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## **RESEARCH SESSION 2 : URBAN AND TERRITORIAL INNOVATION WITH LIVING LABS**

### **1. Semiotic Web and Sign management as new paradigms for Living Labs in Education- Applications in natural and cultural heritage of insular tropical islands**

*Noel Conruyt, Véronique Sébastien, Didier Sébastien, Olivier Sébastien, David Grosser*

#### **Keywords**

Living Lab, Semiotic Web, Sign management, e-service, Creativity Platform, education.

#### **Introduction**

In the context of sustainable development of insular tropical islands, and more specifically for sustainable education in the South West of Indian Ocean, data and knowledge management of specialists of natural or cultural diversity is at the heart of

designing new ICT services. For example, the objectives of these e-services are to manage biodiversity and musical information on the Web, in order to preserve insular tropical islands common heritage. But the method of building data and knowledge bases is moving towards more Open, Inclusive and Smart approaches for a new 2020 Horizon. **Open** was initially inspired by EU (INSPIRE directive) and is characterized by opening public databases, for them to be enhanced by companies in new useful e-services for citizens. As such, Web Services are used for mutual inter-operability of databases. **Inclusive** is related to the different types of people that can participate to data and knowledge creation, i.e. experts, managers, stakeholders, amateurs who wish to involve themselves in useful e-services for the benefit of the community. Social Web is thus a means to connect people and facilitate communications between them in the common society. **Smart** is a sort of collective intelligence where digital and structured knowledge is used to answer more efficiently to complex problems that have been formalized in ontologies. This decision help solution brought by Semantic Web is the third technological response for being sustainable in the UE worldview.

### **Problem**

But for us, it lacks another dimension to reach the knowledge society rather than the knowledge economy for sustainable development. This can be termed Desirable, which is the first spirit dimension of such a digital ecosystem that is linked to information search. **Desirable** is at the root of human motivation to make actions in a certain direction. It is a psychological process (volition) that is anchored in living beings that are immersed in their milieu (umwelt). What is desirable today for young people who are digital natives? It seems that Immersive Web would be the fourth criterion to this new 2020 Horizon, because a lot of people play with video games today. But in an education perspective anchored on a territory such as in Reunion Island, the adequate answer would be to develop game-based learning e-services that are altogether desirable, open, social and inclusive. The New Media Consortium in its Horizon 2013 report pointed out the next challenges in education for the next five years [Johnson et al., 2013], learning games being expected to be adopted in two or three years. This is why we developed the **Wisdom** project (Wide Immersive Solution for Data Object Model) that makes use of Semiotic Web and Sign management as new paradigms for Teaching and Learning by Playing in the Future Web.

### **Semiotic Web and Living Labs**

The problem that we have to solve in our research team is how to develop sustainable e-services that are really used for involving citizens in the preservation of their natural and cultural heritage (action research). It seems that Living Labs with their user-centred design methods are the best answer for co-designing these solutions with motivated end-users, i.e. lead users. So in Reunion Island, we instantiated our University of Reunion Living Lab in Teaching and Learning to tackle this problem, each of co-authors being a Ph.D. lead user specialized in one of the four different dimensions for biodiversity teaching (corals and forests) and instrumental e-learning of music (guitar and piano). We then found a new paradigm

called the Semiotic Web<sup>2</sup> that combines social, semantic and immersive Web services (see Figure 1), in order to put human beings at the centre of innovative technologies. Living Lab (LL) is the overall conceptual frame that stresses on political and methodological principles for user-driven open innovation. On more pragmatic, scientific and technical aspects, we conceived a LL method based on Sign management and a tool, the Creativity Platform, used for co-designing e-services iteratively with the whole community users [Conruyt, 2010].

### **Sign management**

Sign management is the new ecosystem of knowledge management that we want to promote on our Creativity Platform. For making e-services with people and not only with specialists, a more concrete vision of cognition is required. Sign management is a solution for managing living knowledge, which is bi-directional between teachers and learners. It stresses the importance on the sharing of subjects' interpretations, i.e. subjective know-how of end-users, rather than on the transmission of fossilized objects, i.e. explicit knowledge of experts found in documents or books. This new framework tries to give sense to shared information for all the users (specialists, end-users, lead users) acting in their communities.

The notion of Sign is more central than Knowledge for our purpose. It is composed of Data (object), Information and Knowledge. A Sign is the interpretation of an object by a subject at a given time and place, which takes account of its form (Information), its content (Data) and its sense (Knowledge). What is exchanged on a support between subjects is called Information and this digitized codification can be managed. This makes our Sign management ecosystem a tetrahedron model (cf. Figure 1) that is more involved in concrete life with end-users. It emphasizes the sign-ification of objects by different subjects (i.e. subjects) by allowing them to show their interpretations of objects with multimedia (audio, video) annotated in textual descriptions. Signification or semiosis is the key psychological process that makes sense for practising usage based research and development with people by sharing data, information and knowledge [Conruyt, 2013].

### **Conclusion**

Social Semantic Immersive and Service Web form the Semiotic Web by showing know-how (human performances) on top of written and formalized knowledge (machine representations). This endeavour matches recommendations of EU for an open, smart and inclusive innovation pragmatic action. The last pillar of such a vision with ICT is to render this pathway for Future Web desirable. A Semiotic platform such as Wisdom is thus an objective that should not be missed in the frame of our Living Lab methodology for a better education with people.

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<sup>2</sup> This term comes from Biosemiotics [Sebeok, 1992], a science that started by studying semiotic phenomena in animals and then in other living creatures.

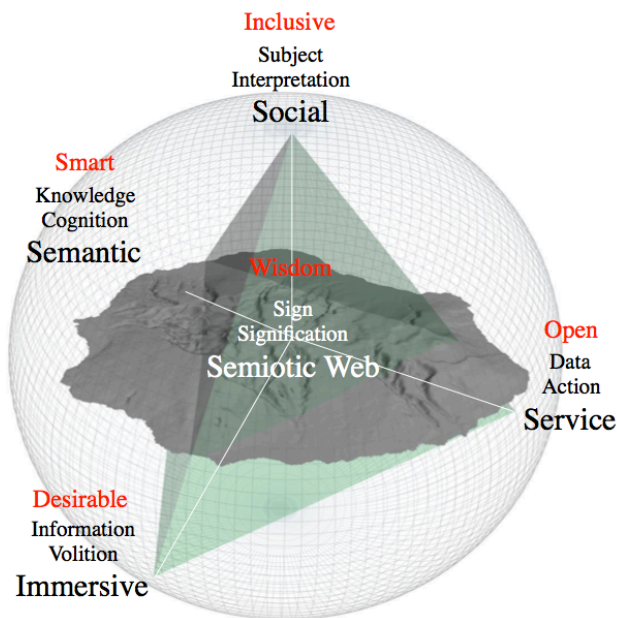


Figure 2: the four dimensions of Semiotic Web: Immersive Social Semantic Service

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## Biography of Noël Conruyt

Dr Noël Conruyt is Associate Professor in computer science at the LIM Mathematics and Informatics Laboratory of University of Reunion Island. Before joining Reunion Island University in 1994, he made a Ph.D. at INRIA and University of Paris IX Dauphine in machine learning and symbolic-numeric data analysis applied to the knowledge management of specialists in biology. Noël Conruyt is also an engineer in agronomy and a classical guitar player from the Regional Music Conservatoire of Reunion Island. Thanks to these other skills, he wants to study computer science through the eyes of an end-user of such domains.