

The Future of Durrës - Smart University & Smart City

PhD. Eng. Alma Stana¹, PhD. Eng. Luciana Toti¹, PhD. Robert Kosova², PhD. Fatmira Prodani¹

¹Department of Information Technology, ²Department of Mathematics.
Faculty of Information Technology, “Aleksander Moisiu” University
Durrës, Albania.

Abstract

The Internet of Things and Smart Cities as recent phenomena have attracted the attention of both the academic world and industry. The present city life has become a difficult challenge to citizens, to city management and performance as a result of urban development. Some of the most critical problems and issues to manage today are; energy, water, education, unemployment, health, urban waste, pollution, traffic, information, etc. Smart cities are expected to address these challenges efficiently by using, among other things, information and communication technologies. Smart cities of today and tomorrow have these characteristics: smart economy, smart governance, smart environment, and smart living. SC and IoT, which have different origins, are closing towards each other to achieve a common goal. IoT has also gained significant development by connecting billions of sensors to the Internet and it is expected to use them as efficient and effective management in Smart Cities. Today, infrastructure, software applications, and platforms are offered as successful services using cloud technologies. In this paper, we will investigate the importance and the utilization of Smart City and how it fits with the Internet of Things. Our goal is to inspect the idea of the smart city in technological, financial, and social points of view and to perceive some significant challenges and issues in our city - Durrës.

Keywords: Smart City, Smart University, IoT, cloud, ICT.

I. THE CONCEPT OF FUTURE AND SMART CITIES

Today, global cities, the hub of economy, innovation and technology provide about 80% of global GDP, (World Bank). By the UN estimates, 70% of people will live in global cities, in 2030. The way these cities will work, manage and operate will always affect the lives of communities and the people. They will influence the local, national and international economies. It is crucial that we understand what we need for our future cities, and manage and make work systems that support our future needs in an effective, sustainable and integrated way. ‘Future cities’ have been mentioned many years from now, as cities around the world have been planned, built and developed.

Some future city visions have been successful and some have failed. ‘Smart cities’ have become the most popular formulation for the future cities. It is becoming a globally recognized term, replacing or co-existing with other terms. The ‘smart city’ has replaced the ‘sustainable and digital city’ as the word of choice of ICT-led urban innovation and as the new model of governance, smart performance and urban citizenship. It is the only English language term to express it, too.

“Smart city” is a term for the cities of the future, for the way they will look and how they will be managed and how they will relate to the people and governments, (Emily Moir, Tim Maonen, Greg Clark, 2014).

The ‘smart cities’ concept has benefited from some of the digital dimensions of connected systems and computing networks. It also includes elements of sustainability, as well as responding to the rise of new internet technology interfaces, (Deakin, 2012). Some observers have pointed out cleverly that “smart” is more politically correct than “sustainability”. Thus, the terms; (‘smart city’, ‘smart growth’, ‘smart development’) are more attractive in countries where there is a large part of public opinion and political power with highly responsible and progressive politics, (RPA World Cities Planning Committee, 2014).

‘Smart cities’ is going to overtake ‘sustainable cities’ as the most commonly used term of today and in the future. Smart Cities typically refers to enhanced city systems which use data and technology to achieve integrated management and interoperability, but can also take on wider meanings to reflect social and political forms of smartness.

II. SMART CITY AND THE CHALLENGES

Cities today compete not only in terms of quality of infrastructure or historic city centers. They also compete in terms of accessibility, quality of life, communication and social services and structures. This has brought about many necessary changes in city planning, creating new strategies such as the Smart City concept.

The distinction between a Smart City and a Digital City is that the Smart City centers around the combination of data and information and on the social and human capital. Many characteristics of Smart City have become part of everyday life in many modern cities; buses start when the next bus is arriving or signs showing where there is traffic jam, etc. The “Smart City” offers many solutions like this; the examples are

encouraging, showing quality and improved services.

Smart Cities are expected to address everyday challenges in an effectively way using information and communication technologies. They create and manage a smart economy, smart people, smart governance, smart mobility, smart environment, and smart living.

II.1 Smart Cities and European innovation Partnership.

The European Commission has taken considerable interest in the smart cities agenda. It started the ‘Smart Cities and European Innovation Partnership’ in 2001, in order to boost the development of smart technologies in partnership with cities and communities, by funding many common projects. In 2013, €365 million of EU funds were used for the use of these sorts of urban technology solutions.

