Software Process Improvement Case Study

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CoMUNe

Configuration Managements & User Needs

Overview

***EID** was founded in 1972 and its activity has evolved from data processing on behalf of clients to the supply of information systems and the production of software. Systems advice has always been an important company activity, as it is part of the founder's professional heritage. The technologies initially used in the production of software were the RPG, COBOL AND TRANS-ACT languages on proprietary systems. For the last ten years the company has used relational data bases (Oracle) and 4GL and object orientated languages (Jam, Smalltalk, Delphi). Since the mid-eighties the company has produced a wide range of products for the Local Health Authorities. This sector currently represents over half of the company's activities.*

Company products are often customised for a diverse array of clients, introducing additional functionalities or modifying standard versions to adapt to the organisational structure of the client. This fact means that for each product there exists a number of variations (almost one for each client). The customisation of products is very important to the company because it is the source of a significant economic return and also because the product's great adaptability to the client's needs differentiates it from other products on the market.

The growing complexity of the management of product evolution needs to be tackled by introducing organisational changes and support instruments. The improvement plan focuses on two fundamental points in the evolution of products; the management of client's requirements, and configuration management. The improvement programme's preliminary assessment showed that the production process displays a low level of organisation, leaving great scope for improvement. The improvement initiative has produced a significant increase in the efficiency of the productive process. The positive response of personnel encouraged the management to plan new improvement operations.

The Organisation and its Environment

The main activity of EID is the development of software for the health sector. (Local Health Authorities), in particular for administrative procedures (accounting, orders, stores, admissions registration, protocols, decisions, analytical accounting, capital resources, reception, centralised booking, doctors on call, pharmaceutical prescriptions) and personnel management. The entire product cycle is managed within the company, including design, production, marketing, installation, training, assistance (hot line), maintenance and customisation.

Other activities include the supply of complete information systems for small companies and consultancy, in particular for cost control systems.

The company employs around 20 people, of which 13 are dedicated to software development. Annual receipts are around 1, 250 000 Euro.

The Starting Point

In EID the need to introduce the basic practices of software engineering was identified in order to obtain greater control of the software production process and a consequent reduction of production costs and risks.

As a collateral effect it was also hoped that a better assessment of the necessary effort and budget would result from the completed estimates.

Another company objective is the introduction of a quality system and a subsequent UNI/EN 9001 certification. In this context the improvement plan was also considered as a introductory step for the introduction of a quality system.

These requirements, perceived as a general impression, were confirmed by the analysis of data on company activity relating to 1997, from which it emerged that, in most cases, the estimates for various projects did not coincide with the final balances. Consequently profit margins and control of the software production cycle were notably reduced.

One of the principal causes of this situation was identified as bad management of the collection and definition of client requirements. This highlighted the difficulty in carrying out a sufficiently accurate analysis of requested operations, and consequently poor precision in the definition of time and professional profiles actually required, and poor optimisation of the costs and times required.

For these reasons the EID management is seeking to introduce practices and software engineering instruments to attain the following objectives:

- improvement of the process of collecting requirements
- introduce an efficient configuration management system.

The SPIRE project was the opportunity that allowed a systematic confrontation of these problems within the company.

The initial assessment has shown up some positive points in the production process:

- The company is made up of technicians who possess a high level of skill and who work on products of their own manufacture.
- The company is highly dynamic, capable of rapidly adapting to the demands of clients and more generally to market demands.
- The software support packages used are known in detail and are used to the full of their potential.

Significant weak points also emerged:

- There are no procedures for systematic configuration control, making it difficult to carry out product revisions and even more difficult to create customisations for individual clients.
- Problems in the collection and tracing of requirements: the agreements, often by telephone, are not in any way traceable. There is no formal acceptance, except in a few cases, of client's project requirements.
- A lack of verification and validation procedures. These are limited to a so-called "smoke test", aimed at verifying that the product is sufficiently stable for installation at the client's premises.
- The lack of significant investment possibilities does not allow the introduction of new technologies and related support instruments.
- The life cycle of spiral software is not controlled; the products are developed around an initial kernel. Subsequent development steps introduce new functionalities, a new version is available in times that vary from days to two weeks.
- The planning and evaluation of risks is extremely difficult due to the lack of historical data. The assessments are always based on the experience of individuals.

Generally the estimate of company processes with respect to SPICE is extremely low, typically between 0 and 0.5 for most processes.

From interviews carried out to determine staff attitude it emerged that:

- the majority accepted the need to improve the software production process.
- all agree on the fact that the improvement of processes is essential for the company, pointing out that an improvement will have the effect of reducing software production costs.
- the lack of sufficient training for professionals was underlined.

