

## Proposed Framework of Smart City for Gawadar, Balochistan Pakistan

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### Abstract

Due to immense advancement in the field of technology, major portion of human's life become dependent on it. Through implementation of information and communication technologies in every field of life, things are getting easier, faster and more reliable. This paper aims to study the very challenging and innovative concept of such advancement known as Smart City (major elements of city are linked with information and communication technology) and its feasibility as well as implementation in Pakistan precisely at Gawadar Port. In proposed Smart city, smart homes, environmental sensors, vehicle networking, surveillance is dimension connected, monitored and controlled by centralized control room. This research is descriptive in nature and in the light of literature; researcher tries to check the feasibility of Proposed Smart City Model at Gawadar Port. Findings of research claims that development of Smart City at Gawadar Port highly feasible and profitable because Gawadar Port is an international route for sea trade as well as CPEC project make that location is more attractive in terms of investment. Moreover, this project is started in private-public partnership by Pakistan Government in collaboration with China.

This project introduces new dimensions of easiness, security, mobilization in human lives as well as brings drastic change in policy making, decision styles and profitability of Government. Limitation of this research is that limited work is available on Smart city concept especially in Pakistan perspective as well as population of Pakistan has low literacy of this concept.

**Keywords:** Smart city; Gawadar port; CPEC; Smart home; Environmental sensors; Vehicle networking; Surveillance

### Introduction

Overnight technology advancement and innovation not only make the world a global village but also introduces many new amazing concepts. Smart City is also one of the innovative concepts of information and communication technology. As men's personal life is facing unpredictable changes due to such advancement in field of technology, desire to involve that technology in every dimension of life i.e., personal life, social life, economy planning, construction, transportation, hospitality industry, parliamentary decision making etc. becomes more fasten. According Harrison work in 2011, to revolutionize the above mentioned fields through latest innovations of information and communication technology, Smart City concept has emerged since 2005. Big giants of information and communication technology industry like Cisco, IBM, and HP etc. analyzed that desire and started work on Smart city project. Definition of Smart city proposed by Cisco is, "developing precise and measurable solution from emerging innovations in communication and information technology which enhances the quality of life, efficiency and cut the regulatory/operational cost. Hatem Bin Sta work suggested that cities regulated by information and communication technologies are more efficient and cost effective in their infrastructure; living as well as utilization of scarce resources is also maximum. First smart city proposed by Cisco was in Dubai and Government, Health Care, Knowledge as well as Media were the perspectives of that smart city upgraded and regulated by information and communication technologies.

From work of Chourabi et al. [1] and Deakin [2] another definition as well as purpose of smart city is deduced as, "investment of capital on information and communication technologies to enhance the quality of living, workability and sustain that quality in urban settlement to achieve desired goals in long run." Smart city covers the different dimensions and proposed solutions as well as assist the Government/ local body for policy making. While Smart city proposed by IBM provided innovative solutions for building, security, energy conservation, public safety, traffic control and water management. Another smart

city project titled SimCity project in which major focused dimensions to be controlled and regulated was transportation system of a city of Libson. It was a project initiated with collaboration of University of Minho, University of Coimbra, Massachusetts Institute of Technology along with IBM and Energias de Portugal-EDP. Through this project; not only transportation element while energy grids, building get controlled by technology and assist people and Government in decision making. Researcher defines Smart City as, "capitalization on information and communication technologies in order to engraved the latest innovations in home designing and construction, transportation system, environment protection, health and education sector, water and sewerage management, energy conservation, pollution dumping, traffic control etc. to improve living standards and strengthen the decision making of Local/ Government Body."

Gawadar port in Pakistan is the world largest international route of sea trade. China Pak Economic Corridor (CPEC) is a China Government collaboration project to develop the Gawadar port and investment done on network of roads, railway lines and wireless network connection to strengthen the trade and exchange of information. This vast network not only connects these two countries but also open the ways of trading among linked countries. So, Gawadar port is highly attractive and profitable investment opportunity for both of local and foreign investors. If smart city project initiated there it will broader the vision of Government, investors. The core purpose of this research is to inspect the monetary and non-monetary

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feasibility of development of smart city at Gawadar port comprised of smart home, environmental sensors, vehicle network and surveillance system connected with information and communication technologies at control room. As well as explore how the usage of Information and communication technologies in these dimensions of a city enhances the living standards and security of people, planning and policy making by Government.

