

Resilience, growth, and GCC smart cities

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If we go back to the origins, when the first concept of “smart” popped up in the common culture, it was an acronym related to the marketing industry: SMART (Specific, Measurable, Attainable, Relevant, Time-based). That is how we all became smart. In the same years, the smart city concept was developed from the technology industry worldwide, including the GCC-countries, around the first 2000s.

The Geographic Information System (GIS) technology was already in place dating back to the 1960 and was mainly used on cartography. Its first desktop product came to the market in the 1990 as a mapping tool for geographers. Its further applications transformed Computer-aided design (CAD) into a geospatial tool on workstation platforms for infrastructure and utility design, called interactive CAD system, Intergraph Graphics Design System (IGDS). Its implication on the urban field increased through mapping and linking data to maps, thanks to space time mapping, and scaling a 2D vision of the city plan up to mapping and documenting. At the beginning, technology was used to link infrastructure. It became intensively used in traffic, infrastructural assets, live interaction with smart systems. The Saudi economic boom began in the mid-1970 and followed in the 1980 from others GCC countries. King Khalid International Airport in Riyadh was completed in 1982, while Dubai still used a basic airstrip for its aviation connectivity. The Burj Khalifa in Dubai (1990-99) marked a new era, and in the same years, the first GIS courses were established in the UAE universities ([Yagoub, 2019](#)).

Among the first governmental application in GCC, it is worth mentioning the Al-Riyadh Development Authority (ADA), known today as the Royal Commission for Riyadh City (RCRC), establishing in 1983 the Urban Information System (UIS), using the most advanced technology at the time of Intergraph using Micro Station platforms, to support the rapidly expanding urban footprint in coordinating infrastructure provision. In the UAE, the Al Ain Municipality established the first GIS sector in 1995. Municipalities began using a comprehensive GIS in 2001 following the establishment of special units to coordinate the basic digital maps in conjunction with approved building plans. This objective became especially important in 2005 when the GIS Centre was in charge of a three-phase plan by the Riyadh Municipality (2008). The three-phase plan strives to maintain an updated databases map and build applications for all municipal departments. At the same time, this GIS Centre expects to create studies that will aid the decision-making process, augmented through applications for an organized urban development ([Al-Azmi, 2012](#)).

However, the data collection and transfer were still on an analogic base. A parallel development was the advertising and software, algorithms, location. Linear progress, by analogic feeding, offering application for individuals came finding the way and public transport and services, and progressively many assets like sensors for selected instructions, especially in environmental counting, traffic flow control of the highways. The smart city concept was still purely technology-oriented; it was a topic for the big tech companies, as Oracle, Cisco, and SAP, during the launching of the economic cities in GCC. A divide between technology and the city made an urban development language needed, embedded with technology driving companies like EISRI to the front of the line in providing such solutions. And from them, several new terminologies are used in the smart city concept, e.g., ubiquitous city, wired city, knowledge city, digital city; all basing the planning processes on Information and Communications Technology (ICT) for efficiency. Meanwhile, very little literature emphasizes the importance of human centering and resilience in the smart city discourse.

Interesting research ([Arafah and Winarso, 2017](#)) classified the steps of smart city progression within the years, from the 2000 Smart City as a Digital City, mainly based on technologies and hard infrastructure systems, through the 2005 Smart City as a socially inclusive system of soft infrastructure and the people-oriented having as keywords: social and human capital, knowledge, inclusion, and participation; toward

the 2010 Smart City as a city with a focus on the high quality of life. The path is the same we can notice in the GCC, embracing now extensive e-government facilities and Quality of Life programs. The GCC ranks among the top Arab smart communities (Abu Dhabi #1, Dubai #2, Riyadh #3), and respectively #28, #29, and #30 worldwide ([Smart City Index 2021](#)).

