Smart Cities: A salad bowl of Citizens, ICT and Environment

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ABSTRACT
Smart City is a fuzzy concept, not well defined in theoretical researches nor in empirical projects. Several definitions, different from each other, have been proposed. However, all agree on the fact that a smart city is an urban space that tends to improve the daily life (work, school,...) of its citizens (broadly defined). This is an improvement from different points of view: social, political, economic, governmental,... Although Smart Cities are based on Information and Communication Technologies (ICT), people (with their knowledge, habits, experiences, culture and behaviour) remain at the heart of concerns.

In this paper, we are interested in the centrality of citizens (i.e. in the heart of the city) and ICT in their environment. This bring us to take into account the tacit knowledge brought by citizens and explicitable knowledge through ICT. We then introduce the difference between data, information and knowledge. Then we present the concept of Information and Knowledge System (IKS) and its distinction with Digital Information System (DIS). And we highlight the role of ICTs in the DIS and their impact to improve the smartness of the city. Finally, we propose a recipe taking account of all these ingredients and relate them.

INTRODUCTION
Since the early 90s, the development of Internet and communication technologies has facilitated the generation of initiatives to create opportunities for communication and information sharing by local authorities. This phenomenon appeared in the United States then moved to Europe and Asia. Indeed, in our everyday life, we are more and more invaded by data and information. This flow of data and information is often the result of Information and Communication Technologies (ICT). Moreover, potentialities of ICT, that have almost exponentially increased, have given rise to a huge mass of data to treat (Batty, 2013). The world is becoming increasingly digital and people are affected by these changes. The city should be closer to its citizens (Bettencourt, 2013).

Today’s world faces two important growths: urbanization and information technologies which mean that digital infrastructure infers an information environment that is “as imperceptible to us as water is to a fish” (McLuhan and Gordon, 2011).

As pointed out by Lima (2011), “The complexity of connectedness of modern times requires new tools of analysis and exploration, but above all it demands a new way of thinking. It demands a pluralistic understanding of the world that is able to envision the widen structural plan and at the same time examine the intricate mesh of connections among its smallest elements. It ultimately calls for a holistic systems approach; it calls for network thinking.”
There exists a kind of parallelism between technologies and humans. On one hand, people use technologies more and more and are hyper-connected, and, on the other hand, (numeric) systems are more and more user-centered (Viitanen & Kingston, 2014). Thus, within cities, systems have to adapt to hyper-connected citizens, in a very particular environment, the one of cities in constant evolution where systems and humans are nested.

The advent of new technologies also confronts the city to a large influx of data (Big Data) from heterogeneous sources, including social networks. It is also important to note that much information and/or knowledge flow between different people (with different uses and backgrounds) and between different stakeholders (Kennedy, 2012). In this respect, the city sees that numerous data circulate via the internet, wireless communication, mobile phones,…

Being “smart” is a challenge increasingly important for many cities or communities. This is of particular interest in the domain of ICT; and for such systems where there are economic, social, and other issues. Giffinger et al. (2007) propose a ranking of 70 European medium-sized cities by using 6 characteristics. In fact, for Giffinger et al. (2007), “A Smart City is a city well performing in a forward-looking way in these six characteristics, built on the “smart” combination of endowments and activities of self-deciseve, independent and aware citizens. […] Each characteristic is therefore defined by a number of factors. Furthermore, each factor is described by a number of indicators. […] Finally 33 factors were chosen to describe the 6 characteristics”: Smart economy (competitiveness, including innovation, entrepreneurship, trademarks, productivity, flexibility, international embeddedness and ability to transform), smart governance (participation, including participation in decision-making, public and social services, transparent governance, and political strategies and perspectives), smart environment (natural resources, including attractiveness of natural conditions, pollution, environmental protection and sustainable resource management), smart people (social and human capital, including level of qualification, affinity to lifelong learning, social and ethnic plurality, flexibility, creativity, cosmopolitanism/open mindedness and participation in public life), smart mobility (transport and ICT, including local accessibility, inter-national accessibility, availability of ICT-infrastructure, sustainable, innovative and safe transport systems), smart living (quality of life, including cultural facilities, health conditions, individual safety, housing quality, education facilities, touristic attractiveness and social cohesion). These six characteristics and factors form the framework for the indicators and assessment a city’s performance as smart city. The indicators that “describe the factors of a smart city are derived from public and freely available data” (Giffinger et al., 2007).

