29 : The socio-economic ambitions assigned to the PIAs (2)

09 Sep 2014

Summary

The MS2T Labex: an interdisciplinary-intensive laboratory

The government-labelled ‘excellence’ laboratory MS2T was selected after the first call for project candidacies in 2011 launched by France’s national Research Assessment Agency (ANR). “*The aim is to provide means to selected French laboratories to move up to the top of the world ratings*”, underscores Ali Charara. “*The original feature of the MS2T ‘Labex’ (abbreviation for excellence laboratory) lies in its interdisciplinary work-load and skills composition and in its integrating approach, tackling both potential scientific and technological stumbling-blocks*”. The first initiative of the Labex was precisely to identify these observes, and this stage was vetted by the international scientific advisory council of the laboratory. This council, chaired by Prof. Mo Jamshidi (University of Texas, USA), Dominique Luzeaux being a member – convened for the first time in September 2013 to draw an interim report on the

fisrb18 months of MS2T's work load and progress. "*We held this meeting concomitantly with the first international Labex workshop, with research scientists and industrialists from all round the world*", underscores Prof. Charara.

The idea hub, monthly seminars and the Master's degree

Over and above this important international meeting, the Labex organises in-house workshops and seminars to create an emulative atmosphere and meetings between experts in this field. "*The experts can exchange ideas, share the results of their research activities … This guarantees an excellent level of visibility for the Labex*", adds Ali Charara. "*The aim is to create a team pushing effect, working with new partners and becoming a recognised focal point for interdisciplinary scientific projects*". Another positive fallout of the MS2T Labex is a new Master's programme launched at the start of the 2013 academic year on interacting complex systems. "*This is an area which immediately proved attractive for potential students*", say Prof Charara proudly. Some 50 students registered and grants have been given to the best French and foreign students.

9 visiting lecturers, 13 theses and about 50 publications

Since it was created, the MS2T Labex has financed 13 PhDs, 3 of which were jointly financed (DGA, the Picardie Region and partner industrialists). Seven post-docs are under way, one of which has been financed with support from Alstom. As far as the international scene is concerned, nine foreign professors (from Australia, Brazil, Italy, Mexico, Poland, Spain and the USA) came to UTC to occupy the visitors' chairs (7 more are planned for 2014) and some 40 research staff (French and foreign) who organised and moderated seminars. "*Among the foreign visitors, some have never heard of UTC. The Labex now opens the way for new forms of collaboration*", adds Ali Charara. "*The Labex is an accelerator for*

scientific activities; we have been able to fund some inter ships, some stays abroad for the PhD students and for the teaching staff." Five international conference have been organized in Compiegne in 2013, over and above the seminars and all told, some 50 articles, published in international reviews, have been written by Labex staff and accepted.

Building a close partnership with the socio-economic world

Studying systems of systems cannot be conducted in a purely abstract manner: concrete, real-world problems have to be addressed, using the equipped platforms and the integrative software packages to validate the relevance of the scientific data and results obtained. For this reason, MS2T has built up strong links with the Robotex (intra) teams who are working on inter-system communications and have the means to carry out experimental setups with drones and other self-driven vehicles. "*The Labex can come up with a theoretical answer to the problem set and can develop generic methods applicable to all the areas concerns, viz., transportation; health, energy, the environment, safety, etc. We are working currently on a project with Alstom that consists of optimizing energy production from several concomitant sources in the framework for future smart network management policies*", says Ali Charara, to illustrate. Other partnerships have been signed or are being finalised with Renault and PSA (car manufacturer) and the government's DGA (weapons). "*We are negotiating contracts with 2 industrialists who would like to remove stumbling blocks met in several theme areas: managing uncertain situations, optimized design protocols, inter-system communication*", explains Prof Charara, who is more than satisfied with the scope of research activities that Labex can now handle.

Detailed 10 year targeted objectives

More and more industrialists are expressing their interest in this new area of research and associate problems to be solved. The

Labex, with its 6.7 Meuros budget over 9 years (787 000 of which are through public allocations, credited in 2013). The Labex is in favour of co-funded research. "*For each area (transportation, e-health, energy, safety, monitoring & surveillance, we have drafted a roadmap that details the stumbling blocks as we perceive them today, identifies potential industrial partners and 4-10 year target objectives*", underscores Ali Charara, adding to illustrate: driverless vehicles running at low speeds and intercommunication with other vehicles will be on the roads and, in 10 years' time, they will be running at normal road speeds and able to communicate with other transport systems. "*We also plan to be able to control a squadron of mini-drones that self-coordinate itself in flight*", foresees Ali Charara. The priority research fields, to be investigate in conjunction with the partner industrialists, are on-board system design, vehicle interactions, driving protocol in smart modes, etc. "*There are numerous contacts and discussion to be held over the coming months*", says Ali Charara. "*The results of the first theses will be available end 2014, an annual summer school will be organized as of 2015 and a club of the industrial partners will rapidly be set up*". The creation of a system of systems university Chair is being negotiated with an industrialist partner. "*Before the end of 2014, we hope to announce several concrete applications of the Labex work programme so that the positive contributions of our research can be made visible and appreciated*", concludes Prof. Ali Charara.