The big step into soft infrastructures and participation came from smartphones, social media, and e-commerce, a multitude of ecosystems and platforms, moving out of the city's jurisdiction, however still related to geography, and making the exchanges time based instead of geographically based. And, as in any other environment, smart platforms can generate protective outcomes and, in some cases, the contrary. That's why it would be more appropriate today to talk about digital enabling cities instead of smart cities and shift the focus to be a human-centric approach. The digital enabling environment would allow for a more sensible and accessible lifestyle, keeping us linked to the community, reducing environmental impact and unnecessary travels, and allowing for more compact cities and highly focused communities, leading to more economic agglomerations to be formed physically and virtually. Surely a digitally enabled environment would enhance and fit well into a circular economy, making the city's productivity and accessibility to markets, and expand the urban boundaries into digital exosystemic environments. Individuals can have a career based on an internet location, making the proximity to the physical markets less important. If supported by an efficient supply chain system, the addressable market is no longer measured by distance and catchment area but by how digitally one is enabled to access the much wider global virtual markets. In addition, algorithms could help possible research scenarios for smart growth, which means resilient growth and urban structure.

On the other hand, we must acknowledge that, nowadays, the huge tendency on applications defining our eligibility for access to places, - as happened during the pandemic with the use of health apps that check your vacation statues for example - have made the divide even clearly impactful, demonstrating how, without a smartphone, some portions of society are left behind. The risk of an extremely digitalized community, is that also good technology solutions might have a negative impact, unintentionally, by excluding not updated people from market-access leaving them behind. Another aspect is that the improving digital enhancement in the industry and daily life is taking over low-skill jobs, and - with it - low-skilled workers are pushed aside. In terms of the smart economy, it should be calculated, what is the comprehensive social impact of this technology, and how can everyone, inclusively, benefit from it? Finally, cybersecurity is another major challenge. How fair will the governments play in protecting the privacy of all citizens without compromising it with possible misuse by private companies and their threatening in abusing personal freedom?

Last but not least, the emphasis on ICT is not making clear that cyberspace is not a replacement for the physicality of the city and its public space. So, the urge now is to apply GIS technology to manage and solve real problems. The real-time monitoring adopted by smart city management can help create a more resilient city. Monitors in cities that provide data on a range of phenomena such as water leakage from pipes, flooding of roads, pollution, traffic buildup, and increased heat and drought conditions are vital to properly assessing climate change consequences in cities. A smart city would also involve an improved risk management system ([Arafah et al., 2018](#)). Also, the concept of resilience has evolved. It moved from an Engineering Resilience Bounce-back to a pre-existing equilibrium state, through an Ecological Resilience Bounce-forth in a new equilibrium state, finally reaching a Resilience of Socio-Ecological System (SES) and its capacity to adapt or transform ([Arafah and Winarso, 2017](#)). SES Resilience clarifies that ICT is an exceptional tool requiring sensitive and knowledgeable intelligence to offer the best contribution to the city and its citizens. Quality of life, inclusivity, and safety are important elements of a resilient community.

We might say that resilience needs a shift from a smart city to a smart design concept for not losing the city's beauty: how are we smart in allocating resources or conforming buildings to location and site? A smart design of cities must be conforming to the physical and social nature of the place, coexisting instead of forcing it, to an economic model from an architecture background into the economy of the settlement. The main GCC cities, growing too fast and with almost no economic and spatial boundary, have been extreme in applying settlement design no longer following the nature and making buildings depending on cooling and air conditioning. For 1000 years, the same communities were building within the natural confinements of the environment, occupying a proper space within the water flows of the vally in a desert environment; there was no space for abstract buildings. The focus was on increasing the benefit from land and water resources, and developing the most resilient urban structures, responding to the social and economic needs.

So, the question about the city might be: could smart digitally-enabled settlements be more resilient by helping in managing the resources efficiently and reducing peak times? How are the cities utilizing modern or advanced technology in information and communication for integrated infrastructure, utilities, and urban systems? How is the community benefitting from using information and communication technology in terms of awareness and intelligence, well-being, participation, effectiveness, and competitiveness of the city's community? How is it finally using information and communication technology as a means to obtain high quality of life and improve environmental quality?

Nowadays, GCC governments are fully implementing the ESE resilience of their communities. They extensively use ICT on emergency, fire prevention, police mobile technology, and mapping weather risks on public safety operations. On urban and network management, on full e-governance by managing school analytical and demographic data, asset management, and improvement/expansion planning. Economic development departments use interactive GIS mapping tools, aggregated with other data (demographics, labor force, business, industry, talent) and a database of available commercial sites and buildings to attract investment and support existing business.

Smart design seems to be one of the missing ingredients in the highly advanced GCC capitals, the last shift to fully resilient and inclusive communities, as they always have been.

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