



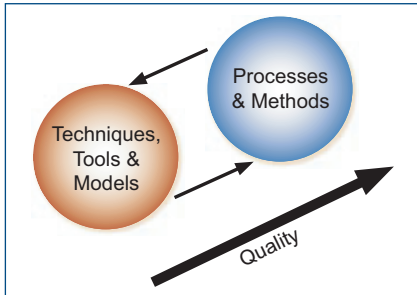
PROJECT PROFILE

Software evolution route to system enhancement

Managing the digital explosion

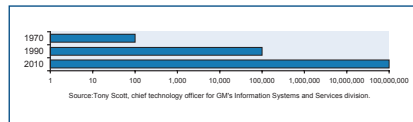
In recent decades European industry and research has paid much attention to new software engineering methods and technology. However, their adoption has often been restricted to new applications, with little effort made to introduce the latest developments to existing software-intensive systems. SERIOUS will deliver methods and processes with appropriate techniques, tools and models to bridge this gap.

Challenges in a changing world. European industry creates a growing number of products and systems by adding new features to earlier versions of the same devices and equipment. New mobile phones, for example, are upgraded by introducing extra software features – while more powerful analytical and imaging software extends medical diagnostic systems, and communications systems benefit from new protocols and capabilities.

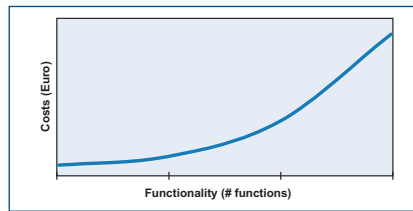


As a result of the continuing trend to implement more and more features in software, the software content of all such products becomes ever larger. Whereas the amount of software included in some medical systems has

doubled over the past four years, it has increased exponentially in the average car over the same period (from 100 Lines of Code in 1970 to an expected 100 million Lines of Code in 2010, see figure).



Adding a new feature to a small system is less costly than adding the same feature a larger, more complex system. The SERIOUS project will therefore focus on reducing extra costs of adding new functionality to large systems, thus reducing the slope of the cost-curve (see below).



The SERIOUS consortium is developing dedicated methods and techniques to support the evolutionary development of software-intensive systems. By applying this approach, the quality of the product should also be improved. Experience and literature studies confirm that software quality is prone to degradation during its lifetime if it is not explicitly managed. To safeguard against such problems, the partners are pursuing a two-pronged approach:

- improving techniques for smooth integration of analytical and refactoring functions into the day-to-day software

SERIOUS (ITEA 04032)

Partners

- Alcatel
- Bertin Technologies
- Calassa Labs
- Fundacion European Software Institute
- Ibermatica
- Nokia
- Philips Medical Systems
- Philips Applied Technologies
- Softteam
- Surlog
- Tampere University of Technology
- University Antwerp
- University of Helsinki
- University Polytechnic Madrid
- University of Zurich

Countries involved

- Belgium
- Finland
- France
- The Netherlands
- Spain
- Switzerland

Project start

September 2005

Project end

August 2008

Contact

Project Leader:

John Pleunis
Philips Medical Systems, the Netherlands

Email:

John.Pleunis@philips.com

Project websites:

- <http://www.hitech-projects.com/euprojects/serious/index.htm>
- <http://lore.cmi.ua.ac.be/serious>



PROJECT PROFILE

development process, leading to a truly evolutionary software-engineering model;

- defining various quality aspects in sufficient detail to permit their application during the early phases of the software development process in order to support software evolution.

Handling software evolution.

The three-year initiative began by investigating existing systems, in order to learn about evolution by looking at the past. For this purpose, it is undertaking trend analysis from different perspectives – code size, problem reports, quality, etc. These analyses will help to identify areas that should be addressed in order to permit future system enhancement. This modification is performed without changing the functionality: software refactoring.

Because software development processes play an important role in the cost and quality of the resulting system, the partners will go on to investigate the development processes that improve the quality and cost of a system, looking at the whole product life cycle. They will

also investigate the quality factors that have the greatest impact on software evolution. Service-oriented architectures are seen as a possible solution for dealing more effectively with software evolution, and will therefore be studied in some depth.

SERIOUS expected results

For almost any European company developing high quality, cost-effective software-intensive systems and facing the reality of software evolution, SERIOUS will:

- provide methods, best practices and models (including tools providing value for industry) for evolutionary software development;
- develop a full life cycle process that supports evolutionary development of software-intensive systems (including tools that support this);
- produce a structured approach to the evolution of software assets, including a controlled way of improving the quality of the system;
- built demonstrators showing the application of some of the above-described results.

ITEA 2 Office

High Tech Campus 69 - 3
5656 AG Eindhoven
The Netherlands
Tel : +31 88 003 6136
Fax : +31 88 003 6130
Email : itea2@itea2.org
Web : www.itea2.org

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Case: Analysis of lines of code in multiple projects

A small case study relating to the development of a medical system effectively illustrates the need for additional techniques to manage software evolution. The figure below indicates the rate of software growth (vertically the lines of code, horizontally the weeks) in two parallel projects, called TJ and DJ, running over a period of 84 weeks. Both projects started with the same base of approximately 5 million lines of code (LOC). Project TJ is responsible for adding some features that have considerable impact on existing code; project DJ is responsible for extending some existing features.

By looking at the evolution of the software size, we can observe some important points (week 1, 19 and 52). Project leaders should be able to clarify 'jumps' in LOCs. For example, in week 52, the LOCs of the TJ project increase substantially. The import of externally developed software in the code base during that week clarifies this increase.

Another observation concerns the divergence of LOCs between the two projects. Both will eventually be required to merge into a single stream of development, so that future projects will be able start with a code base containing all of the features developed in TJ and DJ. This means that when the gap between the lines increases, more effort will be required to merge the code of both projects. It also indicates a achieving the desired end-results. To gain control of such an evolutionary process, it is essential to be aware of, and understand, observations of this nature.

Note: the data is slightly modified due to confidentiality however the nature of the data is preserved.

