INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

## Project Results

# Speeding evolutionary product development

## Agile design, model-driven engineering and early verification and validation ensure right product at right time

*Quality software has a key role in the global digital revolution. The ITEA 2 EVOLVE project has created a high-level methodology for early verification and validation of evolutionary products through the accredited and certified integration of each component. It provides an iterative and incremental framework based on agile and model-driven engineering paradigms, fostering accredited and certified component reusability.*

Reliable, accurate, fast and low-cost validation and verification of products is a cornerstone of modern high-technology industry. Efficient verification and validation technologies are essential to support rapid, high quality software development in a volatile business environment.

EVOLVE has created an iterative and incremental methodological framework for early verification and validation of evolutionary products. The methodology exploits agile and model-driven development paradigms, fostering accredited and certified component reusability in a broad sense. It enables construction of software for real-time embedded systems which may be subject to legal certification or internal company accreditation.

**GETTING IT RIGHT ON TIME**
While agile and model-driven design can ensure products are made in the right way, EVOLVE goes further. It focuses not just on making the product right but rather on making the right product right – a very important step forward for the industrial partners involved.

However well made, a product nobody wants is a waste of time and effort. It should be neither under engineered nor
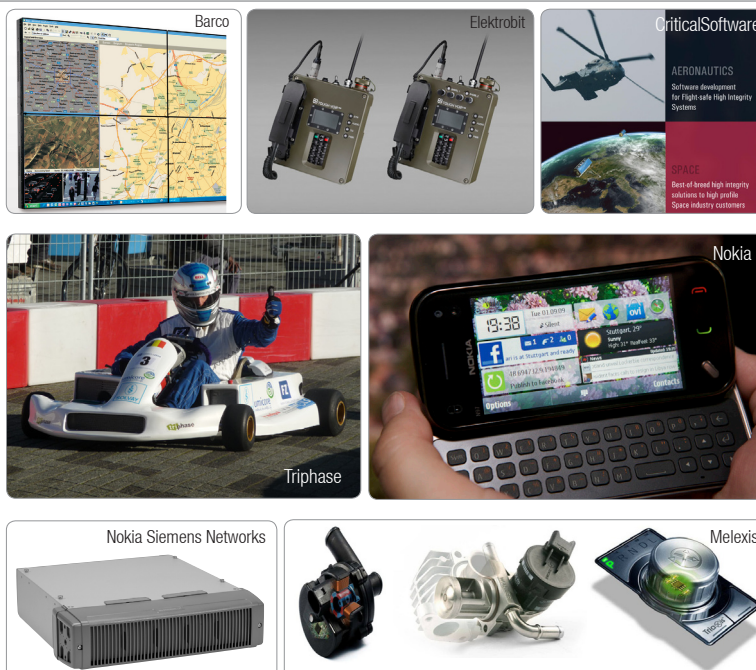


*EVOLVE application areas*

## Project Results

over engineered while providing what the customer wants. This requires continuous dialogue between product management, sales and R&D.

EVOLVE focused on validating functional and non-functional properties for evolutionary products from early architecture design to final customer acceptance. This combined:

1. Dealing with evolution at an early stage and getting early feedback – so-called early verification and validation;
2. Agile development – this has been used for some time but EVOLVE examined how to integrate early verification and validation into the incremental design process; and
3. Model-driven engineering.

**REDUCING TIME AND COSTS**
The work resulted in novel toolsets, methods and guidelines to reduce development cost and time. These included techniques for architecture modelling, model analysis, analysis-based design decisions and model transformations, as well as integrating novel modelling techniques, such as aspect-oriented modelling and domain-specific modelling languages. Test flow was studied for iterative and incremental integration with a model-based testing framework, configuration and build management, and test automation.

EVOLVE also developed a certification process which allows incremental advances once a product is launched in a safety-critical domain. This incremental process makes it possible to handle different levels of certification without having to restart from scratch each time even when changing sectors.

**ENSURING BEST BUSINESS VALUE**
The EVOLVE approach is already in use. For example, Barco had been developing a new product and showing it to customers. Every demonstration resulted in a demand for new features. The scope of the product got out of control. Using an agile approach, it was possible to prioritise features, implement them based on the highest business value and stop adding new features having covered those it wanted to supply.

EVOLVE has also resulted in two spin-off companies, both tool vendors:
- The Open License Society developed the GoedelWorks systems engineering cloud service being commercialised by a spin-off called Altreonic; and
- Critical Software made tools and frameworks which are going to be commercialised in a spin-off called Educed.

**PRODUCTS EXACTLY FIT FOR PURPOSE**
This ITEA 2 project enhanced both the state of the art and the state of the practice – formalising requirements management, clarification and model verification. There was excellent knowledge transfer from the academic partners who where continually challenging their industrial partners.

Use of these results will enhance the competitive nature of European industry – both for the EVOLVE partners and more globally as there was extensive dissemination of results. An added advantage is that a company can quickly change and adapt itself to evolving technology horizons particularly with the ever-growing importance of embedded software.

### Major project outcomes

**DISSEMINATION**
- 34 publications
- 14 presentations at conferences/fairs

**EXPLOITATION**
- Will be used in a multitude of products

**STANDARDISATION**
- 4 contributions to standardisation bodies

**SPIN-OFFS**
- Altreonic N.V.
- Educed

**EVOLVE**
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