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A global digital model to accelerate railway engineering projects

Egis and CEA are developing new solutions for engineering public and rail transportation. The implementation of a project management tool named "Exegis" is planned for the end of 2018. Adapted to the management of major facilities, such as the installation of a new metro line, it will be the interface between the numerous management tools that are frequently used in order to provide an overall digital model of the project.

In light of the implementation of new urban transportation (tram, metro etc.), the management of the project requires a combined observation of the numerous implementation constraints imposed by the terrain and its development, by the service goals and the functional expectations (passenger regularity, information on travellers and on the driver...), as well as by the regulatory and normative frameworks that must be observed. All these constraints represent the project requirements (see the box) that govern the project planning and management from its design to the implementation of the service.

Managing complexity on "mega" construction sites

In the context of "mega projects", such as the Grand Paris Express, the mission of the project manager is particularly complex due to the diversity of actors involved: in addition to the coordination between different teams, he/ she must also propose all the intermediary solutions during works (interruption and temporary deviations of traffic, emergency access, information of the users). He/ she is responsible for the administrative procedures with public authorities and coordinates all the tasks and the actors involved in the project, irrespective their technological sector. The overall requirements of the project must therefore be divided among and specified to each actor so that the project manager can follow how they are observed and whether any deviations occur.

Exegis, a first common research project

The List Institute from CEA Tech, the CEA technological research department, and Egis, an international consulting group for engineering and for project management and operation, developed the tool "Exegis" with the purpose of managing the entirety of a project's

requirements as it unfolds and of ensuring the continuity of information between its different stages.

Beyond guaranteeing a proper consideration of the requirements and ensuring the setting up of verification means for their design and implementation, Exegis is truly a reporting and synthesis tool, which will facilitate the identification of problems, as well as the decision making. By allowing the formalisation and systematic management of requirements, it will facilitate the identification of inconsistencies and redundancies.

An innovative tool due to its interoperability

Egis will innovate through interoperability: Exegis allows its communication and integration with all the other software used frequently by the different companies involved in the project: BIM digital models, models for vehicle transportation systems... By offering this integration, the tool provides access to a "digital avatar" of the project and consolidates the methods for collaborative work, as well as the interaction between the different trades and companies involved.

Exegis is based on the software Papyrus developed by the List Institute. Its operational deployment to Egis is planned for the end of the first quarter of 2018.

This first collaboration project is part of the partnership agreement between Egis and CEA Tech with the purpose of developing innovative methodological and technological solutions in the engineering sector of urban and rail public transportation.

What are the “requirements” of a global urban development project?

The term “requirements” designates the entirety of constraints at the level of a global development project (for instance an urban road network), as the term “specifications” refers to all the constraints of a particular service or piece of equipment.

Some examples of the constraints which represent project requirements for the installation of a railway network:



The railway installation must take into account terrain particularities (slopes) and underground networks, as well as the roads that cross over the railway. © FOTOLIA



The wireless telephone network must be available to all the users along the entire route. © FOTOLIA



The service must take into account the stops necessary along the route. City users must be informed throughout the construction stages. © AUBERT_CEA



The layout plan for catenaries must include maintenance access. © FOTOLIA

Exegis: A tool based on the Papyrus platform



Egis chose to work with the List Institute from CEA Tech to better address recurring project management issues, for instance monitoring requirements such as performance, cost and time management, so as to significantly improve productivity and the secure production of studies. The IT project management solution called Exegis was developed on the basis of the original *open source* solution called Papyrus. Developed by researchers from List, Papyrus enables the development of engineering solutions driven by applied and customisable models and benefits from a large community of experts and users.

{VIDEO} Papyrus in 2 minutes: <https://www.youtube.com/watch?v=cUmysH--J7I&feature=youtu.be>

Regarding Egis

1 Billion euro in turnout managed in 2016
13,800 collaborators

Egis is an international consulting group for engineering and for project management and operation. In consulting and engineering, they work in the sectors of transportation, city, constructions, industry, water, environment and energy. In the road and airport sectors their offer extends to project development, capital investment, equipment control, operations and mobility services. Imagine a sustainable future, in the service of the people...that is our vocation. We are committed to meeting the challenges of the planet and to supporting the transfer of the energy efficient and ecological, as well as of the digital and territorial, in the service of public interest.

With 13,800 employees, including 8,300 in engineering, the Group generated and managed 1,020 billion euro in revenue in 2016. Egis is a 75% subsidiary of Caisse des Dépôts and 25% is held by partner executives (Iosis Partners) and employees (FCPE).

Media contacts

Isabelle Bourguet
Strategy, Sales and Communications Director
Director
Tel. no. : 01 39 41 44 17 / 06 17 10 29 70
33 02 64
isabelle.bourguet@egis.fr

Sabine Mendy
Deputy Communications
Tel. no. : 01 39 41 43 05 / 06 25
sabine.mendy@egis.fr

Webpage: www.egis.fr

Regarding CEA

CEA is a public research organisation working in four sectors: defence and security, nuclear and renewable energy, technological research for industries and fundamental research. Supported by a well known expertise, CEA participated in the implementation of collaboration project with numerous academic and industrial partners. With 16,000 researchers and collaborators, it is a major European player in research and is increasingly present at international level.

At CEA, which in 2017 was considered the most innovative public research organisation in Europe by Thomson-Reuters/ Clarivate, CEA Tech creates technological innovation to improve the competitiveness of French companies through product performance and differentiation. CEA Tech develops and transfers generic technologies that cover most of the sector of industrial applications, from traditional to the most advanced "high-tech" sectors, and addresses companies of all sizes. They deploy this dynamic in all French regions by supporting their local partners in their innovation process, and thus contribute to the creation of value and sustainable jobs in the area that is closest to the needs of the industry. The List Institute from CEA Tech dedicates their research to intelligent digital systems.

Media Contacts

François Legrand
T. +33 1 64 50 20 11
presse@cea.fr

Vincent Coronini
T. +33 6 33 74 16 45
Vincent.coronini@cea.fr

Webpage: www.cea.fr
Twitter: @CEA_recherche