However, it is important to remark that smart cities are multi-level stakeholders. It is difficult to give an exhaustive list of stakeholders involved, for example, local communities, citizens, local governments, environment, culture, non-governmental organizations, ICT,…

The definition of a smart city is indispensable to define its perimeter and to understand which initiatives can be considered smart and which cannot. Moreover, a standard definition is also the first step for each city to specify its own vision of a smart city strategy. The definition and the comprehensive smart city framework are the necessary basis on which to build the smart city goals system. AlAwadhi and Scholl (2013) indicate that the definition of smart city change depending on the practitioners, that is why a huge number of (different) definition exists. In this paper, according to Caragliu, et al. (2009), we consider that Cities are smart:

“when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance”.

It is also important to note that many information and/or knowledge flow between different people (with different uses and background …) and between different stakeholders.
The city sees that numerous data circulate via internet, wireless communication, mobile phones,… Generating as much data requires adequate tools. For example, Kennedy (2012) indicates that Big Data can be seen as a proxy for the city where “infomass” intersects with a “biomass” (Mitchell, 1999).

Faced with these rapid changes resulting from the globalization of markets, the liberalizing of the economy and the impact of ICT, many organizations have become aware of the value of non-material capital, and more especially of their intellectual capital. In the new economy that is taking place, the range of autonomy of action is increasing for more and more individuals, whatever their hierarchical levels and roles: they are placed in situations that need to take decisions. By analogy, for a city all citizens become knowledge-citizen, especially whose knowledge is the crucial factor enabling them to improve their decision-making processes. Knowledge could be valuable is ultimately to make better decisions and actions taken on the basis of knowledge (Grundstein et al, 2003; Simon, 1969).

The paper is organized as follow: we present the related work about, tacit and explicit knowledge, Data-Information-Knowledge, and the link between smart cities and information system. Then we propose, by analogy with a salad’s recipe with ingredients and dressing, what are the recipe, ingredients and the vinaigrette of a smart city.

RELATED WORK
In this section, we detail some works realized on smart cities, tacit and explicit knowledge and Information systems. Remember that we are in a multi-organizational and multi-stakeholder context. To the best of our knowledge, there does not exist researches in such a context. That is why, we based our reflexion on researches realized in enterprise context, i.e. mono-organizational but sometimes multi-stakeholder.

Tacit and explicit knowledge
We suggest an approach to Digital Information Systems (DIS) centred on the Information and Knowledge of people, in order to improve decision-making processes and enhance the value-added of business processes of the city. Information and Communication Technology (ICT) is an indispensable part of our modern World. The worldwide economies are becoming increasingly dependent on technology, that technology makes possible and society demands are expanding in size, complexity, distribution and importance.

ICT allows people situated outside a city, to communicate with others people and to exchange knowledge. These observations concerning knowledge in the city context highlights the importance of tacit knowledge. It points out the interest in creating a favourable climate for both the exchange and sharing of tacit knowledge and its transformation into explicit knowledge and in thus extending the field of knowledge which will come under the rules and regulations governing industrial property. Moreover, we should emphasize the fact that capitalizing on city’s knowledge is an ongoing issue, omnipresent in everyone’s activities, which specifically should have an increasing impact on management functions of the city.

The company's knowledge consists of tangible elements (databases, procedures, drawings, models, algorithms, documents used for analysing and synthesizing data) and intangible elements (people's abilities, professional knack, “trade secrets”, “routines” - unwritten rules of individual and collective behaviour patterns (Nelson and Winter, 1982) -, knowledge of the company's history and decision-making contexts, knowledge of the company environment (clients, competitors, technologies, influential socio-economic factors)) (Grundstein et al., 2003). They characterize a company capability to design, produce, sell, and support its products and services. They are representative of the company's experience and
culture (Davenport and Prusak, 1998). They constitute and produce the added-value of its organizational and production business processes.