## Literature Review

Smart city is defined as; “whole parameters and issues related to each parameter of a city is controlled, monitored and solved through usage of information and communication technology and brought flexibility, precision, cost effectiveness in allocation of limited resource to enhance quality of living environment and security.” According to research of Caragliu et al. [3] a city is called smart when capitalization on modern infrastructure along with traditional one is done along with active as well as foresighted allocation of resources with collaboration of Government to attain sustainable growth in economy, profitability and standards of living. While Kanter and Litow [4] further claimed that if small smart cities are developed and these cities are connected internally and externally via latest information and communication technologies then it will enhance community collaboration and development. Communities of interlinked smarter cities can play effective role in decision making, facing any contingency due to availability of rich information via shared internet. In smart cities and smart homes, things, elements and people are connected with control rooms through wireless network and sensors.

Through sensors, data is collected, scanned at control room and immediate actions are taken in case of urgency. In smart homes, level of CO can be measured, number of people in rooms and outside the rooms can be diagnose via crowd sensors [5]. Temperature sensors, wireless visitors alerts and control of electricity consumption through sensors connected with control room via wireless internet are possible.

These days damage of ozone layer due to human activities is very critical issue and major area of concern is how to control and reduce the influence of human activities on environment. According to research of Seidl et al. [6] industrial or mining untreated toxic waste water not only the reason of environmental degradation but human activities i.e. Garbage dumping at open places, untreated drainage of bathrooms etc. major reactants. So, negative influence of human activities can be monitored through wireless sensor networks. Smart city is also argued as green city and has target to minimize the bad influence on environment and it will be controlled via different ways such as development of and maintenance of zero energy buildings [7]. If Government wants to develop a highly socio-economic status conscious city then must focus on green impact of that technology. According to work of Escolar and Cellucci [8], traffic lamps, road lamps activity can be controlled by sensors. Surveillance system used to monitor security of city and defined as: “continuous monitoring of activities.” Gutwirth [9] proposed surveillance definition as: “A society is smart in respect of surveillance means every activity watched by CCTV cameras with a digital record.” When data related to each activity happening in a city is available to security and Government then such information can be used in more effective way to make people’s life more secured. Technological advancement revolutionized the surveillance system i.e. use of algorithm analysis with CCTV cameras not only reduce manual monitoring, continuous automatic screening of hundred videos and directing attention to suspicious activities as well as keeping non-critical data in database. Infrared

and microwave sensors compliment the CCTV applications. Medical sensors installed at home (e.g., smart toilets), as well as fine-grained and real time infrastructural sensing for utilities such as power, water and gas, will provide the basis for advanced data mining applications that can infer occupancy, movements and even individual activities inside buildings [10]. According to a UK home office study, “the best current evidence suggests CCTV reduces crime to a small degree [11]. Limited and unplanned parking lots cause of many other problems such as traffic jam, vehicle damage, traffic breaching, accidents etc. To overcome such issues, concept of smart parking has introduced initially in Japan, Europe and United Kingdom since 1970. Optical wireless sensor network can be used to monitor and control the vehicle traffic [12]. Shaheen, Rodier and Eaken [13] described few features of smart parking system are tracking of vehicle from entrance, guidance about nearest and feasible parking lot, assistance during parking to prevent from any damage, control of vehicle theft, reduction in traffic control staff etc. to attain above mentioned characteristics, parking guideline information system can be installed in vehicles as well as automated systems can be used.

## Proposed smart city model

From literature, it is concluded that a city is considered smart when every element of that city is connected and upgraded with information and communication technologies. Researcher is proposing such smart city concept in surrounding of Gawadar port and reason to choose that area for development of Smart city is CPEC. CPEC makes that area commercialized and Gawadar port is hub of foreign sea trade in Pakistan. So, if this project started in partnership with china, it will not only strengthen the relations and roots of trade with China but also attract the foreign investment. In proposed Smart city project, Smart homes, surveillance systems, vehicle tracking network, wireless communication system and environmental sensors are initial dimensions that will be connected with control room via wired as well as wireless network connectivity. In Smart homes, security cameras will be affixed at the entrance of every home, along the roads, parks and shopping malls to monitor visitors and any other suspicious activity. These cameras will be connected to control room via Fiber Optic Cable as well as through wireless internet. Fire alarms, room temperature sensors, emergency automated hidden fountains will be implanted and connected with control room to control and provide immediate voice and physical support. Visitor’s alert system will connect homes to main entrance gates and security office as well as control room through Fiber Optic Cable. Information about visitors will be provided to relevant home as visitor get clearance from main entrance. In such way, homes, residents and visitors feel more comfort and secured.

