

Software Processes: How Important Is Your Domain?

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ABSTRACT

There was a time when researching software processes meant just that – we were interested in making sure that the process for software development was effective. We did not really have to worry about the domains in which our software was used – well, maybe that was up to the requirements engineers or even those who were interested in usability, but it did not really affect the software processes through which the software was developed.

But, things have changed! Software has become more ubiquitous. Software is used in products that are governed by regulation. Software is being developed in organisations that heretofore did not consider themselves software companies – such as automotive and medical device companies.

As the manner in which software is being used has changed, so too must the processes by which software is developed. This paper presents the position that software processes can no longer ignore the domain – they have to change to ensure that software can be used wherever it is needed.

Categories and Subject Descriptors

D.2.9 [Management]: Software Process Models, Software Quality Assurance

General Terms

Software Process management, Software Quality Improvement, Evolving critical systems.

Keywords

Software process, software engineering research, software industry, evolving critical systems, software process models, software lifecycle models, domain requirements, development environments, project management, medical devices, software quality management systems.

1. INTRODUCTION

Since Lero's inception in 2005, Lero researchers have been carrying out Software Process Improvement Research. As a result

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of this research, much of it focused within industry – multinational and small to medium-sized enterprises (SMEs) - we have recognized that improving the software process cannot be done in isolation. It must belong to a Software Quality Improvement strategy, within which we have identified three stages as shown in Figure 1. This occurs because organisations must combine various Evolving Process Drivers. These drivers include:

- (i) *Software Process Models and Lifecycle Models* such as Capability Maturity Model Integrated, ISO15504, Agile Methods, V-Model and Waterfall Model;
- (ii) *Domain Requirements* such as such as FDA regulations, EU directives, SoX regulations and Health Information Quality Authority directives;
- (iii) *Development Environments* such as Global Software Development, InnerSource, Outsourcing and Development for Services.

Evolving Process Drivers are not necessarily software driven. If we consider drivers in (i) these will be evolve through software engineering, either being developed in industry or by researchers. Drivers in (iii) may possibly evolve through software engineering, and the world of software engineering (that's us!) will have an input. But, often it is the business case that takes priority. For example, one of the prominent reasons which given within our case studies for implementing Global Software Development has been cost reduction, and this has been dictated to the software engineers by the business [1]. And, drivers in (iii) are determined by the *business* in which we work. In these cases, we, as software engineers must consider the business domain to establish what software processes are of interest. Therefore, software engineers will be driven to use particular processes by the business.

However, developing software engineering processes on a once off basis and then letting them be used ad infinitum without any further changes will not work. Change in the Evolving Process Drivers cause Software Engineering Processes to evolve. In addition, these Evolving Process Drivers can be critical, particularly as the software engineering process contributes to the company's profitability, be that a direct or indirect contribution.

To ensure that software engineering researchers, contribute to software process developments within industry, much of Lero's research has been to develop Process Models which combine these Evolving Process Drivers. We have developed models such as the Global Teaming Model [2] which provides guidance on software processes for global software development; Product Derivation Pro-PD [3], which models software processes for software product lines; GSD-Coord [4], for project management in a global setting;

SALES4MD [5] has developed processes for lean software development in the medical device industry; and Agile V-Model [6] which presents process for use when combining the V-Model with Agile process in the medical device industry.

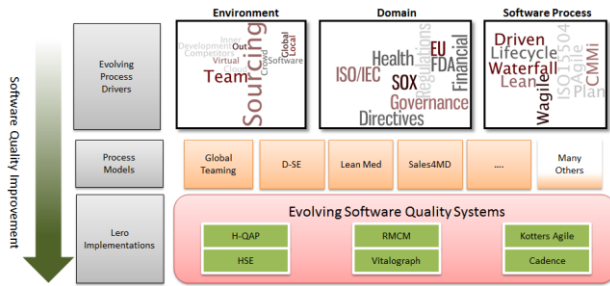


Figure 1: Software Quality Systems

2. INDUSTRY REQUIREMENT

In carrying out software process research in Lero, we recognize that it is not enough to develop process models which combine drivers – it is important that we implement and evaluate them in industry. Therefore, the third stage of Software Quality Improvement is to implement and evaluate models within industry. These implementations include, for example, Hospital Quality Assurance Program (H-QAP) [7], the Risk Management Capability Model (RMCM) [8] and the Kotter-Agile Implementation [9]. H-QAP has been used extensively in the Public Hospital system through the Health Service Executive in Ireland, significantly improving software quality within that sector. RMCM was developed to support the risk management capability process within a Medical Device company and has ensured that the risk management for software has been given priority within the organization which is FDA assessed. Kotter-Agile took a change management process and combined it with agile software development in a company case to fulfill an urgent business requirement. These cases demonstrate the importance of taking Evolving Process Drivers into account when implementing Software Quality Improvement through software process.

3. WHERE TO NOW?

In a recent study [10], we noted that, from an impact perspective, research is not always accessed by industry. This research pointed out that software managers “do not find that complete frameworks are of interest, tending to prefer clusters or patterns of information that are easier to contextualise and implement” [11]. This highlights a concern which we are addressing through Lero implementations – that Software Process models, which are constantly evolving, must be integrated with the Software Project / Quality / Management system used currently in companies. We need to question:

- (i) How are Software Process Models integrated into evolving Software Quality Systems currently used?
- (ii) What industry success factors will ensure that the implementation of process models ultimately improves the quality of their software product?
- (iii) Can we, as researchers, contribute more successfully to industry’s implementation of these models?

To do this, as researchers, we must know and understand industry environments, software processes and domains.

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