Designing a conceptual framework of a smart city for sustainable development in Bangladesh

Editorial Board Members

Editorial
International Conference on Advanced Information Scientific Development (ICAISD) 2020

Taufik Baidawi et al 2020 J. Phys.: Conf. Ser.

International Conference on Advanced Information Scientific Development (ICAISD) 2020 was organized by Universitas Bina Sarana Informatika.

It was held in BSI Convention Center, Bekasi, West Java, Indonesia, event held by the Institute of Research and Community Service (LPPM) of Universitas Bina Sarana Informatika on August 6-7, 2020. ICAISD 2020 is an International Conference for sharing knowledge and research in Computer and Information Science and providing a platform for researchers and practitioners from both academia as well as industry to meet and share the cutting-edge development of Computer and Information Science research. The theme that we raised in this international seminar is: "**Scientific Information for Living Welfare**".

The background of the theme selection is related to the rapid development of science and technology in the 21st Century that has contributed to change or renewal in various fields of life, including Applied Science, Management and Artificial Intelligence. This form of activity takes the form of scientific seminars or international conferences that are held virtually or webinars consisting of plenary lectures and oral presentations. The target participants are practitioners in the field of Information Technology and Management from academics (lecturers, researchers, and students) as well as practitioners and industry as a mean of socializing progress and development in the field of Information Technology and Management to increase their understanding and use for stakeholders on national and international scale. In addition, through this conference, the participants can develop research networks and collaboration with research partners in the field of information technology and management in Indonesia and researchers from abroad.

In connection with this theme, we present four speakers as the main speakers, namely Prof. Ir. Zainal Arifin Hasibuan, MLS, Ph.D (General Chair of APTIKOM Indonesia), Prof. Dr. Gerhard Willem Weber (Poznan University of Technology, Poland), Prof. Dr. Dorien De Tombe (Delft Technical University, the Netherlands), and Prof. Dr. Herman Mawengkang (Universitas Sumatera Utara).

The committee received 214 papers via easychair.org as well, with details of 145 papers received. Of the 145 papers 65 papers in Applied Science, 28 Papers in Management and 52 papers in Artificial Intelligence.

We organized this conference virtually as follows:

> The location of the ICAISD-2020 Conference was virtually using the Zoom Meeting
>
> Topic: UBSI ICAISD 2020 "SCIENTIFIC INFORMATION FOR LIVING WELFARE" (Part 1)
> Time: Aug 6, 2020 09:00 AM Bangkok
>
> Join Zoom Meeting
> https://zoom.us/j/7326877081?pwd=TVFOR1E2YlZEUFR5Q0h5NXlEK1pKQT09

Meeting ID: 732 687 7081
Passcode: ICAISDBEST

Topic: UBSI ICAISD 2020 "SCIENTIFIC INFORMATION FOR LIVING WELFARE" (Part 3)
Time: Aug 7, 2020 10:30 AM Bangkok

Join Zoom Meeting
https://zoom.us/j/7326877081?pwd=TVFOR1E2YlZEUFR5Q0h5NXlEK1pKQT09

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While the off-line event specifically for the Committee was held at the BSI Convention Center, Bekasi, West Java, Indonesia. The implementation began with the delivery of the schedule by the MC and was opened by the chairman of Aptikom (Association of Computer and Informatics Higher Education) Prof. Zainal A. Hasibuan and continued with remarks from the Rector of Universitas Bina Sarana Informatika, Dr. Mochamad Wahyudi, MM., M.Kom, M.Pd.

Figure 1. Welcoming Remarks from Rector of Universitas Bina Sarana Informatika

Plenary of Each Speaker

The keynote speakers each delivered 45 minutes of seminar material through Zoom Meetings in their respective places. As in the following table:

ICAISD 2020

INTERNATIONAL CONFERENCE ON ADVANCED INFORMATION SCIENTIFIC DEVELOPMENT

" Scientific Information For Living Welfare "