Horizon 2020 is the EU’s new funding program for research and innovation. It has a total “pot” of nearly €80 billion in funds available for over 7 years (2014 to 2020), of which €92.32 million in 2014 and €108.18 million in 2015, are being allocated for smart city projects. Under these EU programs, cities apply for funding for their own ‘lighthouse’ projects.

The World Bank is also involved in the ‘smart city’ space. Its ICT sector collaborates with urban sector staff to make operations smarter, but there has not yet been an adjustment in lending activities to respond to the opportunities or challenges around smart cities. Instead, the bank is involved in preparing local governments themselves to be smarter clients. It is also active in basic transport innovation, such as street lighting to improve traffic flow and electronic citywide systems. It aims to develop a toolkit for cities thinking about e-government holistically so that they can make informed

choices when private sector firms approach them to sell a given system

The OECD also works to develop ICT applications for smart grids, smart sensor networks, and systems in the water and health sectors (OECD, 2014b).

II.2 The challenge of Technology in Smart cities

Technological developments have opened up a new world of possibilities for cities. IT promises greater integration of city services and products than ever before. Different city functions such as health, energy, water, waste, communications, buildings, and transport have the potential to be integrated into networks which optimize their efficiency and outputs. New cities are being built with technology at their core to facilitate the creation of such integrated networks. (In South Korea's Songdo City, for example, technology will connect every component of the city including schools, offices, homes and services. Residents will be able to control their houses, offices and other services remotely. In the city of Rio de Janeiro, IBM has created a central control system which integrates and analyses data from 30 city agencies, including weather forecasts, traffic conditions, and information from the emergency city services) (Cisco, 2014; Singer, 2012). Existing cities are also improving technological services and connecting more objects and services together via the internet in order to boost the efficiency of urban infrastructure. By achieving this connection of objects and services, the 'Internet of Things' has helped the cities to improve their operation and management. As a matter of facts, the cities today are one of the biggest new customers for technology companies.

Mass production of daily data from cities - "big data" - offers new ways for citizens to use and manage their innovations. Mobile technology, "applications", and social media

allow citizens to record complaints, ideas, pictures and suggestions while traveling. City governments and local communities can also use "big data" to understand and understand the behavior and needs of citizens, and to create transparency and accountability by opening their data and statistics about public consumption. With the advancement of technology and datasets, there is also a need for new confidentiality provisions to protect people from wrong data behavior and other challenges. Cities are also faced with challenges in terms of quality, data collection and analysis, especially in terms of aligning data from various sources. Big Data must be reliable, safe, accessible and "can be interpreted" when the city wants to provide significant opportunities and solutions.

An integral part of Smart City Concept is the Smart Grid - a digital network that collects, distributes and interacts with information about energy habits. The power grid is a collaboration between many networks, energy companies and producers. The goal of Smart Grid is to improve the efficiency of energy supply and to harmonize individual households or companies with their use and energy opportunities.

III. THE FIRST MODEL OF A SMART CITY IN GERMANY

Mannheim is the first German Smart City where everyfamily is connected to a smart-energy network.Mannheim, the home of famous Benz Mercedes car, since 1885,it is leading the development of future technologies. As a successful smart city, this German town is currently making a new mark as a new future 'smart' city.

This multicultural city in Southern Germany of 331, 000 inhabitants received a 'New Economy Smart City Award' in 2014 and was featured in the magazine's list of top 20 smart cities. The key criteria were the first-

class infrastructure, its economic power, high quality of life, its rich cultural scene, and its researching projects in the fields of sustainability and smart urban design. The city was rewarded with the German Sustainability Award in 2013.

The “New Economy” Journal has named the University of Mannheim as an important factor of innovation— among other world’s best economic science institutions. The Journal also appreciated the close collaboration between some of the city’s academic institutions such as the Centre for European Economic Research and business companies.

The term ‘smart city’ describes the swift development of future technologies that is taking place in the traditionally cosmopolitan city of Mannheim, through the collaboration of many partners and factors.

Let’s have a look at some developments and characteristics of the smart city of Mannheim.

