THE ROLE OF COLLABORATIVE SOFTWARE AND DECISION SUPPORT SYSTEMS IN THE SMARTER CITIES

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Abstract

The transition from the traditional city to the smart city is made by supported efforts regarding the achievement of a more steady, more efficient, more responsible city, through convergent strategies that deal with Smart Transportation Systems, Energy and Utilities Management, Water Management, Smart Public Safety, Healthcare Systems, Environmental Management, Educational Systems, Telecommunications (ITC Support),etc. and Positive Thinking.
Service Oriented Architecture (SOA) meets the customers' needs and the administration, the management of data, information, knowledge and decisions through Collaborative Systems and Decision Support Systems have a major impact both at the level of the smart city and the level of subsystems/services, and the information technology within smart cities becomes a major direction of research in the field of ITC.

Keywords: Smart City, Collaborative Systems, Decision Support Systems (DSS), Service Oriented Architecture (SOA), Portal technology

Introduction:

Collaborative software (also referred to as **groupware**, **workgroup support systems** or simply **group support systems**) is computer software designed to help people involved in a common task achieve their goals. It is usually associated with individuals not physically co-located, but instead working together across an internet connection. It can also include remote access storage systems for archiving common use data files that can be accessed, modified and retrieved by the distributed workgroup members. Collaborative software is a broad concept that greatly overlaps with Computer-supported cooperative work (CSCW). Software systems such as email, calendaring, text chat, wiki, and bookmarking belong to this category. A collaborative working environment supports people in both their individual and cooperative work thus giving birth to a new class of professionals, e-professionals, who can work together irrespective of their geographical location. Finally, collaborative software relates to the notion of collaborative work systems, which are conceived as any form of human organization that emerges any time; that collaboration takes place, whether it is formal or informal, intentional or unintentional ([Source [1]]. Groupware can be divided into three categories depending on the level of collaboration:

> **1. Communication** can be thought of as unstructured interchange of information. A phone call or an IM Chat discussions are good examples of this.
> **2. Conferencing** (or collaboration level, as it is called in the academic papers that discuss these levels) refers to interactive work toward a shared goal. Brainstorming or voting could be a good example of this.

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3. Co-ordination refers to complex interdependent work towards a shared goal. A good metaphor for understanding this is to think about a sports team; everyone has to contribute the right play at the right time, as well as adjust their play to the unfolding situation - but everyone is doing something different - in order for the team to win. That is complex interdependent work toward a shared goal: collaborative management.

The Decision Support System (DSS) is a class of information systems that support business and organizational decision-making activities. A properly designed DSS is an interactive software-based system, intended to help decision makers compile useful information from a combination of raw data, documents, personal knowledge, or business models to identify and solve problems and make decisions. Generally a DSS is a computer system, providing both problem and communicator's capabilities for semi-structured/unstructured problems (Source [2], [6]).

Smart cities can be identified (and ranked) along six main axes or dimensions.[2] These axes are: a smart **economy**; smart **mobility**; a smart **environment**; smart **people**; smart **living** and, finally, smart **governance**. These six axes connect with traditional regional and neoclassical theories of urban growth and development. In particular, the axes are based - respectively - on theories of regional competitiveness, transport and ICT economics, natural resources, human and social capital, quality of life, and participation of citizens in the governance of cities. A city can be defined as a 'smart' one 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 (Source [3], [7],[8]).
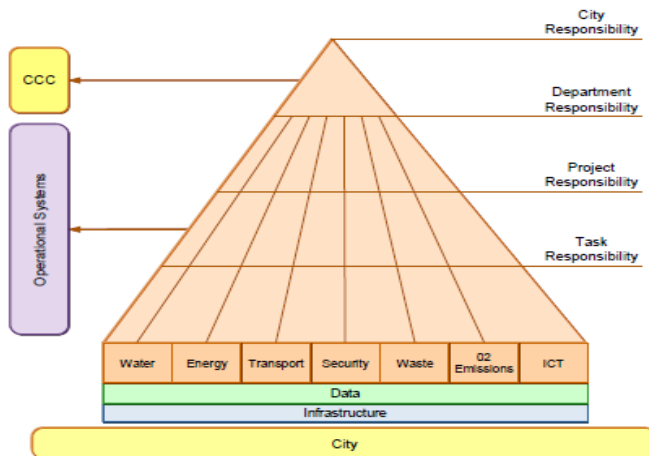

Fig. no. 1 Conceptual scheme of a Smart City (Source [9])
Research directions regarding hardware and software platforms used in the smart city

A smart city is a city that can balance its social, commercial and environmental needs, while it optimizes its available resources.

What is a smart city?

