A knowledge Smart City in the Middle of the Desert: Al-Madinah Al-Munawarah
Saudi Arabia As An Example

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Paper submitted to IGU Urban Commission
Annual Meeting Held at Dortmund-Germany
August 21-26 2012

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ABSTRACT

A Knowledge-Smart City in the Middle of the Desert: Almadina Almunawarah as an Example

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Almadina Almunawara, Saudi Arabia is the holy traditional ancient city for more than 2000 years of vibrant history. Prophet Mohammed (PBUH) migrated to Almadina 1400 years ago from Mecca in obedience of Almighty God clear order, revealed to him to go to this unique spot of Almadina to start lunching and spreading his holy mission of new religion of Islam. Within few years the Prophet succeeded to transform Almadina to become one of the most prominent Capital City State in the world, which provided for long time- super example and model capital for political, economic, social, planning and religion world wide.

Since then, Almadinah became known as: "knowledge City"-the other face of what is called recently: "Smart and Intelligent City"- where substantial literature, information, and data in many fields and disciplines been accumulated, and several schools of thinking were developed, new international relationships been established, mutual agreements been signed, and translation activities between languages and cultures were taking place between and among many parts of the world.

This paper argue that the modern concept of smart( intelligent-knowledge) city is not really a new one, but rather is deeply rooted in the history of mankind, and even in the middle of the desert.

To further sharpen the paper argument-and on theoretical side-the paper attempt to clarify the definition of smart city. In order to remove and reduce the fuzziness of the label: "smart city", attempt is made to classify smart cities into three categories throughout designing qualitative and quantitative measurable index.

Additionally, the major optimum characteristics of smart city been outlined and been considered as bench mark criteria to be gauged against the urban challenges that Almadina facing at present.

This may prove to be quite helpful for Almadina in order to restore its urban vitality and boost its universal cultural role.

Key Words: Almadina, , Prophet Mohamed, Smart City, Knowledge City
(I) Introduction:

A: Entry Facts

(1) The 21st century is the century of cities.

(2) Urban Population in the Cities will reach 75% of the total world population by year 2025.

Figure-1: Growth of Urban Population until 2030

Source: UN World Urbanization Prospects, 2010

(3) 50% of total GNP will be based on knowledge economy.

(4) Post-industrial society is known by knowledge city.

(5) The largest urbanization process is taking place at present after almost 40 thousand years of the appearance of human race.

(6) 21st century is knowledge century or can be called learning century.

(7) The value that is connected to knowledge, is the pushing forceful power toward the progress, and this is new trend in Human History.

(8) Great importance of the economy which is based on knowledge become universal global fact.
(9) Human global urbanism (Urbanization) and emerging knowledge society:
   a : Represents a Complex sophisticated fact or reality.
   b: Proved the limitation of traditional and rigid techniques of urban development social values.
   c: led to formation of most sophisticated complex phenomena which is facing the human mankind and most decisive challenge for his future development.

(10) Knowledge cities phenomena is emerging discipline, growing very fast worldwide:
   * Electronic references in the field.
   * Academic and Scientific societies and organization.
   * knowledgecities.com
   * Periodicals.

(11) Knowledge City Field:
   * Pre-model (not optimum)
   * No collective agreement on its theoretical and methodological framework.
   * Build itself on emerging new specialization not familiar with or common.
     1. Between urban studies + planning and knowledge-management
     2. Based upon history, humanities, geography, biology, sociology, economics.
   * In general the contribution of geographers in this new field is not much world-wide.

(12) Urban performance currently depend not only on the city's endowment of hard infrastructure (physical Capital) but increasingly though on availability and
quality of knowledge, communication and social infrastructure (intellectual and Social Capital).

(13) The later form of capital is decisive for urban competitiveness.

(14) It is against this background that the concept of smart city has been introduced as strategic device to encompasses modern urban production factors in a common framework and to highlight the growing importance of information and communication technology (ICT), social environment capital, in profiling the competitiveness of cities.