MEETING ID : 732 687 7081

PASSCODE : ICAISDBEST

JAKARTA , 6 AGUSTUS 2020

TIME					EVENT	Screen	FOH	DESCRIPTION
09.00.00	-	09.15.00	00.15.00	15'	Registration	Music Play		
09.15.00	-	09.18.00	00.03.00	3'	**VIDEO OPENING**			
09.18.00	-	09.23.00	00.05.00	5'	**PRAY TO GOD Session**			
09.18.00	-	09.28.00	00.10.00	10'	**Insert MC 1** - Opening, Introducing, Present (Mr Agus & Mrs Cicih)	Live Cam	Mic MC	Welcome Remark
09.28.00	-	09.28.30	00.00.30	30 "	**BUMPER**			
09.28.30	-	09.29.00	00.00.30	30 "	**Insert MC 2** - Sing Together , The National Anthem Of Indonesia			
09.29.00	-	09.31.00	00.02.00	2'	**INDONESIA RAYA**			
09.28.30	-	09.29.00	00.00.30	30 "	**Insert MC 3** - Welcome Speech by Rector	Live Cam	Mic MC	
09.29.00	-	09.29.15	00.00.15	15 "	**BUMPER IN**			
09.29.15	-	09.41.15	00.12.00	12'	**RECTOR SPEECH**			
09.41.15	-	09.41.30	00.00.15	15 "	**BUMPER OUT**			
09.41.30	-	09.42.00	00.00.30	30 "	**Insert MC 4** - Opening Remark by Head Of LLDIKTI 3 (APTIKOM *)	Live Cam	Mic MC	Audience sdh duduk kembali
09.42.00	-	09.42.15	00.00.15	15 "	**BUMPER IN**			
09.42.15	-	09.56.15	00.14.00	14'	**APTIKOM + OPENING**			

09.56.15	-	09.56.30	00.00.15	15"	**BUMPER OUT**			
09.56.30	-	09.57.00	00.00.30	30"	**insert MC 5 -** Invite Keynote Speech 1	Live Cam	Mic	
09.57.00	-	09.58.00	00.01.00	1'	**BUMPER PROFILE KEYNOTE SPEECH 1 (Prof. Ir. Zainal Arifin Hasibuan, MLS., Ph.D)**			
09.58.00	-	10.43.00	00.45.00	45'	**Keynote Speech 1 (Prof. Ir. Zainal Arifin Hasibuan, MLS., Ph.D)**	Live Cam	Mic Keynote	
10.43.00	-	10.43.15	00.00.15	15"	**BUMPER Out**			
10.43.15	-	10.43.45	00.00.30	30"	**insert MC 6 -** Invite Keynote Speech 2	Live Cam	Mic	
10.43.45	-	10.44.45	00.01.00	1'	**BUMPER PROFILE KEYNOTE SPEECH 2 (Prof Dr Herman Mawengkang)**			
10.44.45	-	11.29.45	00.45.00	45'	**Keynote Speech 2 (Prof Dr Herman Mawengkang)**	Live Cam	Mic Keynote	
11.29.45	-	11.59.45	00.30.00	15'	**insert MC 7- Q&A Session 1**			
11.59.45	-	12.59.45	01.00.00	60'	**BREAK TIME**			
12.59.45	-	13.00.00	00.00.15	15"	**BUMPER Out**			
13.00.00	-	15.00.00	02.00.00	120'	**PARALLEL SESSION (10 Classroom) Chapter 1**			
15.00.00	-	15.00.15	00.00.15	15"	**BUMPER**			
15.00.15	-	15.10.15	00.10.00	10'	**Music Play**			
15.10.15	-	15.10.45	00.00.30	30"	**insert MC 9 -** Invite Keynote Speech 3	Live Cam	Mic	
15.10.45	-	15.11.45	00.01.00	1'	**BUMPER PROFILE KEYNOTE SPEECH 3 (Prof Dr Dorlen De tombe)**			
15.11.45	-	15.56.45	00.45.00	45'	**Keynote Speech 3 (Prof Dr. Dorlen De Tombe)**	Live Cam	Mic Keynote	
15.56.45	-	15.57.00	00.00.15	15"	**BUMPER out**			
15.57.00	-	15.57.30	00.00.30	30"	**insert MC 10 -** Invite Keynote Speech 4	Live Cam	Mic	
15.57.30	-	15.58.30	00.01.00	1'	**BUMPER PROFILE KEYNOTE SPEECH 4 (Prof Gerhard W. Weber)**			
15.58.30	-	16.43.30	00.45.00	45'	**Keynote Speech 4 (Prof Gerhard W. Weber)**	Live Cam	Mic Keynote	
16.43.3	-	16.43.4	00.00.1	15	**BUMPER out**			

0		5	5	"		
16.43.45	-	17.13.45	00.30.00	30'	**insert MC 11- Q&A Session 2**	
17.13.45	-	17.14.00	00.00.15	15 "	**BUMPER Close**	

Figure 2. The material delivered by Keynote Speaker: Prof Zainal A. Hasibuan (Head of APTIKOM)

