Chapter 21
Rapid Productivity and Quality
Software Product Lines and Trends of the Future

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ABSTRACT

The aim of this chapter is to introduce a reader to the world of software product lines, how it is used and what the future of this field might be. The authors present some of the success stories of organizations who have employed this approach, the benefits they have derived as opposed to conventional approaches. They also present their own views and innovations in touch with cutting edge developments in this field.

INTRODUCTION

By this time the word Software Product Lines or Family Oriented Engineering would need no introduction. A couple of decades ago, this was a promising new venture. Or a famous hot topic for project managers and team leaders alike in the dormitory. Gone are these days when product line based development used to be a favorite past time talk. It is now a reality and ready or not, it is everywhere. At this time, it is interesting to look back at what has been achieved throughout since this technology debuted into the software industry and what new promises are made in the form of new technologies and innovations for the future.

Software Product Lines attempt to reduce development time, cost and effort by taking advantage of the common characteristics among a group of products (Groher et al, 2008). The traditional definition for software product lines explains it as a set of software intensive systems sharing a common managed set of features that satisfy the specific needs of a particular market segment or a mission and that are developed from a common set of core assets in a prescribed way (Clements & Northrop, 2004). Generally speaking, software product lines allow developers to take advantage of common characteristics among a family of products they produce and as a result increase quality, reduce cost and save time. To establish this approach systematically is

DOI: 10.4018/978-1-60566-731-7.ch021

a challenge that involves cooperation between from wide ranging departments. The notion of this chapter is to introduce the reader to a brief introduction, history, and industrial usage and future prospects of software product lines.

DEFINING SOFTWARE PRODUCT LINES

There are many definitions for software product lines. One of the widely accepted ones, given by SEI is:

'..a set of software-intensive systems that share a common, managed set of features satisfying the specific needs of a particular market segment or mission and that are developed from a common set of core assets in a prescribed way.' (SEI, 2005).

In its most simplified form, Software Product Line aims at producing a family of software by taking advantage of the common aspects among them, as opposed to producing applications individually, in a rapid and cost effective manner and at the same time satisfying quality attributes. To be precise software product lines generate a family of products with many common properties and some variant properties so that it caters the individual needs for a wide variety of users. Henceforth throughout the chapter we will use the abbreviation SPL to denote Software Product Lines. The terms product line and product family are often used in the same meaning. But some European companies take a different synonym for product line. Through product line they mean a set of products which appears similar in functionality but has an entirely different technology inside. But product family often represents a set of products that have common functionality with some minor variations but built from the same technology (Linden, 2002).

Today's customer demands products that are tailored to their specific needs. Product family approach facilitates producing bulk products with intended variants. SPL engineering has the potential to offer great cost savings and productivity gains to organizations that provide family of products. Rapid production of product that adapt quickly to market needs offers competitive advantage. It is also pivotal for applications where quality is critical. For Safety critical systems the approach has shown the way for potential reuse of analysis and test results (Thompson and Heindahl, 2001). Reuse allows tried and tested techniques to be reused and thereby reducing the risk of failure in safety critical systems. Thompson (2001) further states that even though there are difficulties in properly defining the boundaries of the product family the approach would work. Research in software reuse has observed that the most successful reuse attempts have been achieved through collections of components with well defined domain boundaries. If a domain is mature, solution to a problem can be deduced easily without complex systems. A potentially larger return on investment lies in support for problems that have not yet matured. Let's take a peek at how this approach came into being and how it is employed in various organizations.

PRODUCT LINES: BEGINNING

Re-write introduction to SPL. Starting from the humble burger shops to airliners, product lines are ever present. When it comes to the literature, product lines did not appear until 1969. Tracing back its history, Parnas introduced the idea of program families, which became the foundation for family based engineering. Later a model of domain engineering called Draco (Neighbors, 1989) emerged which paved the way for major research into the area of software reuse and family based engineering. Further SEI or Software Engineering Institute expanded the research in the domain engineering field and named this area as product line engineering (Clements & Northrop, 2002).