(15) The significance of these two assets social and environmental capital, itself goes a long way to distinguish smart cities from their more technology-laden counterparts, drawing a clear line between them and what goes under the name of either digital intelligent cities.

B. Definition

(1) Smart cities can be identified along six axes or dimensions:

Figure 2: Interactive Axes or dimensions of the Smart City
(2) A city can be identified as "Smart" when investments in human and social capital and traditional (Transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life with a wise management of natural resources, through participatory governance.

(3) Smart city possess self-ability to encounter threats.

(4) Group of peninsula and societies which modernization innovation and regional process meet with digital world application of information society.

(5) Insuring that society, community enjoy (ITC) services).

(6) Provide growth related industries in the future.

(7) Create infrastructure in ITC to become competitive.

(8) Knowledge city: which encourage, nourish, and taking care of knowledge..

(9) Next stage in the urbanization process.

(10) Knowledge city: city aims at development based on knowledge, rejuvenation throughout encouraging the innovation, association evaluation and modernization.

(11) Called knowledge city when environment encourage, allow, bring up intensive and continuous, rich diversified and sophisticated knowledge moment (The Model of Knowledge Moment to be explained latter).

(12) Smart community is a geographic area ranging in size from neighborhood to a multi-county region whose residents, organization and governing institutions are using information technology to transform their region in significant ever fundamental usages.

(13) Similar related format (Definitions – Names) for smart cities:

- The creative city.
- Digital city.
- Knowledge city.
- Mesh cities.
• Spatial intelligence of cities.
• Knowledge economy.
• Knowledge spillover.
• Sustainable urban infrastructure.
• Future cities
• Tomorrow cities.

(II) Theoretical Backgrounds:

A. Rise of Smart Communities:

Already communities and nations around the globe often without being consciously aware of it, are starting to sketch out the first draft of the cyber-places of the 21st century.

**Singapore**: has launched its IT 2000 initiative, also known as the: "Intelligent Island Plan".

**Japan**: is building an electronic future urban plan called: "Technopolis, or Teletopia".

**France**: as early as 1976 initiated a plan called: "Telematique" an aggressive effort to place personal computers on every desktop and in every home in the country.

**U.S.A**: Several years ago, the former Clinton Administration persuade vigorous "National Information Initiative", or "NI" one of whose early goals was to link every school and every school aged child to the internet by year 2000.

The German Model for Smart City:

![Fig. (3) Determination of the main urban system as relevant drivers for sustainable](image)
Other communities:

• **Stockholm, Seattle, Sacramento:**
  Have constructed large scale access networks that residents can use to obtain information about government, community events and critical social services like disaster preparedness, child abuse, presentation and literacy education.

• **University town of Blacksburg, Virginia:**
  Has transformed into electronic village in which majority of the town business and residence are connected to the local data network.

• **San Diego counties:** as a result of its city of the future project; are building even more sophisticated electronic infrastructure that one day soon will allow a wide variety of local government, business and institutional transactions.

• **State of California:**
  Couple of years ago lunched a statewide smart communities program which has been managed by: *"International Center for Communication"* at San Diego State University. More recently a *"World Foundation"* was established to help other communities around the world with their struggle to get on the global information highway.

**B. Characteristics of Smart Lands (City):**

1. Smart Land are designed by communities.
2. Environmentally sensitive and responsible.
3. Capable of creating competitiveness advantages.
4. Committed to social cohesion and development.
5. Have effective structure for governance.
6. Strong relationship with the surrounding.
7. Committed to innovations.
8. Connection to city network.
C. Knowledge Recipe for support of city knowledge and intellectual Power:

(1) Attracting (Pulling) factors for intellectuals.
(2) Geographical political location.
(3) Dynamics within the city, and existing of communication network between the city and its neighbours and gathering places.
(4) Connectivity of the city and its good logistic flow.
(5) Cooperative nature of the city and its ability to produce values and support for health and human quality of life.
(6) Social creativity and innovation of the people of the city and their interests and activities.
(7) The cultural wealth of the city and its compactness and value insurance.
(8) The intensity of the events in the city which supports it existence.
(9) Wealth formation.
(10) Security and peace.