Figure 3. The Presentation of Keynote Speaker: Prof Zainal A. Hasibuan
(Head of APTIKOM)

Figure 4. The Material delivered by Keynote Speaker: Prof. Dr. Herman Mawengkang
(Universitas Sumatera Utara)

Figure 5. The Material delivered by Keynote Speaker: Prof. Dr. Dorien De Tombe

(Delft Technical University, The Netherlands)

Figure 6. The Material delivered by Keynote Speaker: Prof. Dr. Gerhard W. Weber (Poznan University of Technology, Poland)

The questions asked by the participants for the keynote speaker were presented in two ways:

1. Through the chat room zoom meeting addressed to the committee to be conveyed to the keynote speaker.
2. Ask directly through zoom using the unmute feature by informing the committee in advance with the raise hand. Direct submission of questions is limited to a maximum of 5 questions for each keynote speaker.

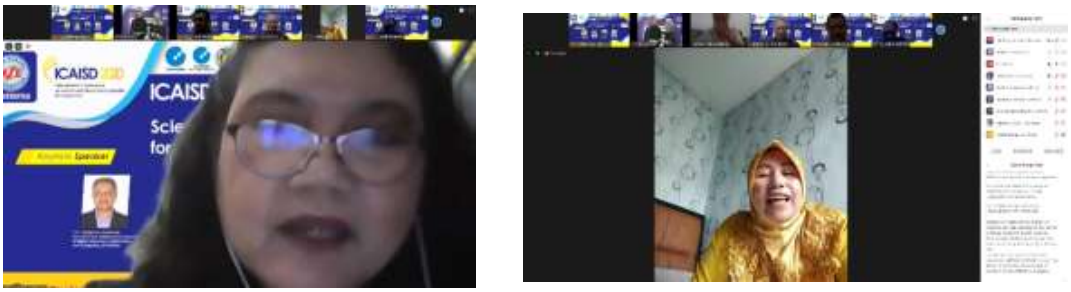

Figure 7. The Participants were delivering the Questions Addressed to Keynote speakers

The committee gave 15 minutes for each question session.

Durasi **: 15 Minutes/ Team**

Total Durasi **: 195 Minutes**

The Zoom Meeting application can support the ICAISD seminar to run smoothly due to travel restrictions by the Government due to the Covid-19 pandemic, so that meetings involving many people cannot be held. The zoom meeting application makes it easy to meet virtually without limiting certain areas so that the ICAISD seminar can run smoothly.

Technical obstacles in the implementation of the ICAISD-2020 conference were usually problems from participants who cannot display the presentation file, but because participants have sent / uploaded the presentation file (ppt/ pptx) previously via the icaisd.info page, the committee can help display the presentation files of the seminar participants.

The positive side of the implementation of seminars is that participants and keynote speakers can deliver seminar material without holding a meeting because the Covid-19 pandemic will make it easier for participants far away from Bekasi, West Java, Indonesia. Therefore, that it can be efficient in terms of time and travel.

This conference can be held due to the assistance of various parties. For this reason, on this occasion, we would like to thank the Rector of Universitas Bina Sarana Informatika and staffs, the Dean, the Head of the Study Program, the Head of Technology Bureau, the Head of Communication Marketing and his staffs, Advisors, Program Committee Chairs, Executive Chairs, Chair of Committee, and Co-Hosts who have participated in this conference.

Our highest appreciation is also extended to all the Organizing Committee Chair who have worked hard for the success of this conference. We are aware that there are still many shortcomings in organizing this seminar in presenting events, administrative services, and limited facilities. For that, we apologize profusely. Through this opportunity, we invite conference participants to join again in the 2nd ICAISD conference in 2021 next year. Finally, I hope that all conference's participants who attend this conference will have many benefit and useful things from this conference.

Jakarta, August 27, 2020
Chairman,

Taufik Baidawi

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Accepted papers received: 07 September 2020
Published online: 23 November 2020

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Designing a conceptual framework of a smart city for sustainable development in Bangladesh

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Designing a conceptual framework of a smart city for sustainable development in Bangladesh

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Abstract. A smart city is a future solution to better management of the city and people. Recent researches have highlighted the necessity of smart city projects to improve urban lifestyle for the growing population. Bangladesh is one of the most densely populated countries in the world. Despite being a developing country, Bangladesh still lacks a smart city. A smart city framework is required to ameliorate urban lifestyle. The purpose of this study is to address a conceptual framework for a smart city project focusing on sustainable development in Bangladesh. The research approach follows an exhaustive literature review to collect suitable information to design the new smart city framework. Necessary information to design a smart city framework such as the core smart city dimensions and the sustainability indictors are identified through the thorough literature review. From the extracted information a new smart city framework is developed focusing on sustainable development. The findings of this study offer a clear overview of the smart city core dimensions and factors that influence sustainability in a smart city. The research presents a smart city framework that can be followed in a developing country like Bangladesh.