Tangible elements are “explicit knowledge”. Heterogeneous, incomplete or redundant, they are often marked by the circumstances under which knowledge was created. They do not express the unwritten rules of those who formalized knowledge, the “unspoken words”. They are stored and disseminated in archives, cabinets, and databases.

Intangible elements are “tacit knowledge”. Acquired through practice, they are adaptable to the situations. Explicitable or non-explicitable, they are often transmitted by implicit collective apprenticeship or by a master-apprentice relationship. They are stored and disseminated in archives, cabinets, and databases.

Here we are referring to the knowledge classification of Polanyi (1967). He classifies the human knowledge into two categories: tacit knowledge and explicit knowledge. “Tacit knowledge is personal, context-specific, and therefore hard to formalize and communicate. Explicit or ‘codified’ knowledge, on the other hand, refers to knowledge that is transmittable in formal, systematic language” (Polanyi, 1967, p.301). Our point of view can be found in the work of Nonaka and Takeuchi (1995), with reference to Polanyi (1967), considering that “tacit knowledge and explicit knowledge are not totally separated but mutually complementary entities” (Nonaka and Takeuchi, 1995, p.61). For Nonaka and Takeuchi (1995), explicit knowledge can be easily expressed in written documents but is less likely to result in major decisions than tacit knowledge, which is to say that the decision process stems from knowledge acquired through experience, albeit difficult to express in words.

These observations concerning knowledge in the company context highlight the importance of tacit knowledge. They point out the interest in taking into account tacit knowledge in decision process.

By analogy, in smart cities context and more generally, in cities context, there exist tacit knowledge and explicit knowledge.

**Data, Information and Knowledge**

Many people associate terms Knowledge Management (KM) and Information System (IS) with some kind of technological terms. It is very often reduced to simple IT-based systems, which offer basic functionality to share the documents and informations among the employees of the company. It is based on a wrong assumption that knowledge can be gathered and managed in the same manner as informations - processed, transferred and stored. Knowledge can be very often mistaken with information. What is the difference then? In the following, we will present the difference between concept of data, information and knowledge. Finally, we will present the empirical model of DITEK process which presents the transformations between them and its formalization.

Numerous authors analysed the notions of data, information and knowledge. Let us quote notably Polanyi (1967), Tsuchiya (1993), Newell et al. (2000), and Walsham (2001).

Besides, Wilson (2002) makes the following synthesis: “The developing practice of knowledge management has seen two different approaches to definition; one arises from information management and sees knowledge as some higher-level order of information, often expressed as a triangle progressing from data, through information and knowledge, to the apex of wisdom. Knowledge here is seen as a thing or entity that can be managed and distributed through advanced use of technology... The second approach sees the problem from a sociological basis. These definitions see knowledge as a human capability to act” (Wilson, 2002).

The dominant positivism approach of KM is implicit in the DIKW (Data-Information-Knowledge-Wisdom) hierarchy model. This model induced numerous computers and information researches. For
example, Polanyi (1958) revisiting the DIKW hierarchy by examining the articulation of the hierarchy in a number of widely read textbooks in information systems and knowledge management preferably published in 2003 and later, noted that “there is a consensus that data, information and knowledge are to be defined in terms of one another, although data and information can both act as inputs to knowledge; the tangle of concepts can be explored at two levels – the relationship between data and information, and the relationship between information and knowledge” (Polanyi, 1958) and she raised the question: “Is there a sharp divide between data, information and knowledge, or do they lie on a continuum with different levels of meaning, structure and actionability occurring at different levels?” (Polanyi, 1958).

In fact, we think that, beyond all these studies, we have to position our thoughts in the contextual field where the notion of data, information, and knowledge are used: in our case, the field of enterprises and more generally organizations. That leads to conceive how the transformation process should be, constructing the empirical model DITEK, which is described below.