The answer to this question should be searched in the descriptions below:

Instrumented city: the events and the data in the city must be visible using the existing infrastructure or a new one which is being administered by the city or its collaborators.
Interconnected city: the events and the supervized data must be corellated so that they could become useful information.
Smart city: the information about the events in the city are turned into decisions and actions that optimize the city's working.
The activity of a smart city takes place within well-defined and intercorellated sub-systems, for the profit of the population, the economy and the ecosystem. In fig. No. 2, we present these sub-systems diagrammatically, as sub-systems which are interconnected through hardware and software platforms and their good working assures the standard of living of the citizen who lives and works in a smart city.
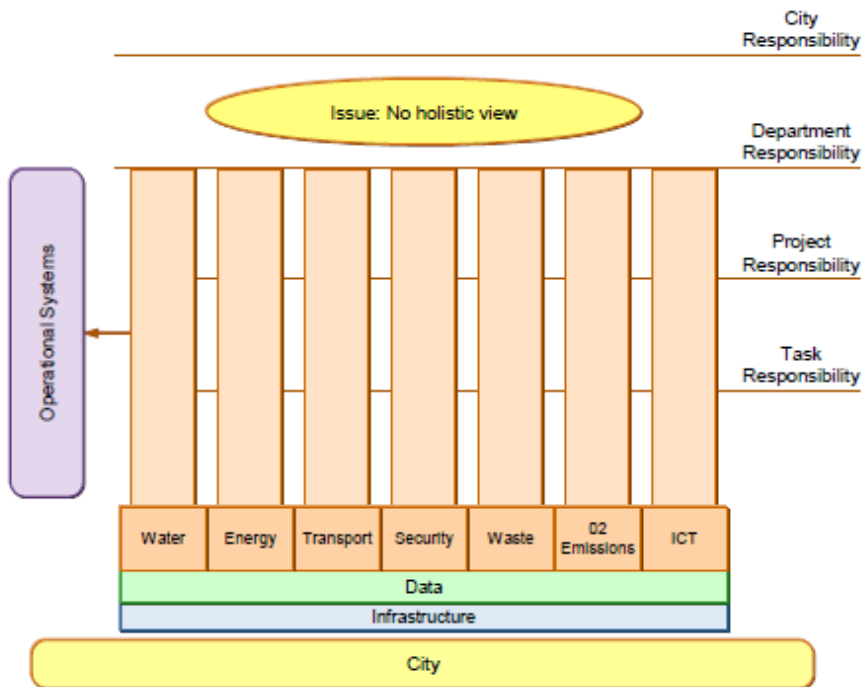

Fig. No. 2   The structure of services in a smart city

The information belonging to the flows of data, information, knowledge and decisions in a smart city are divided into levels and represented diagrammatically in fig. No. 3 [Source [9].
        The present research directions in the ITC field are focused on the elaboration and the putting into practice of some performant Hardware and Software platforms which, by

using the facilities offered by the Systems / Collaborative Software products and Decision Support Systems, should offer, on one hand, data and information in due time to the decision bodies and, on the other hand, the population of the smart city should have a permanent access to these information and decisions.
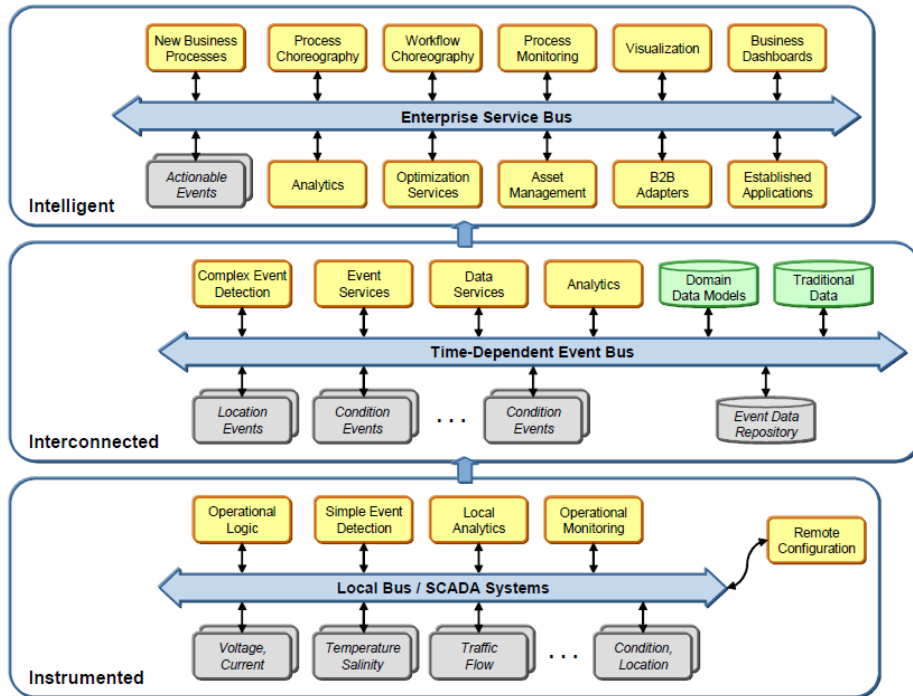