Keywords: smart city, framework, sustainable development.

1. Introduction

Bangladesh is a developing country. According to the Bangladesh Bureau of Statistics, there are 532 urban centers in Bangladesh. The rapid growth of the population in Bangladesh makes the city life more challenging. Every day more and more people are migrating to the cities from rural areas for better livelihood. The management and governance of the cities are becoming harder than before due to the increasing population. In these circumstances, sustainable smart city projects can be a solution for a better urban lifestyle in Bangladesh.

The concept of a smart city is fuzzy and inconsistent. The label “smart city” is sometimes replaced with other adjectives like the digital city, eco-city, knowledge city, or intelligent city. Despite its popularity, it is difficult to find a prevalent or universally acknowledged definition of a smart city. Stated by Meijer and Bolı´var [1], there are three different kinds of ideal-typical definitions of the smart city. They are – technology-focused, human-resource focused (smart people) and governance focused such as smart collaboration among the government and the citizens. V. Fernandez-Anez [2] defined a smart city as a system that interacts with natural and economic resources via technology-based solutions and intensify human and social capital properly. Regarding public engagement, smart cities are divisible into three groups: bottom-up, beneficial, and techno smart cities [3]. Lara et al. [4] defined the smart city as an umbrella concept holding several sub-concepts such as smart technology, smart governance, smart

transport system, smart health management, smart economy, smart economy, and so on. The expected outcomes of smart city projects are sustainability, the livability of the citizen, improved quality of life, equity, and resilience [5].

A smart city has some unique characteristics than traditional cities. According to M. Angelidou [6], a smart city can hold a variety of characteristics based on distinct domains like technology-centric, development of human resource and social status, promoting the entrepreneurs, information security and privacy, adapted strategies, top-down management, networking, an explicit strategic framework, exchange of information, interdisciplinary planning, and general collaboration. The fundamental characteristics of a smart city are high-speed broadband connection plus quick data management. The strategy that lies beneath a highly effective and demand-responsive smart city project is to create a clever combination and connection between these characteristics and overcome the challenges deliberately.

A smart city project requires having a clear concept of sustainable urban development. According to the United Nations [7], "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs." A recent review study by Yigitcanlar and Kamruzzaman [8] found out that cities need to be sustainable before they become smart. Despite incorporating several dimensions, smart cities cant successfully achieve sustainable goals in practice rather than using technology [9], [10]. A smart city faces difficulties to meet the sustainable goals because of its high-tech requirements, the complexity of practices, and conceptualizing the smart city idea in an ad-hoc manner [8]. T. Yigitcanlar et al [8] found that smart cities practice a genuine and progressive approach that easily reaches a sustainability goal. The study approach dealt with quick practice and policymaking to achieve the set goal of a smart and sustainable city.

This study aims to present a conceptual framework for smart cities which is expected to be a major turning point for sustainable development in Bangladesh. The study searches for other successful sustainable smart city models and case studies to create a new framework. The research also recommends the elements which must be met for the smart city initiative in the Bangladeshi context. The outcome of this study provides a conceptual model of a modern smart city for Bangladesh. The model includes the core smart city dimensions and sustainability indicators with the technological backbone. The whole smart city architecture stands on four generic smart city pillars. The new smart city framework shows a proper relationship between the smart city components.

2. Proposed Method

This study follows a qualitative research method based on a thorough literature review. Figure 1 is showing the proposed research methodology for designing a sustainable smart city framework.