D. Knowledge Moments Model:

(1) Human experience either simultaneously or planned for or accumulated.
(2) In it, discovery, creating, support, exchange, and transforming the knowledge to a new form.
(3) There is a cycle of four poles for knowledge transform

![Knowledge City Diagram](source: Carillo 2006)
(III) Almadinah Almunwarah as a Lab for the Study:

A. The Holy City of Madinah (Historical Knowledge Background):

(1) Al-Madinah Al-Munawarah is in the western province in the Kingdom of Saudi Arabia. Madinah, which lies 447 kilometers north of the Holy City of Makkah, is the second holiest city in Islam.

(2) It was to Madinah, that the Prophet Muhammad, peace be upon him and his followers, departed in 622 AD when faced by the hostility and persecution of the Makkan merchants.

(3) The citizens of Madinah asked the prophet to live amongst them and to arbitrate in their affairs [an invitation taken to mean their rejection of polytheism and submission to the will of the one God, (Allah)].

(4) It was then in Madinah that the Islamic era began. Madinah is then the city of the Prophet. As the place in which the Holy Qur'an was compiled and from which the Prophet's companions administered the affairs of the Muslim community, it was the seat of the first Islamic state.

(5) From Madinah, armies, spreading the word of the Prophet were dispatched to Egypt, Persia and Syria. Networks of international and national communications resulted in intensive political and social relationships.

(6) Madinah is also the place in which the Prophet, peace be upon him is buried.

(7) After prophet Mohamed passed away, Madinah continued to be enlighten center for cultural, commercial activities, knowledge, schools of thinking, new values, and ethics.

(8) As a result the whole world learned about Islam, east and west and Almadinah became second to none knowledge city.
B. Current Situation in Al-Madinah Al-Munawarah:

(1) Realization of Saudi leaders and policy makers:

(a) Toward becoming competitive knowledge based economies.

(b) Becoming an "intelligent city" presents the community with opportunities to develop its full potential on local and global scales.

(c) The key issue here is:" how best to create an intelligent city or community"?, and how Almadinah restores its historical and cultural role as knowledge intelligent smart city?.

(2) The Holy city of Al-Madinah has taken important steps to join in leading the growing national interest in transforming the nation's leading cities into intelligent cities.

(3) First step:

(a) Needed infrastructure:

* Fixed broadband.
* Fiber optics.
* Wireless technologies.
* Conversion and integration.

(b) Experts point of view:

* Start with a top of the line broadband infrastructure.
* Debate on how to deploy such infrastructure.
* Do communities invest in fixed lines and fiber optics or wireless alternatives, or both?

(C) Deliberations will include e-government, safety control system and security applications, intelligent city management applications, and most importantly is how to develop a large...
community of users with ICT skills. While the availability of the needed broadband infrastructure is the central issue for the needed transformation. It is also important to address the required application to improve city services to residents and guests, boost productivity, enhance global communications, and provide state-of-the-art emergency response and disaster mitigation applications.

(4) Second Step:

Intelligent buildings and homes must be developed with the city infrastructure for effective utilization of the broadband guide.

(a) The broadband network in the community empowers the development of the solutions and applications. It targets the habitats, buildings, facilities and homes that utilize the grid to allow them to communicate with any part of the globe expediently and inexpensively, as well as provide certain services within the confines of the building, facility or home.

(b) Applications for intelligent towers, buildings, and large developments. Towers, large buildings and large communities require certain applications to make them intelligent buildings. A light should be shed on technologies, including systems for: security and safety system, access control, energy management, HVAC, communications, cable and digital satellite, data and networking, structural monitoring, maintenance operations and management, convergence and integration solutions, and specialized resident services.