Energy technology

Germany’s change in energy policy, urged by political and social motives and interests gave renewable energies an important raise. They now account for 30% share of energy production and it is on the rise. The City is also part of the E-Energy project, along with five other regions in Germany.

Another future-orientated project is currently underway in the south of Mannheim. The program makes it possible to store and stagger one’s own use of electricity from decentralized generation sources. A local storage facility takes up subscribers’ current energy production surpluses and releases them when energy requirements are greater than the actual generation. This makes it possible to increase the proportion of self-generated electricity, reducing losses and pressure on the grid. Participants of the project are connected with the storage facility online via an ‘Energy Cloud’.

Participants have always direct access to their own generation and consumption data as well as their electricity account via tablet computers. The project is still running.

Leading the innovation in the urban sector is the PRIMOVE bus. Two electric buses produced by Swiss company Hess have been undergoing tests in real street traffic. The vehicles are the first e- buses equipped with wireless charging technology and a compact and fully integrated propulsion system.

Medical technology

Over the past few years, Universities of Mannheim and Heidelberg have collaborated closely with pharmaceutical companies located in Mannheim. Many research institutions have brought the medical technology business in the city. This level of collaboration and survey has a characteristic profile of powers that is unique in Germany and Europe. The medical Institutions are working in projects for the future of public healthcare. These centers are focused on diseases like cancer, diabetes, circulatory conditions, weight problems and age-related symptoms.

Many projects are focused on the development of medical technology such as neuro-engineering, cell and tissue technology, telemedicine and communication, modelling and simulation, etc.

Another example is the expertise center of Meditech firm. The Fraunhofer Project Group for Automation in Medicine and Biotechnology is located in Mannheim city. It is also home to an experimental operation theatre of the BMBF research program ‘Mannheim Molecular Intervention Environment’.

Climate protection

One of the greatest goals of the city is to further improve the quality of life of the citizens and to extend their leisure relaxation

space within the city. The city is surrounded by kilometers of green space, the green parts of the city are enlarged and improved. Under the 'Blue City Mannheim' project, a modern district for energy efficiency will be developed in the former US settlement, for up to 10,000 inhabitants. Another city's techno-ecological project is the Green Logistic Park. This initiative aims to divert heavy goods traffic away from the city in the medium term of future. However, the urban districts of the city center are also going green, thanks to the work of many active volunteers. The university city of Mannheim is now already green – with two large recreation parks created there.

IV. IoT AND SMART CITY INFRASTRUCTURE

IoT has also achieved great significance by connecting billions of sensors to the Internet. IoT is using them for efficient management and effective resource in Smart Cities.

The Internet of Things solutions work for the city's benefits, they are not limited only to local departments but also to information systems, schools and libraries, health services, power plants, water supply networks, transportation systems, urban waste management, law enforcement, and other community services. The goal of building a smart city is to improve the life of people by using information and technology to improve the efficiency of services and satisfy residents' needs.

ICT permits town officers to act directly with the community and also the town infrastructure and to watch what's happening within the town, how the city is evolving, and how to enable a better quality of life.

ICT is helping to improve the performance of urban services. It is helping to reduce costs and resource consumption and to improving contacts between citizens and government. Smart cities have integrated multiple

information and communication technology (ICT). Smart cities are getting prepared to respond to the challenges that are created with new technologies.

Sectors that are developing sensible town technology include:

- ✓ government services
- ✓ transport and traffic management
- ✓ energy, water, health care
- ✓ innovative urban agriculture
- ✓ waste management, etc.

Major technological, economic and environmental changes have convinced city management to pay greater attention in learning and implementing projects for smart cities. Big cities are facing climate change, economic restructuring, aging populations, urban population growth and pressures from public finances.

The European Union (EU) has devoted constant efforts to plan a method for achieving 'smart' urban growth for its metropolitan city-regions.

The EU has developed a spread of programs underneath 'Europe's Digital Agenda'.

New Internet technologies, by promoting cloud-based services, real-world user interfaces, meters and services, networks of sensors and more accurate communications, have created new ways to collective actions, cooperation's and problem-solving.

In London, a traffic control and management system maximizes the time of green light at street intersections by feeding back magnetometer and inductive loop data to a supercomputer, which can orchestrate traffic lights across town to boost traffic turnout.

