#IoT #BigData #BlockchainTokens #Mobility #ICT #Operation #DataAnalytics #AI #Ecology #Knowledgecity #CidadedoConhecimento #Planetandpeoplematter

The technologic challenges on the Knowledge City

Imagine a place where **nature, people, and companies are synchronized and in synergy**, assuring that naturally and transparently, every single action is impacting our lives and our environment positively.

Imagine a place where **you feel comfortable wherever you are**: at home, at the office, walking in the street or taking a coffee, during your transport, or reading a book in a garden close to you.

Imagine a city where **all residents and visitors are teachers, guardians, and enablers of the environment**, acting naturally, keeping these values for themselves, their family, friends, and colleagues.

The vision of the Knowledge City is to bring to life all we imagined without significant effort or enforcement. This vision is coming to life very soon.

The Technologic Challenge

The challenge of technology for the Knowledge City is **enabling all imagination to support the maintenance of our processes seamlessly.** Things that have a person dedicated to helping is removing an essential brain from doing something that no technology can do (for now), think.

Good technology should be invisible. Usually, you do not notice that it's been there, but your phone works all the time, your elevator still takes you between floors, the traffic lights are there to ensure no accidents, and the gardens are beautiful. These and hundreds of other services are technology-enabled.

Additional challenges enabled by the technology are **security to assure your data and privacy are guaranteed**, reliability as these services need to run continuously, and efficiency as a specific technology needs to be there on time to be effective. Usually, when one of these conditions is defective, you start noticing the technology (or lack of it).

Intervention vectors

The diversity of intervention areas is tremendous. The possible technologic synergies require a close adjustment for the need and purpose of the Knowledge City, its inhabitants, and visitors with the **comparable technology enablement and integration done by a multidisciplinary team.**

To simplify the architecture, we organized the challenges and use cases we are working on vectors that we describe herein, some of them in a high-level way and a non-importance order as all are required:

Infrastructures

Infrastructures vectors are structural as all cities need to connect all their components (buildings, pieces of equipment, roads and paths, electricity, gardens, you name it). More than the cabling or the conduits to guide the cables, **the challenge is related to the**

infrastructure planning and change management, the access control to technical rooms, and the shared services like field support.

The technology part of this vector is related to the ITSM (IT Service Management) **tools and processes to assure the Configuration Management Database** (CMDB), providing one updated vision of what exists and secure the proper Impact management of the changes and interventions all over the Knowledge City.

The second part of this technological challenge is related to **infrastructure access control, and environment monitoring, and proactive actions to mitigate problems in technical rooms with active equipment** (network, servers, etc.). Handling the data collection, **we use IoT devices designed to collect data and store it in a data lake repository**. Other devices worked as remote actuators to execute maintenance actions after analyzing the condition of the collected events.

Mobility and Energy

At a very early stage of the Knowledge City design, one of the activities is the **mobility design, merging information from the different traffic origins and destinations**, the flow of this traffic planning, the number of vehicles, pedestrians, bicycles, etc. flowing through the city. **The modulation is made initially (before construction) with an extensive set of data assumptions.** The challenge is to collect live data from sensors or specific cameras in the street, sidewalks, etc., that identifies the type of vehicle (or person), the speed, the flow, etc., and stores all this data in the Data lake. This data, shared via APIs (Application Programming Interfaces) into the simulation and predictability model, validating the initial assumptions. **The accurate results are registered as KPIs** (Key Performance Indicators) that, with the accurate live simulation results, are constantly challenged and, with proper alarmistic, adjusted in the case of field intervention needed.

The field of Energy covers a wide range of challenges. First, the management of consumption having the data of all the mobility and residential smart meterings, second by the assured delivery of the necessary energy. **Having self-consumption using solar panels, eolic generators, and many other sources requires a network of efficient measurement devices**, a stable data lake to store all the data. Last and not less important, the information system to support the planning, seamless production vs. distribution, and all the countability and charging.

Public Spaces

The ecological concerns are the basis of all worries about the environment, our descendant's inheritance, with improving environmental footprint.

Technology usage is widely adopted to measure and maintain green spaces anticipating adverse conditions like frost and activating mitigation actions to keep the gardens beautiful.

Another challenge is to **keep our comfort in public spaces.** Imagine you are seated talking with friends or reading in a central square in a dry and hot day condition. After some time, this becomes particularly uncomfortable. One solution is building a wall using 3D printer technology. This wall allows the introduction of water in its structure. We blow an air breeze to go throughout this wall and keep the environment with the necessary humidity and freshness to make us feel great.

Once more, with technology, from the different sensors, going to the algorithms that receive this data and decide the ideal conditions, to the actuators to open the water and the low speed/noise solar-powered fans and the decision to introduce some specific smell to improve even more the experience.

Ecological Network

Growing and actively cultivating environmental protection, using Websites, Mobile Applications, informational charts, live video streams inside beehives, or bird nests are widespread technologies to adopt.

Replication nature in our building processes, use the same materials as Nature to develop our equipment, and share nature´s secrets to everyone.

The technology, in these cases, will enable us to use a 3D printer to print public spaces pieces of equipment with **Nature materials and Artificial Intelligence** to help modulate the same patterns found in nature when printing materials.

Traditional Vectors

We found most of the traditional vectors common in all companies, usually represented by:

- The Operations monitoring the ecosystem and acting (proactively/reactively) to requests, events, and evolution trends;
- The Software Management team with all the agile delivery methodologies translating strategic business goals into operational value-driven solutions;
- The ICT Management with the critical mission of keeping all clouds, data centers, communication, etc., constantly running despite all the changes happening all the time;
- The Data Management team is continuously improving data quality. It is supercritical. We need to trust entirely on all collected data to be used and build the necessary information system this using information from all the vectors above and the rest of the company;
- The City Management, Marketing, Communication, and Sales using dashboards supported by analytics, ERPs solutions to control administrative activities (Financial, RH, etc.), CRMs solutions help customer interactions and knowledge.

Conclusions

For the sake of simplicity, I did not enter too much into the technology implementation, keeping the description of what technology used to enable the challenge solution. In most cases, we shared the same technology in different vectors, changing little things. One example is the IoT device that, in some cases, is very specific, like the ones used to measure the water flow to anticipate flood conditions; others are widespread and frequently used like thermometers or humidity sensors.

Same way as having the right people in the team, assuring data on time and with the maximum quality possible is critical to all vectors. Trustful data to build information and decide better.

After all of these technological challenges, the only true challenge is building this city for people. Technology is a tool to achieve our vision faster.

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