From data to information, and tacit and explicit knowledge: the DITEK process model

Relying to the theories and assumptions set out above, we elaborated a model that attempt to describe the transformation process from data to information, and from information to tacit and explicit knowledge. This model, called DITEK process model (Nonaka and Takeuchi, 1995), describes at a first level the relationship between data and information, and at a second level the relationship between information, and tacit and explicit knowledge. Contrary to the idea of continuum between the concepts of data, information, and knowledge induced by the DIKW hierarchical model, DITEK process model shows a discontinuity between these concepts. In DITEK model, by analogy with mental model (Dermott, 1999), we highlight the function of interpretative framework as a filter that provides the mechanism through which data aggregated in a new information are filtered and processed by individual’s tacit knowledge.

1) The first level: from data to information: At a first level, we have to consider the relationship between data and information. This level must be thought as a basic process where data are discrete raw elements perceived, gathered, and filtered by a person before to be aggregated, supplemented, and organized into information. Let’s describe the transformation process (see Figure 1 below).

![Figure 1. DITEK process model level 1: From data... to information](image-url)
At time $T_0$, a sender $P_1$ is acting in specific context and situation. $P_1$ possesses pre-existing interpretative frameworks, previous tacit knowledge, and intentions. In an information creation phase, $P_1$, has direct access to a set of data outside himself. Then, $P_1$ according to a sense-reading process – that depends of his pre-existing interpretative frameworks activated depending of his context, his situation, and his intentions, filters some of these data that take sense for him. At the same time, a sense-giving process using $P_1$’s previous tacit knowledge enables $P_1$ to aggregate, supplement and organize selected data into information $I(P_1,T_0)$. Once created this information becomes a static object independent from $P_1$, and time. It is this information that is passed-on by the individuals or by means of the Digital Information System (DIS) where it is stored, treated and transmitted as a stream of digital data. During this process, $P_1$’s pre-existing interpretative frameworks are not changing; previous tacit knowledge can be reorganized and modified into new tacit knowledge. 2) The second level: from information to tacit and explicit knowledge: At a second level, we have to consider the relationship between information, and tacit and explicit knowledge.

This level is in rupture with the first one, it presupposes that information already exists whatever are time and context in which it was created. Let’s describe the transformation process (see Figure 2 below).

![Figure 2. DITEK process model level 2: From information... to tacit and explicit knowledge](image)

At time $T_n$, a later stage of the first level process, when $P_2$ perceives the information $I(P_1,T_0)$ during a reception, self-reflection and observation phase, this information is captured by $P_2$, who is in different context and situation than $P_1$ who elaborates it. $P_2$ has his own intentions. Then, $P_2$ according to a sense-reading process interprets this information, filtering data through his pre-existing interpretative frameworks activated depending of his context, his situation, and his intentions. At the same time, a sense-giving process that uses $P_2$’s previous knowledge operates, and engenders new tacit knowledge. That’s the way that changes $P_2$’s pre-existing interpretative frameworks, and enriches $P_2$’s previous tacit knowledge enabling $P_2$ to understand his situation, identify a problem, find a solution, decide, and act.
The results of this process are modified interpretative frameworks, and new tacit knowledge. The process of transformation of information into tacit knowledge is a process of construction of knowledge.

Created knowledge, can be very different from one individual to another when the commensurability of their interpretative frameworks is small, whatever are the causes of it. There are large risks that the same information takes different senses for each of them, and consequently generates a construction of different tacit knowledge in the head of the decision process stakeholders. Unlike the information, knowledge is dynamic. Once constructed it cannot be considered as an object independent from the individual who built it, or the individual who appropriates it to make a decision and to act. Later on, at time T_{n+1}, when P_2 as a sender communicates with a receiver P_3, during a tacit knowledge articulation phase, a sense-giving process enables P_2 to articulate a part of his new tacit knowledge into explicit knowledge that is no more than information I(P_2,T_{n+1}) for P_3.

As a result one can understand the importance to clearly distinguish static factual information, which allows describing the context and the situation that raise a problem, from the cognitive process engendered by the interpretative frameworks and the tacit knowledge possesses by the individual who processes this information to learn and get knowledge he needs to carry out his tasks. Consequently, paraphrasing Chua and Brennan (2004) if technology provides the possibility of making information available across time and space, we always have to keep in mind the role of individual in the knowledge sharing process, but we do also pay attention to how individual uses technology to share knowledge. Our approach of KM induces to consider tacit and explicit knowledge as the outcome of a sense-giving process that involves people engaged in actions. It mainly depends of the economic and strategic, organizational, sociocultural, and technological, contexts.