The city of Santander in Cantabria, north of Europe, has put 20,000 sensors that connect buildings, infrastructure, transport, networks, and utilities. They offer information for the IoT functions, such as interaction, management protocols, device technologies, identity management, and security. The sensors also monitor the levels of pollution, noise, traffic, and parking.

The Internet of Things (IoT) has also acquired significant attention over the past 10 years. IoT provides data and information for efficient and effective resource management in Smart Cities. Cloud technologies also are offered to help using infrastructure, platforms, and software applications. SC and IoT, which are of different origins, are closing towards each other to achieve the common goal of smart management. We believe that sensing as a service model resides in between these two concepts, together with many other technological and business models. Everything as a service is a category of models introduced with cloud computing. (P.

Banerjee, R. Friedrich, C. Bash, P. Goldsack,). Sensing as a service model is a solution based on IoT infrastructure. It has the ability to address the challenges of Smart City information and management. As a result of having 50 billion things connected to the Internet by 2020, there will be many sensors available that can be used. The sensing also can contribute significantly to address the challenges of the IoT and SC. The sensing as a service model and its applicability is the core of the Internet of Things paradigm. This vision is backed up by a number of projects started around the globe, including FP7 ICT project Open IoT.

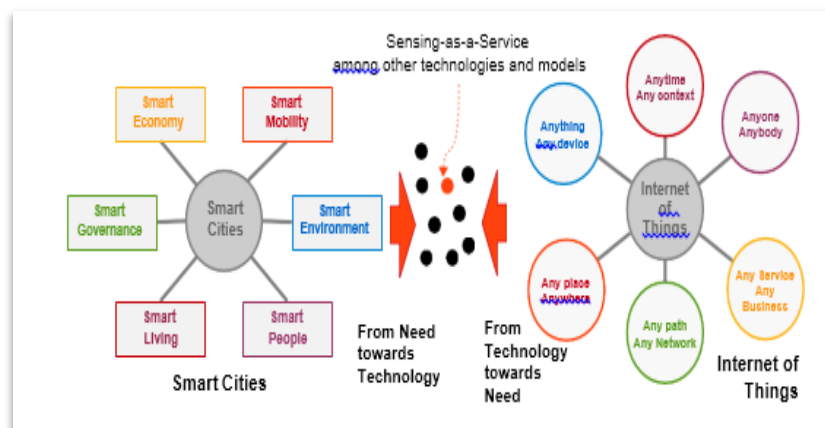


Figure 1. The Relationship among Sensing as a service model, Smart Cities and IoT, (Charith Perera. 2014).

V. THE FUTURE OF DURRËS - SMART UNIVERSITY&SMART CITY.

V. 1. The collaboration between Universities and city government.

‘Smart city’ modules are taught by many disciplines, from geography to engineering, from ICT to art and design. They also appear to be on smart cities universities, for example, the Universities of Arizona, Tel Aviv and Ohio.

Smart Cities are certainly the most frequent area of collaboration between universities

and city governments. For example, the Open University is leading a project to transform its hometown of Milton Keynes into a smart city. The £16 million MK's Smart project will draw together the growing amounts of data generated by the city in a central hub. It will use sources, ranging from satellites to crowdsourcing from social media and applications, analyze the information to find ‘smart solutions’ for managing resources and promoting business growth. Elsewhere, ‘Smart London’ is a Mayoral initiative chaired by Professor David Gann,

Head of Innovation and Entrepreneurship at Imperial College Business School. The project is looking at how London can best use technology and data in order to help the city to remain one of the world's most efficient cities. In Europe, 'Smart Aarhus' is a partnership between the City of Aarhus, the Central Denmark Region, Aarhus University, Alexandra Institute, VIA University College, the Danish Technological Institute, and the company Systematic. Its goal is to develop the city of Aarhus into a Scandinavian model for digital urban development.

In terms of research, academic focus on smart cities can be found in a number of universities: The Future Cities Research Centre at Trinity College, Dublin has a technological or 'smart' city basis, it uses scientific method to find workable ways of integrating technologies and data; The sensible Cities Lab at MIT (Boston, USA) is investigating and evaluating how digital technologies are changing the way of life of the people. The Future Cities Project/Porto Living Lab at the University of Porto, Portugal, is an example of a university carrying out research 'on the ground' in collaboration with a city, through the creation of a living lab which, aims to turn Porto into a smart city with embedded ICT, sensors and wireless platforms.

