section. 2 promises the contextual heritage of the blockchain and overview of the correlated work. section 3 gives the contributions which enlighten the SLR method and in section. 4 conclusion and intended studies advices are discussed.

II. Background

The usage of blockchain for the area of smart cities is quiet around but because of the lack of understanding, it has never been utilized in its actual feel. The smart city covers a huge range of situations under its area, inclusive of schooling, mobility, domestic, energy, healthcare, enterprise, safety, and privacy. Considering that many savvy frameworks have been actualized, security and protection problems
have converted a great take a look at that calls for compelling countermeasures. Be that as it can, standard virtual protection assurance methodologies cannot be applied legitimately to those keen applications via considering the dynamic characteristics, heterogeneity, and adaptableness of smartcities [XXVIII]. In a centralized technique, exceptional domain names of smartcities have distinctive demanding situations. modernIoT frameworks rely on unified or expedited standards with enormous computational and capacity limits. The contemporary IoT preparations are along those traces highly-priced, inferable from the good-sized prices due to the cloud server setup(s) and protection. this is the cause blockchain that turns into possibly the maximum important factor. at the same time as the client-server worldview has been instrumental in interfacing conventional gadgets with one another for a great duration of time, it may not have the choice to assist the difficulties that come from the improvement of the IoT economic system. Using a standard allotted decentralized correspondence technique may not simply decrease the prices referring to protection and foundation of server companies however will additionally percentage the planning and space requirements of a wide variety of instruments at the IoT architecture, without sharing any additional sources. Blockchain gives a reaction that suits the need for this type of phase. The greater part of the IoT devices have confined assets, facilitating blockchain on IoT devices is a key check. alongside those strains, several blockchain stages are constructing up a light consumer, to simply maintain the important records on the device. Facilitating the blockchain straightforwardly on asset pressured IoT devices isn't always favored in light of the reality that IoT devices have Low computational assets.

Related Work

There exist some surveys, which recollect the blockchain platform's security dangers. [XVIII], proven that modern-day clouds cannot fulfill the new conditions of future adaptable IoT structures. Another associated study [XXV], evaluate the security assaults on the blockchain systems & summarizes the security improvements. The heterogeneous nature of resource-restrained gadgets are highlighted by using [XIV], a smart city is at risk of some of the protection attacks. They applied blockchain's points of interest in a mix with hazy figuring and software-defined Networking (SDN) innovation to accumulate a novel circulated engineering that fulfills the essential structure requirements, as an instance, versatility, productivity, flexibility, adaptability, and safety. In addition investigation by using [XX], uncovers the growing enthusiasm for the topic of blockchain innovation.

Existing Systematic Reviews of Blockchain in Smart City Domain.

Different search strings were applied to ensure the availability of Systematic Literature Review on the topic but it seems that there is very less work done precisely on the theme “Blockchain for Smart Cities”. To grasp the most relevant and updated information related to the blockchain for smart cities the following strings were used (Smart City and Blockchain” OR “Smart City and research issues”). (OR “Blockchain in Smart City”) AND SLR OR “Systematic Literature Review”
According to [XIX], the smart city faces unique difficulties. Probable the maximum crucial problems are diagnosed with the expanded measure of data flow and ensuring security. This study provides the ability to utilize revolutionary blockchain technology that may alleviate problems by way of capitalizing on the possibilities and blessings of blockchain and other new improvements. Blockchain improvement has a large capability with respect to framing the upgraded smart networks.

According to [XX], numerous articles targeted at the areas: health (roundabout five%), smart agreements, smart cities, and commercial enterprise (with approximately 10% each) digital forms of cash, digital government (approximately 12%), monetary (approximately 15%), IoT (approximately 30%), and bitcoin (about 40%), this factor of view affirms the conventional version look at records bolstered in blockchain innovation for eager spots, specifically whilst implemented to smart cities.

III. Research Method

Our research scheme encompasses the research questions Table 1, research objectives Table 2, data sources Table 3, search strategy, and study selection using the inclusion/exclusion criteria Table 4 and Table 5 Data Extraction Description.

Research Questions

To identify the potential, benefits, and issues of blockchain, Table 1: Research Questions

| ID  | Research Question                                                                 | Motivation                                                                                     |
|-----|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| RQ 1 | What are the application zones of the blockchain era inside the smart city area? | The main goal is to highlight the areas of the smart city domain, wherein blockchain is getting used |
| RQ 2 | What regions may be taken into consideration as a barrier to the smart city and its area? | The intention is to find out the difficulty concerned in a smart city domain.                    |
| RQ 3 | What blessings does blockchain bring to smart cities?                              | The objective is to find the advantages of blockchain era                                      |

Research Objectives

This systematic review has been carried out for the objectives described in Error! Reference source not found.2.
Table 2: Research Objectives

| ID | Objectives                                                                 |
|----|---------------------------------------------------------------------------|
| 1  | To study the blockchaininculcated areas in the smart city domain.         |
| 2  | To sightsee and categorize the blockades and hurdles in the Smart City domain. |
| 3  | To rationalize how blockchain technology could be the best-suited answer to the Smart Cities limitations. |

Data Sources

In this systematic review, different electronic databases Error! Reference source not found. has been used as primary sources.