In Smart City context, Kennedy (2012) proposes to use the difference between data, information and knowledge by using the Data-Information-Knowledge (DIK) continuum (Luca et al., 2010) to transform data into knowledge for data visualisation.

From our point of view, tacit knowledge is per se linked to persons. To the extent that citizens are central in our approach, we introduced the concept of knowledge-citizen since, for us, the citizens are bearers of tacit knowledge.

**Information and Knowledge System and Digital Information System**

In this section, we will present the Information and Knowledge System (IKS) concept (Figure 3) and the Digital Information System (DIS).

Many authors have already defined the concept of Information System, for example let’s quote the following definitions:

- “An Information System is an organized set of resources: material, software, employees, data, procedures, in order to acquire, to process, to store, to disseminate information (data, documents, image, sound, etc.) in organization”, translated from (Reix, 2000).
- “An Information System is the set of all elements that contribute to the process and the circulation of informations in an organization (data base, software, procedures, documents) including Information Technology”, translated from (Educnet, 2006).
- “Technically, we can define an Information System as a set of elements interconnected which collect (or recover), process, store and disseminate information in order to support decision and process control in organization” (Laudon, 2000).
- “Information System is an organized set of technological and human resources which aim is to enhance the activities of the organization”, translated from (Nurcam et al., 2006).
For us, the information system is composed of two dimensions.

- Organizational dimension: human and tools who can collect, process, store and disseminate information in order to support decision and process control.
- Technical dimension: artificial object, an artefact, human made. The DIS which collects, processes, stores and disseminates information and knowledge in order to support decision and process control.

The concept of IKS takes into account the potentialities of the Information and Communication Technologies (ICTs).

For us, ICT is included into the perimeter of Information System, ICT is a part of Information System (see Figure 4) and, ICT is, de facto, a part of the DIS.
Information and Knowledge Systems (IKS) are supported by Digital Information Systems (DIS). DIS is source and support for decision and monitoring process. DIS structures and induces new organization's process. DIS has new functions. These new functions generate new uses and new behaviours very different from the analyses requirement at the beginning of the design process.

According to the design, models and technical tools used when DIS are implemented, this phenomena is a factor which induce organizational innovations. In that case, value-adding processes are creating and modified, in the sense of Porter (1979). These evolutions generate new problems and needs. On one side, the understanding and the resolution of problems induce the construction of new knowledge and on the other side; the new needs induce the design of new functionalities. The IKS must take into account these evolutions.

The Value-added processes
Value-added processes represent the organizational context for which knowledge is essential factors of performance. It is in this context that is implanted a KM initiative. As pointed out by Tonchia and Tramontano (2004): “Process Management, with the concepts of internal customers and process ownership, is becoming one of the most important competitive weapons for firms and can determine a strategic change in the way business is carried out”. These authors specify that: “Process Management consists in the rationalization of processes, the quest for efficiency/effectiveness, a sort of simplification/clarification brought about by common-sense engineering”. As Process Management engenders structural changes, when doing Business Process Reengineering we should consider KM activities in order to identify knowledge that is essential factor to enable value-added processes to achieve their goals efficiently (Figure 5).
Digital Information System, ICT and Smart Cities
The use of Information and Communication Technology (ICT) is a very important ingredient of smart cities. According to Ferro et al. (2013), “the smart city house” model, “ICT offer to creation of value and the transformation of cities in smarter and more sustainable environments”. ICT offer also an important contribution in terms of management, planning and control of production to both energy “prosumers” and energy network operators. The second contribution of ICT, always according to Ferro et al., is the possibility to transform the way in which many daily activities are conducted. And finally the role of ICT is very important in informing individual choices and behaviours. From our point of view, as detailed in Dameri et al. (2014) and Dameri and Rosenthal-Sabroux (2014), ICT is the heart of smart city.