V.2 Smart Cities - The University courses on future cities

Smart cities have emerged in the last few years as a key focus for university courses in future cities, and tend to be linked to engineering or IT faculties. Many courses are very recently established: the UCL and Dublin City University Smart Cities masters are all being run for the first time in 2014, Cardiff's Eco-Cities and Girona's smart Cities courses both were launched in 2013. Smart city courses run in partnership with mega- corporations are also a new phenomenon, as evidenced by the new

Dublin Smart Cities masters, which is sponsored by IBM (IBM 2013).

A number of think tanks and research institutes have sprung up in recent years which focus predominantly on smart or digital cities. These include the Future Cities Institute (Australia), Sustainable Digital Cities (Australia) and the Fraunhofer Fokus Centre for Smart Cities (Germany). They explore how to create innovation ecosystems for city growth, and generally advocate integrated city systems. The Fraunhofer Fokus Centre works in partnership with business, government and the EU to develop practical, demand-oriented initiatives for application in developed and developing cities. Other think tanks have individual initiatives or research programs on the topic of digital or future cities. For example, The Institute for the Future (USA) has developed a 'forecast map' called 'The Future of Cities, Information and Inclusion' which charts the crossover between urbanization and digitalization. It identifies the harnessing of data as a critical issue for the next decade and beyond (IFTF, 2011).

V.3 The concept of Smart University

Smart University is an emerging and rapidly growing academic area that represents a creative integration of smart technologies, smart services, smart software and hardware systems, smart pedagogy, smart curricula, smart learning and academic analytics, and various branches of computer science and computer engineering. This is the main reason that in June of 2013, a group of enthusiastic and visionary scholars from all over the world had the idea to organize a new professional community event that would provide an excellent opportunity for universities, scholars, Ph.D. students, administrators and practitioners to propose and evaluate innovative ideas and approaches, to develop new systems and technologies, and to discuss outcomes of

researches, case studies and best practices in Smart Education, Smart e-Learning, Smart University and related areas.

The research, design and development topics of our interest in those areas include but are not limited to:

- Conceptual modelling of Smart Education, Smart e-Learning, Smart Universities, Smart Campuses, Smart Analytics;
- Infrastructure, main characteristics, functions and features of Smart Universities, Smart Campuses and Smart Classrooms;
- Smart University-wide software, hardware, security, safety, communication, collaboration and management systems;
- Smart Education and Smart e-Learning strategies, approaches and environments;
- Smart Pedagogy;
- Smart Learning Analytics and Smart Academic Analytics;
- Modelling of Smart Student/Learner and Smart Faculty;
- Assessment and quality assurance in Smart Education and Smart e-Learning;
- Professional development in Smart Education and Smart e-Learning;
- Social, cultural and ethical dimensions and challenges of Smart Education; and
- Educational applications of various innovative smart technologies such as the Internet of Things, cloud computing, ambient intelligence, smart agents, sensors, wireless sensor networks and context awareness technology, and numerous other topics. (Smart Universities - Concepts, Systems, and Technologies - Uskov, V.L., Bakken, J.P., Howlett, R.J., Jain, L.C.)

V. THE FUTURE OF DURRËS - SMART UNIVERSITY&SMART CITY.

Durrës is the second most populous city of the Republic of Albania. The administrative center of Durrës municipality is the town of Durrës. According to data from the National Census in 2011, Durrës city population is 201,110 people. Durrës city is one of largest cities on the Adriatic Sea and ranks 5th with a population of 175,110, in a total area of 338.30 km². The metropolitan area has a population of 265,330 inhabitants.

The Municipal Council of Durrës has approved by the majority voting the ‘General Urban Planning and the City Regulation’.

The municipality has a lot of projects like SUMPORT, TOURISM, ADRIMOB, ADRIACOLD, TURGRATE2, SIMPLE, etc. The ADRIACOLD Project was a part of the IPA Adriatic Cross-Border Cooperation project 2007-2013. Its goal is the saving of energy and the Sources of renewable energy in collaboration with Scientific Park Area in Trieste, Italy.

The University of Durrës, founded in the year 2006, has 20.000 students and six faculties. The Technology of Information Faculty, founded in 2010, is one of the most important Faculties.

