Smart Cities and Internet of Things, the future of human coexistence

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Abstract—**Smart cities and the Internet of Things(IoT) two meanings that are used a lot in the 21st century. Cities that are considered smart are not rare in 2022 and cities that for every issue of every citizen has a smart solution. With the combination of internet of things and smart cities there has been created an environment that is favorable for the citizens because it provides them privileges that help them in their every day life. The IoT is a big help for the creation of these cities and this has a result that the advantages of these cities prevail their disadvantages.**

Keywords-component: Smart cities, Internet of things, smart, IoT

I. INTRODUCTION

Smart cities, in the the decade of the '90s it was just and idea or a "project" and now it is globally known and that is because there are a lot of em around the world. The definition of a smart city evolved many cities started to become "smarter" day by day, but smart cities would not exist if without the internet of things. Cities around around the world decades ago started to make changes and upgrades in many sections of the cities in order to be called smart, because a smart cities is the future of cities. Something that stands out in the smart cities is the Information Communication Technologies(ICT) as they are very important so that a city may be "smart". But when a citizen hears the terms "smart city" and "internet of things" he will have some questions like: What exactly is smart city? What is its characteristics? What is the internet of things? How is the internet of things useful in smart cities and how are these two combined? What are the advantages of smart cities? Which are some of the smartest cities in the world? Questions that we explain in this article and that is because smart cities is part of a big rate of peoples life on Earth.

II. SMART CITIES AND THEIR CHARACTERISTICS

The idea of a smart city is something that can change throughout the years because there may changes on how we describe a smart city and to be honest which of the million cities around the world would not want to be characterized as smart? Neither a clarification nor a definition about what the famous smart cities. But a smart city is a city that mainly offers many privileges to their citizens and with combination with the information and communication technologies there is briefing about everything and for example there are cameras everywhere so that they can record everything. Smart cities are not consisting of only smart communication but it consists of smart transportation for the citizens, that is a big variety of public transportation services and a smart road network for a safe transportation, and to add up there are also smart buildings that are technologically advanced that have for example security cameras and mainly buildings that have as a priority the security and safety of the citizens. The smart environment is a very important role for the idea of a smart city, an environment that is "healthy" that has many measures for the protection of the environment like the constant supervision of the air that we breath, water etc.. Big factor for smart cities are smart people and mostly the smart governance of the city if the governance has the internet "by its side", for example they have created online environments where every citizen can extract information, contact, have access to services where in ant other case his physical presence would be necessary. For the citizens of a city that is considered smart health has a big priority. Smart health consists of smart health facilities for every citizen on every corner of the city, and the quick transportation of a citizen with an emergency with the help of the smart road network. Except from emergency health a smart city has to take care of their citizen's long term health with gymnastic parks for to exercise. These are some of the characteristics of a smart cities that define "what smart cities are".

III. ADVANTAGES OF SMART CITIES

Smart cities are wealthy with advantages and the only certain is everyone would want to live to a smart city. One of the many advantages is the local economic development that is being noticed and it is huge, and one of the many reasons why this is happening is because of the big tourism development. Like we mentioned in the previous paragraph the provision of public transportation methods and their network services as result the life of citizens becoming much faster as it concerns their every day transportation or their general liabilities. Security that a smart provides is one of the most fundamental advantages. As an extra advantage of the smart cities is the energy they save like the smart building with low electricity consumption etc.

IV. THE DISADVANTAGES

Of course we cannot skip the disadvantages that every human idea has and the disadvantage is the cost of money that a smart city may have. The process of applying the idea is expensive because the technological investments that to be

done for a city to be smart are too many as the are a lot of sections in the city that can be smart.

