

In this third issue of the Metrics report, the business impact of projects is addressed more specifically and in more detail than in the previous two issues. This now becomes possible since the first ARTEMIS projects that started in 2009 and 2010 are finished; their results are known and have been brought further to the business by the organisations involved in these projects. In this chapter 2, we interviewed a set of projects on a voluntary basis. We chose the interview method to be able to capture the wide diversity of the projects' business impact, which would not have been possible simply by answering a questionnaire. We hope to show the diversity of impact on the business created by the different projects. Also for the future we hope to follow the results of the finished projects to collect more evidence of the impact of the ARTEMIS programme. We hope that in future more projects will strive to make their business impact visible to create a clear message about the impact of research in Embedded Systems on the competitiveness of Europe.

1.1 CESAR

CESAR (Mar 2009 - June 2012)/ Partners: 53 – 4 Domains/ Total Eligible Costs: 54.92

Challenge

The main challenge taken up by the CESAR project was to reduce the time, and thereby the cost, of development by some 30% by improving the tools and methods for requirements and system engineering. However, the introduction of an open Reference Technology Platform (RTP) for tool interoperability prompted a further challenge: to change the mind-set of tool suppliers, tool users and design methodology research, in which industry orchestrates the direction.

Achievements

To achieve these goals implied the creation of more mature design processes able to accommodate large design teams distributed over many sites and combining many different fields of expertise. It was the cross-domain research in the project that made unexpected results possible and gave a strong boost to systems and requirements engineering, which had not been anticipated initially. The concentration of all engineering disciplines of the design phases in one project also delivered many learning experiences.

An important achievement was the anchoring of competences for systems engineering and functional safety within the companies' organisations (dedicated teams created or strengthened with new employees).

For example, in AVL, the world's largest independent company for the development of internal combustion engine powertrain systems and instrumentation and test systems, the safety research team was transformed from a research department into an industrial department with its own external trade mark (AE). The fact that this transition occurred among other companies in similar ways shows the usefulness and applicability of the results achieved. The SME partners in CESAR also created or extended existing products based on the results of the project. The experience gained and the results achieved in CESAR have been published in the book "CESAR-Cost-efficient Methods and Processes for Safety-relevant Embedded Systems" (ISBN-13: 978-3709113868).

The extent of the interest in this project paved the way for the standardisation of tool interoperability. In this context, cooperation with existing standardisation bodies or working groups such as the OSLC (Open Service for Lifecycle Collaboration) were established and a new annual conference on interoperability was initiated.

From a partner point of view, this work was an important enabler for the development of related core technologies such as the AVL Open Development Platform, Fraunhofer ModelBus or Dassault Systèmes Enovia. Within AVL, CESAR led to the introduction of an open development platform that is now extensively used along with the establishment of two new departments for systems engineering, system safety and for the implementation of the open development platform.

Furthermore, from a management point of view, the CESAR Process 4 Exchange has been established to enable continuous improvement of engineering disciplines and tool interoperability. This process targets the efficient exchange of information with other research initiatives, thus ensuring that the follow-up projects can build on technical outcomes achieved so far. Process 4 Exchange has already been implemented in many other ARTEMIS projects as has the way in which the technical progress was measured in CESAR.

Business impact

The business impact that CESAR has had can be described as both wide and penetrative. Improved product maturity and the ability to manage a more complex system design enable a greater degree of sustainable market competitiveness while internal exploitation has benefited from better development processes with an improved capacity to handle complexity. The results of the CESAR project have made a significant contribution to the handling of large teams and the cooperation between many different institutes and

experts from a range of domains geared to working jointly towards the same target with one system. Furthermore, in targeting the creation of safer and more reliable products, the design methodology applied within the project has led to greater product safety and has provided a comprehensively dependable system.

An undeniably major impact on the European market in the long term is the success of CESAR in laying the foundation for topics that were expanded in ten follow-up projects. The definition of these projects has been strongly influenced by the CESAR project, and specific technical outcomes from CESAR have been taken over and further developed in these initiatives.

Table 10.2 M18 – projects building on CESAR results

Acronym	Phase	Total investment	Coordinator
MBAT (ARTEMIS)	Running	MEUR 34.5	Daimler
pSAFECER (ARTEMIS)	Running	MEUR 10.5	Volvo
nSAFECER (ARTEMIS)	Running	MEUR 16.3	Volvo
VETESS (ARTEMIS)	Running	MEUR 19	Infineon UK
iFEST (ARTEMIS)	Running	MEUR 16	ABB Norway
CRYSTAL (ARTEMIS)	Proposal	>MEUR 70	AVL List GmbH
SPES 2020XT (National German)	Running	MEUR 25	TU Munich
ARAMIS (National German)	Running	MEUR 37	KIT
OpenCOSS (FP7)	Running	MEUR 11.7	Tecnia
SAFE (ITEA 2)	Running	MEUR 14	Continental



In conclusion, the importance of large projects such as CESAR to achieving and setting standards cannot be understated. The know-how transfer between the different application domains was a key success factor to consolidate the different engineering disciplines according to the respective needs and experience. At the same time, an important lesson that has been learned from the experience of the CESAR project is that maximum impact can best be derived if the focus is limited to fewer research topics.