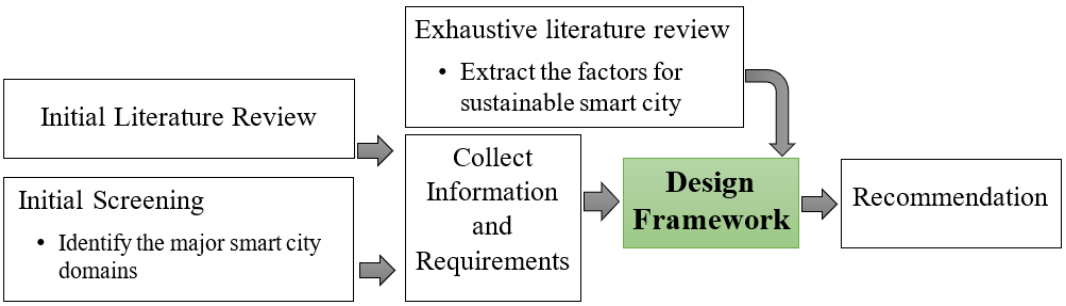

Figure 1: Research methodology for sustainable smart city framework design

The literature review process takes two approaches. The initial literature study focuses on finding papers related to this study and screening them according to quality and relevant information. The initial approach also focuses on identifying the major smart city domains. Initially, relevant studies published in reputed journals and conferences for the last five years are collected. Assuring the quality of the literature to SCImago Journal Rank (SJR indicator) is followed. The journals bearing highest rank Q1 to least Q4 has been considered as a good source of information. The core smart city dimensions are identified from the selected papers. The rigorous literature study reviews the current smart city

frameworks in practice according to various dimensions which helps to extract the factors for a sustainable smart city. The extracted factors are used to design our smart city framework for sustainable development. This study however is different from other existing studies in this sector. The focus on sustainable development, extracting the factors for smart city core dimensions and smart city sustainability dimensions combined with smart city pillars, makes this framework unique than other existing frameworks.

3. Result and Discussion:

According to the literature review findings, the smart city's core dimensions are smart governance, smart people, smart economy, smart mobility, smart living as well as smart environment [11]–[13]. We identified the sustainability dimensions that influence the sustainability of a smart city. Table 1 is showing the sustainability dimensions derived from recent existing literature.

Table 1: Sustainability Dimensions of a Smart City

Sustainability Dimensions	References
Transport/Mobility	[14], [15]
Power system / Energy	[16]
Environment	[17]
Resource (Natural and Human Resource)	[18]–[20]
Education	[21]
Public safety	[22], [23]
Healthcare	[15]
Data security and privacy	[24]
Land use	[25]
Waste management	[26]

Table 2: Smart City Projects Focuses on Sustainability Dimensions and their Contributions

Ref.	Year	Focus	Purpose	Merits
[14]	2018	Transportation	Optimizing transport system and reduce carbon footprints	Optimized transportation routes and less CO_2 emissions
[16]	2016	Power system / Energy	Efficient resource utilization using smart technology in the photovoltaic connected grid system	Efficient power utilization, forecast, and smart suggestion
[17]	2018	Environment	Environmental sustainability solution for smart cities	A framework for future use in smart cities to achieve environmental sustainability
[18]	2019	Resource management	Developing a sustainable algorithm to minimize electric drains thus prolonging a smart city's battery lifetime	Optimized power and energy
[19]	2018	Human resource management	Knowing the HRM role towards exploiting and exploring the smart city projects' alliances	Guidelines to multinational enterprises to adapt HR practices in a smart city context

[25]	2019	Land use, zoning	Optimizing zoning and land use allocation in a smart city	Enhances decision sustainability involved in zoning and land use
[26]	2016	Waste management	Enhancing quality, performance and the interactivity of urban services using ICT	Cost reduction for better resource utilization in garbage management

Table 2 is showing a summary of the recent researches focuses on the smart city sustainability dimensions, tools, or methods used and their contributions. From Table 1 and Table 2, we can say that the major sustainability dimensions of a smart city are transport, education, public safety, land use, data privacy and security, energy, environment, resource, healthcare, and waste management. B. Silva *et al.* mentioned four pillars on which a smart city can be based – institutional, physical, social, and economic 'infrastructures' [27]. We designed our new smart city framework based on the smart city core dimensions, the sustainability indicators, and the generic smart city pillars.