The position of the UTC-BMBI (biotech and bioengineering) Laboratory

"The concept of 'systems of systems' - carried over from the world of engineering - applies very well to living matter. Our body represents a very complex system of systems, structured in sub-divisions, running from cell level to the organs", says Anne-Virginie Salsac, research scientist at the UTC-BMBI Laboratory, where systemic biology is a daily ingredient of the research teams' work programmes. As she sees it, the living world offers a wide panel of possible applications and future investigations, for ideas and

conducting research on systems of systems, for the benefit of all. “This is a new path forward to better understand certain pathologies and better define certain treatment protocols, etc.” says Anne-Virginie Salsac, for whom the key advantage of a Labex is to allow for various UTC to join forces and engage in common projects, adding to illustrate that “It is a very federating tool enhancing our synergies. I, for a start, have been in charge for the past 18 months of a thesis prepared in collaboration with our UTC-Roberval Laboratory, in the reference framework of the MS2T Labex”.

A Roberval/BMBI PhD thesis

“We were faced with an image processing problem in the context of this thesis. We discovered that the UTC-Heudiasyc Laboratory had the skills needed to solve it”, notes Anne-Virginie Salsac. This particular thesis is being prepared by Benjamin Sévénié and focuses on a development of a model to simulate the dynamics of micro-capsules in human blood streams. The objective is to build appropriate modelling tools to learn more in situ about the effects of micro-capsule treatments injected in patients. “We have to simulate a large number of deformable objects, such as those present in our blood streams, and this represents a lot of work. We are seeking to discover new numerical procedures to facilitate the computations”, explains Anne-Virginie Salsac. The research related to optimization and model reduction techniques is carried out by the UTC-Roberval Laboratory while the work on fluid mechanics and digital simulation is carried it at the UTC-BMBI Laboratory

Succeeding with interdisciplinarity

“This UTC Labex now has considerable scope; it is very structuring for the university and highly beneficial for ten research scientists working there, especially at a time when funding of interesting, innovative research work is not exactly easy”, adds Anne-Virginie Salsac. This work places UTC in the forefront of the underlying concepts of “systems of systems. “What we have is an ongoing,

developing concept. UTC organized an international conference on the subject in September 2013, bringing with it an excellent visibility for our unit", underscores Anne-Virginie Salsac. The objective is to see UTC become a recognised key-player in the field, and this can later be extended to all fields covered by UTC. "The very concept of systems of systems is just emerging today but could in the future overarch all the university's specialties. Anyway, this is how we intend to move to attain interdisciplinarity", says our enthusiastic research scientist Anne-Virginie Salsac

What exactly is an 'excellence' laboratory?

The Labex units (excellent laboratories in French Government parlance) are the result of two calls for proposals issued by the national Research Assessment Agency (ANR) in 2010 and 2011, where the projects submitted came mainly from laboratories working in networks or in collaborative configurations. 100 projects were selected in the first round, 71 in the second, out of a total 436 projects submitted. These 171 were awarded funding amounting to 2 billion euros (1 billion for each round). The so-called Programme of Investments for the Future (PIA) aim at "providing laboratories that already benefit from international visibility with ways and means that enable them to be on a par with peer institutions abroad, to attract research scientists and lecturers of international standing and build on this basis an integrated policy for teaching and training and high level valorisation of their processes and products. The projects are very varied and have implications that go far beyond the academic research community, via new partnerships between public research establishments and private enterprise", assures the spokesman of the French ministry for Higher Education & Research.

The Labex units share the following ambitions:

- To raise the level of excellence of the unit and augment its scientific notoriety, to enhance transfer of knowledge produced and, consequently, increase the international attractiveness of

French research in general, drawing other national laboratories into this virtuous spiral;

- To guarantee pedagogical excellence and to play a key role in Master's and PhD level courses;
- To be an integral part of the higher establishment's strategy and to reinforce the dynamics of sites.