SALAD’S RECIPE
By analogy with a salad’s recipe with ingredients and dressing, we propose in this section, what are the ingredients and the vinaigrette of a smart city.

Note that, energy efficiency and open innovation are the basis of the concept of smart city (AMETIC, 2013 Chesbrough, 2006 & 2003). The advent of ICT opens up new possibilities to transform governance and redefine the interactions between the various stakeholders of cities (Chan, 2013; Pyrozhenko, 2011; Almirall & Wareham, 2008; Schaffers et al, 2011). Urban planning, urban development (Trivellato et al, 2013) and smart growing from urban planners’ point of view (Ferro et al, 2013; Anthopoulos & VAKALI, 2011; Fernback, 2010) also contributed to the development of smart cities. In addition, the technology will allow, e.g. urban planners, to better shape the city (Townsend, 2013, Wang et al, 2007).
Ingredients
In the literature, Chourabi et al. (2012) propose 8 critical factors for smart cities initiatives into a framework, that can be seen as 8 ingredients (People communities, Economy, Governance, Natural Environment, Built infrastructure, Policy, Organisation, Technology) and Nam and Pardo (2011) only propose 3 ingredients. From our point of view, smart cities are multi-stakeholders. So, we have an undefined number of ingredients. In fact, the ingredients you put in the salad give it a special taste. Different ingredients produce different tastes and therefore, a different smart city.

The smart city consists of:
- Citizens,
- Information and Communication Technology (ICT),
- Environment,
- Transportations,
- Administrations,
- Government and e-government,
- Urban planners,
- …
from the given city and also from other cities.

Vinaigrette
What we call the vinaigrette consists of everything that flows and transits within the city and with other stakeholders (other cities ...) and how it is managed, articulated. It is:
- tacit knowledge,
- explicit knowledge,
- data,
- information,
- ...

Recipe
According to what we said previously, the smart city owns an Information and Knowledge System (IKS) which contains a digital part: the Digital Information System (DIS) that allows qualifying the city as digital city.

We propose a definition of digital city adapted from (Ishida et al., 2002) where cities are digital: “when investments in Information and Communication Technologies (ICT) and communication infrastructure in which people in regional and national communities can interact and share information, knowledge, experiences, and mutual interests. Digital City integrates urban information (both achievable and real time) and create public spaces in the Internet for people living/visiting the city”.

Thus, nowadays smart city is absorbing digital city, these two different urban strategies need different processes and practices to successfully be implemented and to gain the best results from them. For this reason, even if they are concretely fused into a unique city plan, they should be implemented taking into consideration their different nature. Some elements emerged from a survey: ICT bears functionalities, functionalities bring new uses, these new uses induce new organisation of cities. This new vision induces “Smart City” (see Figure 6 below).
A city may have new objectives, such as, new services or improving its smartness (Negre and Rosenthal-Sabroux, 2014), e.g., the city can decide to develop public transportations (display waiting times at bus stops, …). These objectives bring new processes in city governance. These new processes need information and knowledge to be achieved. A part of these information and knowledge can be supported by ICT. The concept of Smart City takes into account the potentialities of the ICT and includes the concept of IKS.

Under the influence of globalization and the impact of ICT that modify radically our relationship with space and time, the city increasingly develops its activities in a planetary space with three dimensions:
- A global space covering the set of the cities that are the nation,
- A local space corresponding to the city situated in a given geographic zone and,
- A space of influence that covers the field of interaction of the city with the other cities.

The city locked up on its local borders is transformed into an extended city, without borders, opened and adaptable. The land is the territorial dimension of a city, with different levels. They go from the local dimension, to regional, network, national and finally the global dimension (Figure 7).
Furthermore, this city is placed under the ascendancy of the unforeseeable environment that leads towards uncertainty and doubt.

The city meets fundamental problems of information exchange and knowledge sharing among, on the one hand, its formal entities distributed in the world and on the other hand, the city's people (nomadic or sedentary), bearers of diversified values and cultures according to the origin.

Two networks of information overlap:
- A formal information network between the internal or external entities, in which data and explicit knowledge circulate. This network is implemented by means of intranet and extranet technologies.
- An informal information network between nomadic or sedentary peoples. This network favours information exchange and tacit knowledge sharing. It is implemented through converging Information and Communication Technologies (for example the new IPOD with Web 2.0).

