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[Home](#) > Project SOFIA: collaboration between the DPCS and Ferrovial Research Group, the result of which was Project SOFIA.

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[1]

[Website](#) [2]

Context:

Infrastructures are fundamental to the development of the economy. Daily life depends on the good working order structures, such as buildings, bridges, roads, etc. They also represent a large part of public and private sector capital investment. Most infrastructures are inspected manually on a regularly basis or, in some cases, cabled monitoring systems are used, which are extremely expensive. The use of new technology clearly optimizes these costs from the point of view of resource, energy and time consumption.

Within this context, Ferrovial-Agroman is considered one of the companies from the sector that is capable of taking on technological challenges and selectively incorporating the most suitable technology for carrying out its work.

For its part, one of the aims of the UOC's DPCS (Distributed, Parallel and Collaborative Systems) research group is to research and develop services based on the application of wireless and sensor networks to capture and use data.

Implementation:

The project came about after a meeting between Xavier Vilajosana, a member of the DPCS research group, and one of the Ferrovial strategy managers, who had had a commercial relationship outside academia. Knowing the company's needs enables the research group to undertake a project that seeks to capture, aggregate and use the data provided by the company's decision-making infrastructures.

This led to the creation of SOFIA, the aim of which is to incorporate the latest information and communication technology into the construction and functioning of large infrastructures. SOFIA is a sensor network management platform, capable of integrating and processing the information in real time obtained by measuring a wide range of parameters associated with construction, environmental monitoring and the management of large transport infrastructures.

Project SOFIA is a pilot trial held between 2010 and 2013 based on the implementation of sensors that capture information on a section of the Terrassa-Manresa motorway.

SOFIA services and technologies are based on open standard models that ensure the interviability and expansion capacity of the platform designed. In this context, the project provides a generic platform as a starting point into which sensors can be incorporated progressively, as these are key to more efficient road, railway and large infrastructure management.

It is also a scalable platform, which supports real-time data processing and also means that the information obtained by the sensor networks can be stored generically, securely and efficiently, which

makes the subsequent extraction of knowledge through data correlation and inference techniques possible.

A large part of the project's funding has come from public money through the INNFACTO programme of the Ministry of Economics and Competitiveness.

This formula means that leadership of the project lies with the company that subcontracts the research group. The budget that was finally approved by the INNFACTO programme was much less than the amount requested, which led to significant readjustments to the scope and tasks to be carried out.

This made a huge impact on the execution of the project and, once complete, on deciding whether it should be continued.

During the execution stage, the reduced budget meant that the time the research team could spend on it, as well as the number of sensors and data incorporated into the analysis, had to be reduced. Despite this, the results from the project were very positive, as it meant that it was possible to develop the desired solution.

The current project has had to overcome two large university-business cooperation challenges: first, the difficulty in depending on cut-back public financing that has meant fewer achievements; and second, the difficulty of working with a large company unaccustomed to working with research groups. This meant that during the execution process, there were communication difficulties. Ferrovial-Agroman is a large company that focuses on infrastructure management, but which on the ground works with many subcontracted companies. Since Project SOFIA had to integrate multiple data sources based on different infrastructure services overseen by different managers, in some cases the integration process was more complicated than expected.

Opportunities and challenges:

This is a hugely important project that will have a significant impact if it is included early enough in the construction phase of the infrastructures, as it will be a driving force regarding the incorporation of intelligent road concepts and intelligent infrastructures. The solution developed proposes wide-ranging innovative services and fosters the creation and development of new ecosystems and business models that can also be implemented in other countries.

It is hoped that Ferrovial-Agroman will incorporate this technology into the new heavy traffic road infrastructures. However, a second phase of the project needs developing but has been put on hold due to a lack of support tools for RDI funding, which offers attractive conditions for the company. The second phase should enable the data collected and interpreted by the platform to execute proactive actions. For example, if the information collected indicates a problem with pollution, the platform should be able to modify the speed signposts automatically.

From the research group's point of view, the project has allowed progress to be made with a solution that would eventually apply to a wide number of sectors linked to infrastructures.

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<http://transfer.rdi.uoc.edu/en/cases/project-sofia-collaboration-between-dpcs-and-ferrovial-research-group-result-which-was-project>

Links

[1] <http://transfer.rdi.uoc.edu/en>

[2]

<http://transfer.rdi.uoc.edu/en/cases/project-sofia-collaboration-between-dpcs-and-ferrovial-research-group-result-which>

-was-project

[3] <http://transfer.rdi.uoc.edu/en/the-uoc-transfers>