In surveillance system, security cameras both fix and pan-tilt-zoom cameras (PTZ cameras) along with temperature sensors will be installed at parks, clubs, shopping malls, along the roads, fix cameras at home entrances, Auto Focus cameras with face recognition at main gates, along the boundary walls and connected to control room. ICT based Vehicle tracking system will be installed at entrance gates and the record of all the vehicles will be maintained at the entrance and exit times. Micro sensors will be installed in the registered vehicles of the smart city and these sensors are multipurpose i.e. tracking, communication with control room. In case of accident/theft, auto lock, auto parking etc. and connected through wireless network with control room. Moreover, through such sensors traffic flow, navigation guidelines, spare parking slots information and traffic jam issue can be easily resolved by direct connection with drivers. It will provide voice guideline in case of wrong parking pattern as well as parking at wrong

place. If vehicle met with any accident or parts failure, an immediate backup will be provided by regulatory authority sitting in control room. Environment sensors will be placed on automated lamp poles around the roads. These sensors will measure temperature, humidity level, wind flow, air pressure, and garbage dumping activities etc. All these sensors will connect with control room and few installed at malls and parks. In control room, relevant staff will observe each element and take corrective measures to overcome the contingencies. All these elements of smart city will be connected with control room and control further connected with local authority that will assist them in planning and decision making as well they can keep eye on every activity of smart city. In order to increase the redundancy of the system, proper power backup availability to all this system so that any sort of mishaps and disturbances may be tackled well in time. The surveillance, IP telephony, sensors data, vehicles data will be stored on cloud so that data corruption, theft and data loss chances may be minimized. In this smart city the technical teams will be available on 24/7 basis, working in different shifts. Quick decision will be taken on regular basis by the duty in charge in the best interest of the public and the policy making decisions will be taken by higher ups.

## Discussion and Conclusion

According Pardo and Nam [14], smart city is organic collaboration of human, institutional and technological components of a society while Schaffers et al. claimed it as a multidisciplinary interconnected concept while Volano [15] defined it as; "efficient utilization of city technology along with citizens intelligence to develop a modern city." From literature review, it is explored that investment in technology upgrading and embedding that upgrading in every dimension of a city either it is social life of citizens, government decision and planning process, education system or transportation control etc. to make an idle living environment is known as smart city." Different giants from the of information and communication technology offered developed different smart cities i.e. in New York, smart water, building, transportation management offered in a smart city by IBM while a smart city model was presented by Siemens in Germany. But in all these models latest information and communication technologies adapted to govern economy, environment, governance, mobility, citizens living, education, resource allocation etc. Due to the use of IC technologies in decision making, regulating a city, planning by continuous flow of even minor information enhances the living standards, security, economy development, growth and profitability of a developing economy. And if such project initiated at highly attractive in respect of investment, trade base point like Gawadar port in Pakistan, such concept will pick high popularity, market acceptance and put the country on the track of rapid growth and incorporating international living standards. But starting such mega project without international financing is not feasible at initial stage. So due to high collaboration of China in economy development of Pakistan via CPEC and very fast friendship, it will be an attractive opportunity to offer partnership to China in order to start smart city project at Gawadar port. Pakistan internet system is single lane system due to which failure of network means link down of whole system with no backup. China is highly advance in technology and if smart city is started with China collaboration then such failures can be controlled and establishment of smart city will become possible.

## Limitation

Limitation of this research is that limited network connectivity as in Pakistan only the major internet service provided by Fiber Optic Cable under sea water by Etisalat working with PTCL under Pakistan

Telecommunication Authority, United Arab Emirates. If it is damaged then the whole internet connectivity of the country is suffered badly. So, for smart city it is very necessary that with cooperation of China another Fiber Optic Cable should be laid with CPEC project for redundancy of internet connectivity so that the smart city security and services may be maintained in the real sense. Secondly, in Pakistan imported optical fiber is used for networking. Thirdly, population of Pakistan has low literacy of technology advancement and innovations. Last but not least, lack of facts and figures related to smart city models.

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