Table 3: Data Sources

| SOURCE       | URL                                         |
|--------------|---------------------------------------------|
| ACM          | http://portal.acm.org                       |
| Google Scholar | https://scholar.google.com/               |
| IEEE Xplore  | http://ieeexplore.ieee.org                  |
| ScienceDirect | http://www.sciencedirect.com               |
| Springer     | http://www.springerlink.com                |

Search Strategy

It is decided to recollect this Systematic evaluate Protocol from the year 2008 due to the reality that the first actual research in the blockchain turned into published in 2008. It was ensured that the search blanketed conferences, symposiums, journals, magazines, workshops, and e-book sections. in the beginning, we used a blend of watchwords inclusive of blockchain and city but observed those chase terms too much restricted. Blockchain application has been proposed on in lots of practical senses, a huge quantity of them contacting certain city components however the papers don't absolutely state city or smart city explicitly. therefore, we ultimately settled discovering all papers on the strings, (“Blockchain for the smart city” or “the use of Blockchain for smart cities” or “smart city and research issues”).

Study Selection

The primary studies were decided on investigating the inclusion/exclusion criteria Error! Reference source not found. The primary focus turned into the “name”, “abstract” and “conclusion” of the papers to make certain the matching of the papers with our RQs. The primary study selection process is shown in Fig 1.
Table 4: Inclusion / Exclusion Criteria

| Inclusion criteria                                      | Exclusion criteria                                      |
|--------------------------------------------------------|---------------------------------------------------------|
| Papers that may contain the terms Blockchain or Smart City or Both. | Duplicate articles                                      |
| Papers that describe related blockchain attributes.     | The papers which are not available in the English language version. |
| Peer-reviewed papers                                    | If the study is concerned about a different subject from this work. |

Fig.1: Primary Studies Selection

Data Extraction

Data were mined by concentrating on the objectives Error! Reference source not found.2 and RQs Table 1: Research Questions

1 of this paper. Associated information such as (Title, Author, paper reference type, and other related information) was extracted in demand to cover the objectives. Error! Reference source not found.5 shows the information and data items.

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The first research question (RQ1), indicates the regions wherein blockchain is supported and implemented. RQ2 addresses the main worries like layout constraints, environmental information collection and the dearth of systems and approaches, and so forth. RQ3, highlights the major advantages of blockchain e.g. secure communication without the involvement of mediation, permanent and immutable storage of data, and many others.

Table 5: Data Item Description

| Data item                      | Description                                      | Study research Questions |
|-------------------------------|--------------------------------------------------|--------------------------|
| Paper Title                   | Title name                                       | RQ1                      |
| Author(s)                     | Study authors name                               | RQ1                      |
| Published in (Journal / Conference) | (Journal / Conference)                           | RQ1                      |
| Name of Database              | Name of the articles Database                    | RQ1                      |
| Year                          | The study/ research publication(s) period or duration. | RQ1                      |
| Research Type                 | Describes the type of research                   | RQ1, RQ2, RQ3             |
| Research (Issues / Challenges) Identified | Describe the general characteristics proposed in each blockchain research issue (study) | RQ1, RQ2, RQ3             |
| Design / Methodology / Approach | Research approach and framework                  | RQ1, RQ2                 |
| Future Work                   | The study's main conclusion and future directions. | RQ3                      |

IV. Conclusion and Future work

This Systematic Literature Review Protocol explores how blockchain implementation could change the dwelling standard of human beings. What safety risks or hurdles are present and what protection risks are mitigated by way of introducing the blockchain to the smart cities. thinking about the characteristics, a blockchain foundation in a smart city will improve the sharing of records, and updates will occur seamlessly and securely. In the beginning, it will require a great deal of resources. Despite the fact that blockchain innovation ensures comfy or non-public transactions, there's as yet demand for strong encryption techniques. Constrained supremacy of computation is being identified in many IoT gadgets and different sensors which forces them to apply only the simplest cryptography algorithms. Consequently, encryption, biometrics, anonymity are sadly no longer sufficient for the smart city structure. Blockchain can assist innovative communities with authenticating and attribute the source. It is expected that this paper will boost enthusiasm for additional conversations and research in these zones.
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