As might be expected, academic institutions are contributing to future city discourse in a number of ways:

Running academic courses on future city themes:

Although cities and city systems have not yet emerged as widely recognized distinct academic disciplines, a handful of universities run Masters Courses or offer PhDs specifically on future city topics. These courses are predominantly found in Western Europe, where many universities offer full program courses or modules on future city themes. Education Faculty of the University of Durrës has included this theme into its Master courses.

Research on future city themes:

Some universities run specific (usually interdisciplinary) future city research programs. The City Science Centre Initiative inside the university, for example, has completed researches for urban strategies that can reduce carbon dioxide emissions, pollutions and traffic congestion. All Master Schools of every Faculty in Durrës University can realize this project.

Modelling and visualization of future cities:

Universities are amongst the most advanced ‘modelers’ of future cities. For example, a field leader is The Centre for Advanced Spatial Analysis (CASA) at UCL (London) a specialist department which uses computer-based visualization for city planning, policy and design. Professional Studies Faculty at Durrës University can realize this collaboration.

Tracking City Performance:

Some universities are engaging in monitoring and benchmarking cities’ relative performance and the specific variables which they track in order to reveal their future city priorities. The Livable Cities program – a collaborative project between the Universities of Southampton, Lancaster, Birmingham and UCL – is one example from the UK: the program measures how cities are operating and performing in terms of services, environment and governance. The University of Durrës can organize these specific courses, too, especially in master programs.

Engaging students in future cities through projects, case studies and real challenges:

It is important to note that it is not only at the tertiary level that educational institutions are engaging with future cities. In the United States, a major national competition asked teams of middle school children to imagine the cities of the future. The project was run by discovering, a foundation which aims to sustain and help to grow a dynamic engineering profession. As such, the

emphasis of the competition is on use of computer and tabletop modelling of future cities, and on solving the engineering problems they present. The Technology of Information Faculty at Durrës University can realize this duty.

Direct collaboration with cities, to develop real solutions to urban challenges and design urban futures:

Collaborations in the UK are taking place between Manchester Metropolitan University and the city, and Sheffield City Council and the city’s two universities (in the form of the Sheffield Urban Think Tank) (University of Warwick, 2012). Another project, “Smart Aarhus” is a successful model of cooperation between a Danish City and a University. Faculty of Professional Studies, at Durrës University can realize this kind of collaboration, too.

VI. CONCLUSIONS AND RECOMMENDATIONS

In this paper, we explored the concept of Smart City and how it fits with the Internet of Things. Our objective is to investigate the concept of smart service model in technological, economic, and social perspectives and identify the major open challenges and issues in our city - Durrës.

Durrës is the gate of Albanian tourism, as harbor-city and it can be transformed into a Smart City by an smart and effective urban development vision where multiple information and communication technology are integrated together to secure and manage the city assets such as local information systems, schools and libraries, transportation systems, hospitals, power plants, water supply networks, urban waste management, law enforcement, and other community services.

The goal of Durrës Smart City is to improve quality of life for the citizens by using urban informatics and technology to improve the

efficiency of services and meet residents' needs.

The idea of a Smart Cities can be implemented only through the collaboration between Durrës University and Durrës local government. The common project should emphasize the concept of 'future city' using knowledge of geography, engineering, ICT, and art and urban design and high technology.

Durrës Municipality can learn from the similar experience of the city of Mannheim that is the first of smart cities in Germany. Together, they can implement a common project, funded by EU programs.

Durrës University can contribute in Durrës Future City discourse in a number of ways like running taught courses and research on future city theme, modelling and visualization of future cities, tracking City performance, engaging students through projects, challenges or competitions.

All Faculties in Durrës University and all Master Schools of every Faculty in Durrës University can be engaged to participate and work.

And finally, a close cooperation with the University of Durrës and local companies, port district, IT companies such Crystal System, Tetra solutions will help by offering technology business cluster. This cluster of expertise may produce a unique experience in Albania because Durrës Port is a unique enterprise and a national asset of Albania. To this matter, a large center of expertise for Durrës companies could be set up on the campus of Durrës University.

Durrës University can become a Smart University & City itself, and the home to a new experimental research program "THE FUTURE OF DURRËS - SMART UNIVERSITY & SMART CITY".

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