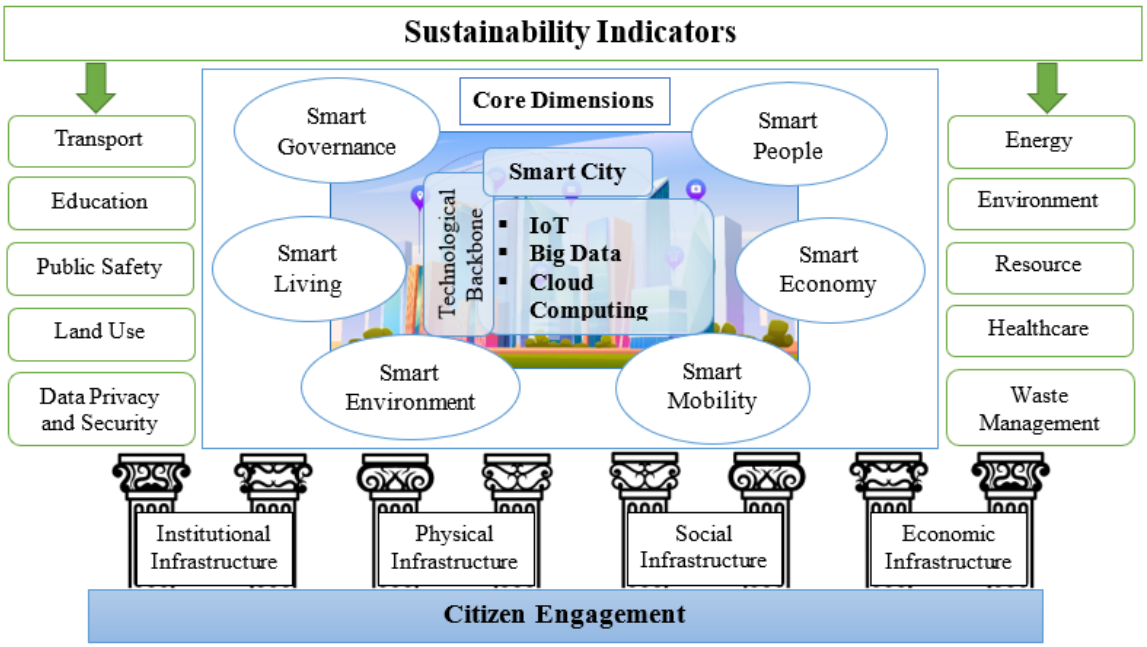

Figure 2: Smart city conceptual framework for sustainable development

Figure 2 is showing our new smart city conceptual framework for sustainable development. In our conceptual framework IoT, Big Data, and cloud technology are working as a backbone. The smart city core dimension surrounded the backbone creates an interconnected combination and network of the dimensions. These core dimensions communicate between the sustainability factors by exchanging data and information. The technological backbone, the core dimensions, and the sustainability dimensions based on the institutional infrastructure, physical infrastructure, social infrastructure, and economic infrastructure. In the whole process, citizens engage actively to improve the quality of life. The success of the smart city project following this framework depends on the proper alignments of these factors with each other.

A smart sustainable city requires fast public transport as mobility is a prominent requirement in this development. The citizens need to move quickly to increase overall productivity. People need quality education to be smart. From primary to higher education, the quality of all educational sectors must be monitored updated with new concepts, methods, and techniques. Ultimately, smart educated people will serve for a long time with a significant contribution. The government must ensure public safety, data

privacy, and security for better management. Lands and living zones must be utilized smartly to support the increasing number of inhabitants One essential building block of a sustainable smart city is the smart economy. Investment in the urban sectors can act as 'engines of a smart economy' in a smart city. The healthcare system must be smart to ensure the quality of medical treatment of the citizens. Smart resource management will ensure the maximum utilization of the limited assets for a longer time.

For the successful implementation of this framework, we recommend a four-step strategy for Bangladesh. Figure 3 is showing the recommended strategy steps. Initially, Bangladesh needs to develop its technological background and fulfil the requirements of fundamental requirements for a smart city such as high-speed internet. Secondly, the existing megacities like Dhaka and Chattagram should be developed into the first smart cities. Thirdly, new small smart city projects should be started along with turning the existing medium and small cities into a smart city. Finally, smart cities must integrate by exchanging data and information.

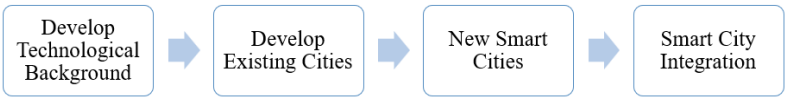

Figure 3: Strategy recommendation for smart city projects in Bangladesh

4. Conclusion

A smart city's success heavily depends on project sustainability. In this paper, a conceptual framework in the context of sustainable development is proposed. From a rigorous literature review, the smart city core dimensions and sustainability factors are identified. The new framework is designed based on the smart city core dimensions and sustainability factors and technological background. The total structure stands on four generic pillars. The citizens actively engage in the whole process to make better livability. The research recommends a strategy process to begin a smart city initiative in Bangladesh. This work preliminarily contributes to the development of a smart city in Bangladesh for a sustainable future. However, farther researches must be done if the new framework is appropriate for building a sustainable smart city.

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