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Smart Cities and New Technology Trends

State of the art and perspectives

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***Abstract*—** Smart cities are becoming the trend in strategic and technological planning in the modern world to qualify a city as a smart city, we should overcome several challenges in other words, it's an equation of heterogeneous settings and parameters for a concrete outcome which is improving the quality of life for citizens in mobility and access to services in their entourage.
The components of the "smart city" equation are multiple and are essentially urban and environmental coupled with technological and social governance, our goal is to draw up an action plan highlighting the state of the art of the technological and social components in terms of:

- Technology: big data, Internet of Things.
- User Motivation: gamification.

This article discusses the architectural part of the smart city from a perspective based on the foundation of good technological practices and technical users loyalty in their interaction with the city. This work is a first step for a future study on the mobility of citizens and mechanisms that motivate their movements.

Keywords*—Smart City; Big data; Internet of things; Gamification; smart cities; Cloud computing.*

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I. INTRODUCTION

The concept of smart city is the consolidation of several existing or newly modelled components with the aim of levelling at one or more constraints. The smart city is based on the principle of the physical city and digital one[1] these two principles coupled with new technological trends (cloud computing, Big data, internet of things) generate social wealth and allows a dephasing of the (top-down) model where the minority of policymakers of the city had the prospects and developments of the city into a model (bottom - up) where the fundamental element of the society is the 'people' and participates in the production of wealth and environment switching from the passive status to active. The 4P vision [2]is a model of smart city that has proved its excellence in several countries and will be implemented in Morocco: Casablanca [3]as the first smart city in Africa.

Figure 1 4P Schema

SMART CITIES INITIATIVES **ACROSS** THE WORLD

Québec,Canada	Snow cleaning Management Project: Sensor System inter-city network: connecting with major cities of the province of Quebec Open Data Initiative Online transport control system
Friedrichshafen,Allemagne	GPS distress signal, emergency, people can send a signal by touching their mobile phone mobile clinic interactive system allows remote monitoring of patients with chronic heart disease Smart Metering provides customers with information on their electricity and gas consumption. Service for deaf people to access a language interpretation service signs, using videos on their phones
Seattle, USA	Intelligent draining system and wastewater rain monitoring program review of the electronic system city map Implementation of the Smart Grid

II. BIG DATA AND THE TECHNOLOGICAL WAVES

Nowadays, the socio-technical evolution of the human action has enabled the direct or indirect discovery of new patterns of management, connection and data visualization.

This progress has been marked by several milestones [4] in the modern chronology of technologies and social sciences.

A. Internet

The first wave that resulted in this development is the advent of the internet in the early 1990s, this tool already had a panel of good practices by a secret use by the US army before his public release, internet laid the technological pillars of what we live and will live in the future, an architectural meta model.

B. Social networks

Having established the topology and the technological basis, a new player has emerged in the IT world, social networks helped to a phase shift that was essential, the transition from a model that connected machines to a connection between humans that has led to a complexity greater than the binary model between machines.

C. Mobile

The internet and social networks have allowed the passage from business computing to personal computing "consumerization"[5], this appellation has given birth to a peripheral revolution through mobile devices. A new horizon of use has emerged, each user had his own machine 24/24 h giving more room to an advanced interaction.

D. Cloud Computing

New interactions implies new needs, the challenges that faced IT players in the world was purely physical and were concentrated on the layer of data storage, where the advent of cloud computing, this technology gave the possibility of abstraction over the hardware constraints and gave a virtual dimension to the storage[6], despite the problems of security and integrity cloud computing has grown in maturity and good practice throughout the previous years.

E. Interenet of things

The union of the previous technology waves resulted in a considerable wave from the intensive use of previous technologies[7], the internet of things is the result of years of evolution and sharing of a community connected worldwide.

III. BIG DATA

The fact that it is the long-term trend in the IT world, reducing Big data to an unique definition is hard, part of experts define the big data by its Vs and their evolutions.

3V, to the 5v...:

The 3V express how Big Data represents the advent of technologies that enable a new approach with the data. Big Data is treated previously, consequently higher than those processed data volumes with an undeniable speed, all by integrating a variety of a much more significant data[8].

To these 3V is added to the value V and that of truth[9], that define the need for reliable, relevant and meaningful data to give enough sense and economic interest to the analyses and thus a thoughtful and thorough decision support.

Big data can be defined along three axes: attribution / comparison / architecture [10]

F. By Attribution

We detail the meaning of each V to identify needs and constraints that led to a technology as big data to see the day.

G. By Comparison

Big data is compared to the old management models and data processing; this comparison mark the point of evolution[11]from business intelligence to the big data.

H. Architecture

Big data is presented as a complete IT architecture[12] which consists of several layers and components.