The people involved have showed awareness of the SPI (software process improvement) and the advantages that can be obtained from it.

In conclusion it was agreed with the management to provide, in the improvement phase, a training programme with the following objectives:

- improve knowledge of the "best practices" of software engineering
- introduce the concepts of versioning and configuration management
- introduce the basic testing concepts.

On the basis of the results of the assessment and as far as the project time allows, two processes for improvement were identified:

- configuration management;
- collection and systematic management of user requirements.

The Improvement Project

The improvement plan provides for two preliminary activities:

- definition of standards;
- training in the principles of software engineering;

and three lines of intervention in the production process;

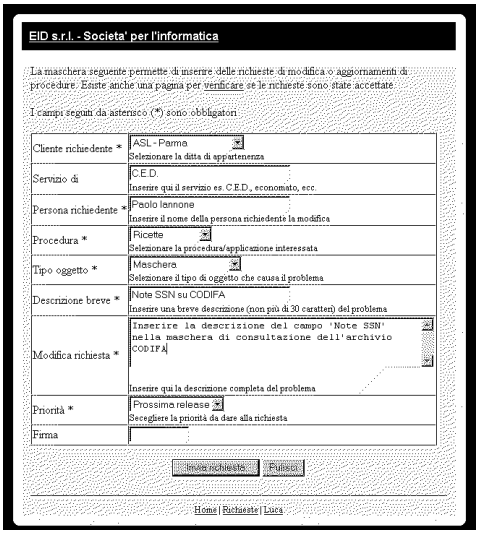
- management of requirements
- configuration management
- management of requests for customisation

From an organisational point of view, a pilot project was designed to run for a time period compatible with the SPIRE project and a pilot client.

Regarding the management of requirements, an organisational procedure was defined which had not been formalised at company level. The procedure specifies the steps and responsibilities of collection of requirements. Finally a support tool was developed that permits the management and tracing of requirements.

For configuration management, a configuration management system was introduced, permitting internal tracing of individual versions and specific external tracing of customisations specific to individual clients. The PVCS instrument was also introduced, which is economically suitable for the company's needs. The use of this instrument was introduced in a pilot project and a plan was defined to extend it to other projects.

An intranet WEB page was created to support requests for customisation of products. The WEB instrument was made available to the pilot client, who judged it positively and is using it fully.



The Results

The following are the results of the three objectives of improvement:

Management of requirements

The comparison between two software modules carried out respectively by the use of the requirement management instrument and by the traditional method showed a reduction of 30% of the time employed in recycling the software development and in general a reduction of the number of recycles.

Configuration management

The application of configuration management produced some measurable results:

- a 90% reduction in generation time of new releases
- and 80% reduction in disk space occupied

Other results, difficult to quantify but not less important, are:

- no limit on the number of historical releases
- greater efficiency in the restart of product releases

Requests for customisation

The instrument for the management of requests for customisation produced significant results:

- the typical management time for requests was halved, from 20-30 minutes to 10-15 minutes per request.
- positive impression from clients

On completion of the improvement project, the assessment of processes was repeated, and showed how, within the limits of the processes included in the project, the improvements are visible, rising from the initial level of 0 to 1.

From the quantitative point of view the project demonstrated the possibility of:

- reducing the management time of requests for customisation by 50%
- reducing the time dedicated to the generation of releases by 80%
- improving the overall time of software development by 50% (estimate)

Extrapolating the date from the base year and approximating due to the lack of improvement

percentages, it can be estimated that the overall obtainable saving is 7%.

Considering that the company activities to which the improvements defined in the project apply are worth around 500, 000 EURO to the company in one year, applying improvements similar to those obtained in the project to 43% of its activities (215, 000 EURO) the company will benefit by an amount equal to the cost (15, 150 EURO) without considering that while the costs conclude with the improvement project, the benefits are repeated in time.

Lessons Learned

- Moving from a craft-type process of software production to a more industrialised type brings improvements in efficiency and a more efficient control of production.
- The formalisation of management of requests reduces misunderstandings with clients.
- The basic training of collaborators was a determining factor for the success of the project.
- The use of new technologies favoured the involvement of technicians in the project.

Plans for the future

- To extend configuration management above all to the projects in client/server technology and subsequently to all others.
- To extend the use of the collection tool for requests for customisation to two clients (already chosen) other then the pilot client.
- Promote the use of the requirement management tool.
- Standardise the company processes in view of the introduction of a quality system.

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more information is available on the web site
http://www.cse.dcu.ie/spire

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