Fig. No. 3 The architecture of a smart city

IBM solutions for a smart city

The present research programs of the unquestionable leader on the market of the hardware and software platforms, are focused on the offer of performant solutions regarding the processes, the systems and the software products that will operate in the smart city in order to assure the sustainable development of the cities for the benefit of the population, the economy and the ecosystem of that city.

As the world's largest business software company, IBM is helping organizations of all sizes to tackle their most important business needs, among the main research methods concerning the development of a smart city we could enumerate:

- **Processes and policies** - a collection of structured activities, actions and policies for the administration of the city

▪ **IT** – a collection of systems and applications used for the administration of the city

▪ **Data model**- the way of organizing the data access for their better admistration

▪ **The smartness of the city** - the analysis, the forming operation and the correlation in real and historical time concerning the information about the city

▪ **The semantic model of the town** – describes the resources of the city and the dependence among them

▪ **The implementation of the smart town** – the analysis and the correlation of historical and current data in order to establish the indicators that determine optimization actions concerning the methods of work in the city.

▪**Visualization** - the display of data, information and indicators for users.

IBM solutions are built on a core set of software capabilities.
The systematic approach of the components of a hardware and software platform, as a support for the development of ordinary activities in a smart city is presented in table no.1 (Source 7).

Turn information into insights:	Drive business integration and optimization:
- **Business analytics** - **Enterprise content management** - **Information integration and federation** - **Data warehousing** - **Information governance** **Data management**	- **Connectivity and integration** - **Commerce** - **Business process management** - **Enterprise marketing management**
Connect and collaborate:	Enable product and service innovation:
- **Social collaboration**	- **Enterprise architecture and portfolio management** - **Complex and embedded systems** - **Design and development** - **Security** - **Application lifecycle management**

Table no.1

The integration of the best functionalities enriches the capabilities and simplifies deployment and management

In order to train the personnel for the projection/achievement/use IBM offers a wide range of courses among which only the titles of the fields: Information Management, Business Analytics software, Web Sphere, Lotus, Rational, Tivoli, Cloud Computing and Storage

In fig. 4 we present an inter-correlation of the main software products that are offered by IBM for the prompt solving of this issue. In order to offer a few examples of solutions for the smart cities it is recommended to visualize the site: www.ibm.com/innovation/us/thesmartercity/index_flash.html

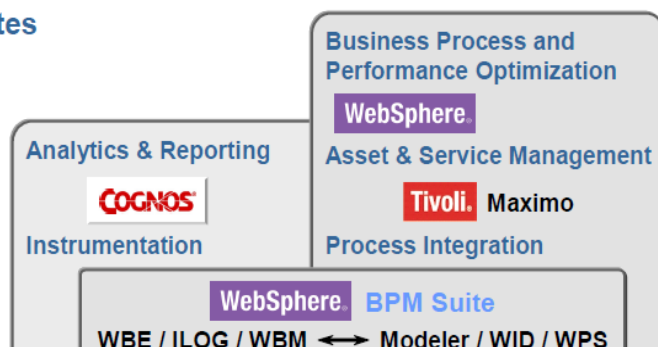**Business Visibility Creates New Intelligence**

Analytics & Reporting
COGNOS
Instrumentation

Business Process and Performance Optimization
WebSphere
Asset & Service Management
Tivoli Maximo
Process Integration

WebSphere BPM Suite
WBE / ILOG / WBM ⟷ Modeler / WID / WPS

Fig.no. 4. The range of available software products

Conclusions

The concepts of Collaborative IT Systems (as a mediator between the partners of the IT System) and Decision Support Systems (as a software support to make decisions) are the main vector that administers the transmission of data, information and knowledge for the management of applications and the complex processes that occur in the smart city.

IBM, the worldwide leader in the field of hardware and software platforms, offers performant work platforms for the business activities and processes in all the organizations, regardless of their size, as well as for the management of activities and processes that take place in the smart city.

This paper draws the attention towards the present orientations in the field of the ITC industry and the major research methods in this field, that were mentioned at the reunion on the 17th-18th March 2011 at The West University from Timisoara on the occassion of the event « IBM Academic Days for Universities in Romania 2011 », event focused on the topic « The Role of University in the Smarter Cities »

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