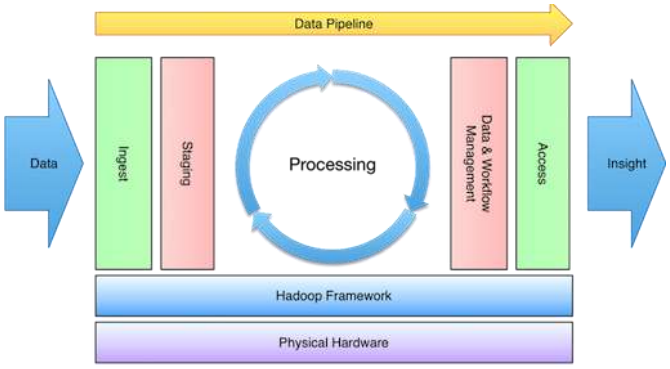

Figure 2 : Big Data Architecture

IV. INTERNET OF THINGS

As each new trend, the internet of things barely have a unique definition, this concept is seen as a set of different technologies and social areas[13]what will bring us to define from the need for a system so that it is called: system of connected objects or the internet of things.

I. Interconnection

The first feature comes from the appellation, a link[14]is necessary between the objects to establish a baseline of work.

J. Objet-internet connection

The other side of the connection depends on the constant access to internet.

K. Unique Identity

The objects in this architecture must have a unique identity[15]to ensure operability and erroneous identification with the concept of zero tolerance

L. Availability

One of the key to a system of connected objects feature is the omnipresence[16]of the network in time and space, the system should adhere to a principle of globality.

M. Capture

The components of an IoT system must have sensors[17], this criterion is essential and defines the beginning of a dimension of intelligence among the object.

N. Intelligence Integrated

Objects by their intelligence[14]and dynamic, produce an extensible behavior to the body and human brain.

O. Communication interopérability

Based on good practice protocols of communications in the previous two decades, the internet of things[7]uses these standards and guarantee a solid communication.

P. Auto-configuration

the heterogeneity of the objects[18]requires the latter to self-management in terms of hardware and software resources, this component covers mainly in supply and intelligent detection management.

Q. Programmaton

Objects must refer to a programming[19]sparkling user behaviour, so commands can make changes without physical interaction as a generic example intelligent lamps that light up and turn off automatically by detecting the movement.

As synthesis to the concept of the internet of things is a system: connected and interconnected, uniquely identifiable, highly available, interoperable, intelligent and auto-configure open to the programming of the capabilities of its sensors.

Figure 3 : IOT vision

V. GAMIFICATION

The gamification is designed to implement elements from the mechanics of the games on non-playable contexts[20], this will identify more human-machine interaction and retain users to spend more time on the interfaces which means more data users and subsequently a consistent layer of granularity to understand the users needs and motivations.

R. History

The experience started in the field of marketing in 1982, a new method[21] to analyze the behavior of consumers has emerged as an alternative to the classical model. Unlike the traditional approach, the experience is interested in emotional and subjective consumer reactions and experience that individuals are likely to live.

Testing has evolved over time in 1998, passing to offer products and services to consumers, to provide an experience full[22].Since that time the priority of specialists focused on improving the consumer experience.

S. Playful dimension

The use of games in non-playable contexts has become trivial[23], [24]the theory is based on the result obtained from the experience of the players, as long as the games gave a look of pleasure to the user so the same logic applied in a non-playable context should provide the same result of playfulness[25].

T. Components

The concept of the gamification was represented by the MDA model[26]«Mechanics, dynamic, aesthetic»

Mechanics: a grouping of functional elements acting on the conceptual level[27]to guide the action of users.

- Dynamics:represents the interaction of users with the mechanics of the system at a time between user and the interface or users between them.
- Aesthetics: this phase is the result and the feeling generated by the user through its interaction with the two previous components.

VI. PROPOSED SCENARIO

Unlike the classical architecture with smart cities, we offer an advanced architecture that will expand the spectrum of acquisition-storage-analysis-visualization with the Big data - Internet of things couple, as well as involvement accentuated the citizen through the mechanisms of motivation and loyalty guaranteed by the gamification while enjoying good practices of the previous architectures of intelligent cities.

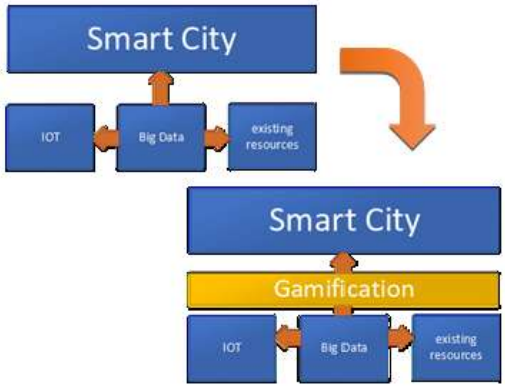

Figure 4 : Architectures existing / proposed

VII. CONCLUSION AND PERSPECTIVES

In this article we detailed in the form of a State of the art several paradigms that will constitute the basis for modelling a smart city, joining the technological and social facets to achieve a desired result which will be the objects next researches.

A choice of application will be made on a key area of the smart cities to highlight the contribution of the model proposed in this paper.

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