V. THE INTERNET OF THINGS (IOT)

With the idea of smart cities the idea of the Internet of Things was developed. Like it has been mentioned before in previous paragraphs smart cities are the future and with that justification the internet of things reserves many developments in the future and it will play big importance for a very long time. We can mention that the internet of things is something that affects the life of every citizen. The idea of the internet of things is that every electronic device or physical object will have connection to the network with the help of 2G/3G/4G, Bluetooth, WiFi, RFID(radio frequency identification), GPS, QR(quick response) codes, NFC(near field communication) and throughout wires they can collect data. Something that characterizes the IoT is how smart it is because every object that is connected to the IoT network has applied intelligence that creates the ability of everything to be automatic. An extra characteristic is the energy it helps to save and for example in a mall the escalators work throughout the day but with weight sensors the escalators can automatically stop whenever there is no person on it and it can start moving again the moment it detects a person on the escalators. Of course the security that they provide is the most important characteristic for example the ability of a car not to go off track in a dangerous turn it can prevent a lot of accidents. That is why a lot technological companies have started to promote products that the idea of IoT is being applied, companies like Samsung, Apple, Google, Nest as it is being estimated that the idea concept can reach 7.1 trillion dollars a very promising amount of money where who wouldn't want invest in? The Iot has a steady development and there is no doubt for the continue of its uprising. The Internet of Things is characterized as something that combines the physical and digital form of data that they collect.

VI. THE COMBINATION OF SMART CITY AND IOT AND THEIR ADVANTAGES

The main idea of the IoT is collecting data though objects that are connected to the network, that way a smart city has a help because these data are useful for example in the smart road network and with the help of GPS. The smart environment with the help of sensors there the capability of close supervision in temperatures, infections etc., also the smart security is being achieved by through the security cameras , smart health with the help of heat sensors that where developed though the corona virus pandemic, the indication for the lack of air that tires in cars may have has as a result to prevent many accidents. The combination of smart cities and the internet of things doesn't stop there and it “spreads” on the smart tourism where QR codes are a huge help because with then scan of the code in a cafeteria,bar etc. the menu can be shown to the customers or at a landmark the scan of the QR can show a video of where the history of the landmark can be explained. Very useful are the apps where through multiple devices mostly smart watches and smartphones for example they can warn when a pulses sensor that a smart watch has can be life saving is many cases because when a user's pulses drop it can call automatically for help. Nowadays the IoT has turned the homes of citizens smart with the help of AI (artificial intelligence) and this AI is connected to the electricity or many electronic devices of an apartment and with a vocal command of the user it can turn on and of the lights or play a certain song. The transportation for a citizen through the city is an every day need and the internet of things is making it smoother with the use of GPS on public transportation services for example in the bus, trolley and subway there constant updates of the citizen for the location of the transportation service they want to take and through the satellites for the drivers for the best road possible etc. The combination of the internet of things has many applies that we cannot apply in this paper because it will need 100 and more pages.

VII. SMART CITIES GLOBALLY

Smart cities are almost on every continent of the world and it is not only an idea any more that will be applied but as we said previously they are the future of the development of the cities as many cities have started to apply many smart ideas with the help of the IoT. Many people may not realize it that they live on an smart city because it is something normal to them. That kind of people may live on these cities:

- Seattle, U.S.A.

A city that has found many smart ideas for the reduce of carbon in the air and also road networks where traffic lights are programmed to work depending to the weather situations and also many security cameras for the police to use.

- Barcelona, Spain

Barcelona is a city that turned on the road network to apply smart ideas such as sensors that make the traffic lights work only when cars are around and also with sensors they collect data for the environment.

- Singapore

Another city that with sensors is trying to solve traffic problems and trying to save energy with smart homes that help with saving electricity and water. Also this city has been called as an Eco-city because of it's low energy. In addition the governance of Singapore wants to put sensors so that they can fix issues with the plan that they have for the city.

VIII. CONCLUSIONS

In this paper we analyzed the term of a smart city and we managed to answer the questions that a citizen could make. We analyzed the idea of Internet of Things and how innovative idea it is and the combination of smart cities and also we gave 3 examples of smart cities in 3 different continents that developed with IoT. We conclude that as the technology is getting more and more advanced the internet of things and the smart cities are getting advanced too because there is a lot of expectations for smart cities in the future. In the future many cities with become smart like Seattle, Barcelona and Singapore.

IX. **ΒΙΒΛΙΟΓΡΑΦΙΚΕΣ ΑΝΑΦΟΡΕΣ**

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