The problems occur when nomadic people (tourists or students for example) placed in new, unknown or unexpected situations, needs to get “active informations” that are information and knowledge they need immediately to understand the situation, solve a problem, take a decision, and act.

That means that ICT provide the information needed by people who are the heart of the city. By extension, our reflection is: ICT bear potentialities, they bring new uses, they induce a new organization, and they induce a new vision of city, what we call a “Smart City”. And, ICT are the heart of the smart city.

A city owns an information system and because people are hyper-connected and tacit knowledge bearers, smart city owns more than an information system: an Information and Knowledge System. In fact, the City’s Information and Knowledge System (CIKS) consists mainly in a set of individuals (people) and
Digital Information Systems (DIS). CIKS rests on a socio technical context, which consists of individuals (people) in interaction among them, with machines, and with the very CIKS. It includes:

- A Digital Information Systems, which are artificial systems, the artefacts designed from ICT
- An information system constituted by individuals who, in a given context, are processors of data to which they give a sense under the shape of information. This information, depending of the case, is passed on, remembered, treated, and diffused by them or by the DIS.
- A Knowledge System, consisting of tacit knowledge embodied by the individuals, and of explicit knowledge formalized and codified on any shape of supports (documents, video, photo, digitized or not). Under certain conditions, digitized knowledge is susceptible to be memorized, processed and spread with the DIS. In that case, knowledge is no more than information.

CONCLUSION

In this paper, by analogy with a salad recipe with ingredients and dressing, we propose a kind of recipe for smart city including ingredients, which are citizens, environment, Information and Communication Technology (ICT), ... and dressing, that is, for essential, knowledge.

In our everyday life, where (i) Information and Knowledge are the heart of the City, (ii) worldwide economies depend more and more on computers, (iii) ICTs become more and more important, complex and distributed, (iv) city requires more and more productivity, more and more quality with ever shorter development and (v) finally, knowledge can improve the decision process in city.

Our vision is new because of the concept of City’s Information and Knowledge System (CIKS). The smart city has more than ICT, and more than people. It also has to do with knowledge.

Our vision is an approach that takes into account people, information and knowledge. The advantages of this approach are that knowledge is at the heart of the approach and it is a new vision of Information and Knowledge System in order to handle the complexity. From our point of view, knowledge is a factor of competence in order to improve the “smartness” of the city.

The multidisciplinary of a smart city program requires defining a set of objectives to be reached. Citizens should even be involved, both in the plan phase and in the smart city implementation steps; communication is at the centre of a shared participation in defining smart city goals and in spreading awareness about the smart city role and benefits for people (Viitanen & Kingston, 2014).

From our point of view, the smartness of a city can be improve with (i) a more global view of the city (multicriteria, multi-views, context, ...), (ii) an approach centred Technological & Human, by (iii) taking into account knowledge in the smart city concept.

The expression “Smart City” covers all the managerial actions aiming to answer the problem of smartness of city in general: it is necessary (i) to align the management on the strategic orientations of the city; (ii) to make people sensitive; (iii) to form, to motivate all the stakeholders of the city; (iv) to organize and to pilot activities and specific processes leading towards more mastery of smartness; (v) to arouse the implementation of favourable conditions to the cooperative work and to encourage the sharing of knowledge (Bettencourt, 2013; Negre & Rosenthal-Sabroux, 2014).
Figure 8 tries to display the evolution of the city over time, starting with scattered houses, then these houses are grouped into cities, which are industrialized and mechanically connected to other cities (transport ...) and finally, who are now hyper-connected (with citizens who are connected, who need to access to different information, and the city which is connected to the rest of the world) (Kennedy, 2012).

Citizens with a window open on to the city and its environment should be able to receive information and knowledge specific to their activities, to have access to data, information and knowledge and to transmit and share their own tacit knowledge.

In sum, cities must evolve, otherwise they will die!

In conclusion, the question is:

*To be smart or not to be smart? A Darwinian evolution for cities…*

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