(c) Intelligent home applications should be identified… A true appreciation of the intelligent aspects of the community or the large development are truly felt by a user at the level of the individual home. At this level the user can have a habitat intelligently wired to allow for data distribution and computer networks, multifunction telephone system, audio in every room, access, security and camera
systems, monitoring children areas, HVAC controls, light control, home theater, curtains and shades control, using mobile and/or remote control.

(5) Third Step: Intelligent Applications Responsive to Its Unique Characteristics:

Intelligent applications for Holy Madinah have to be responsive to its unique characteristics and need, security, safety control, emergency and disasters mitigation.

Holy Madinah is not just another city that aspires to transform itself into an intelligent city with intelligent buildings, homes and users. This alone would offer enough of a challenge, but holy Madina is one of the world's most important and unique cities. In this regard the transformation to an international standard intelligent city requires addressing the needs of the Moslem pilgrims and visitors from around the world, before, during, and after their visit.

(a) Pilgrims pre-arrival applications for the pilgrims and visitors...

Pilgrims and visitors from around the world need information prior to arrival, about the places they will stay, and visit and about the logistic arrangements that will be in place once they arrive. A powerful broad band infrastructure can allow for the development of a variety of useful applications in this regard, including virtual tours, and enhanced communications with city officials and service providers. Information on the latest traffic routes, last minute updates, and health advisories can easily be disseminated around the world to the subscribing pilgrim community and their local service providers.

(b) Pilgrims services while visiting the holy city..

Few city officials around the world need to meet the kind of logistic, security and life safety demands created by millions of seasonal visitors that descend on the city in a very short time period. The pilgrims need a accommodations, meals, information and communication channels, and various modes of transportation. A combination of the latest technologies that integrate fixed and wireless broadband networks, fixed and mobile GIS and GPS applications, and user friendly information and communications points can
greatly enhance the visitors experience, and the city's objective of quality services to the visitors of the Holy cities. Mobile GIS-GPS emergency response and management systems, RFID, real-time traffic management and re-routing, real-time stress points monitoring and mitigation, can all be enhanced by intelligent applications operating over an intelligent broad band grid.

(C) Pilgrim Services after their visit:

The world has changed. with the advent of abundant and inexpensive travel options, and the kingdom's policy of facilitating religious tourism, faithful Moslems from around the world no longer aspire to a single visit in a life time… but multiple visits and Umra performance. Staying informed and updated on un-crowded periods when they can return with their families is a growing international interest.

(D) Building intelligent towers and communities suitable for one of the most expensive real estate areas in the world:

Holy Madinah is undergoing a massive urban renewal and redevelopment. The city features some of the most expensive real estate. The cost of one SQM can be over $80,000. The intelligent towers and communities being developed on such prime expectation of the owners. They have the right to demand real value and sophisticated properties for their investment. These properties need to offer intelligent security and access control, intelligent HVAC, lighting, and energy management, latest data and communications. Networks, and latest technologies in high value asset intelligent structural monitoring.
C: Knowledge Economic City: Smart Knowledge City On the Ground

Figure (5) ALmadinah Almunawarah Key Sites at Present

Source: Google Earth, With Modification (DCM,2010)
Fig. (6) The Exact Location of Al-Madinah Knowledge Economic City East of Al-Madinah (The Green Area Bounded by Red Color).

Source: Knowledge Economic City, Almadinah Almunawarah, (H.D.)
Fig. (7) Sample of Proposed Intelligent Smart Buildings will be Carried Out in Knowledge Economic City of Almadinah.

Source: Knowledge Economic City, Almadinah Almunawarah, (H.D.)
Fig. (8) General View of the Expected Proposed Smart Community within the Knowledge Economic City of Almadinah.

Source: Knowledge Economic City, Almadinah Almunawarah, (H.D.)
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