Chapter 15
Positive and Negative Innovations in Software Engineering

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ABSTRACT

The software engineering field has been a fountain of innovation. Ideas and inventions from the software domain have literally changed the world as we know it. For software development, we have a few proven innovations. The way software is built remains surprisingly primitive. Even in 2008 major software applications are cancelled, overrun their budgets and schedules, and often have hazardously bad quality levels when released. There have been many attempts to improve software development, but progress has resembled a drunkard's walk. Some attempts have been beneficial, but others have been either ineffective or harmful. This article puts forth the hypothesis that the main reason for the shortage of positive innovation in software development methods is due to a lack of understanding of the underlying problems of the software development domain. A corollary hypothesis is that lack of understanding of the problems is due to inadequate measurement of quality, productivity, costs, and the factors that affect project outcomes.

INTRODUCTION

There are two kinds of innovations that are important to the software world: product innovations and process innovations. Product innovations involve developing new or improved products that will excite customers. Process innovations, involve developing new or improved methods of development that can shorten development times, reduce costs, or improve quality.

Innovations can be either positive or negative. Positive innovations are those that add value and have clearly defined benefits. Negative innovations are those that make situations worse, or which add to expense levels but not to perceived value.

In the software domain external product innovations and internal process innovations are at differing levels of sophistication. Even in 2008

very sophisticated and complex pieces of software are still constructed by manual methods with an extraordinary labor content and very distressing quality levels.

Another example of an imbalance between product innovations and process innovations can be seen in the migration of technology jobs from the United States to India, China, and other countries with low labor costs. Many sophisticated products designed in the United States are now being manufactured abroad because the U.S. has not been able to introduce internal manufacturing innovations in sufficient quantities to stay cost competitive.

However at the start of 2008, the continuing decline of the dollar against the Euro, the Yen, and other international currencies may become severe enough so that the United States becomes an outsource country with lower labor costs than most of Europe and parts of Asia. Also inflation rates abroad in much of Europe and even India are rising higher than in the United States. If these trends continue, within perhaps five years the cost advantages of international outsourcing may tip in favor of the United States.

External Product Innovation

The software domain has created scores of innovative products that have changed the way the world does business. Some examples of positive software innovations in alphabetic order include compilers, data base software, embedded software, graphical user interfaces, the internet, medical software, search engines, spreadsheets, web browsers, and word processors.

Unfortunately there have also been negative or harmful innovations. The most harmful of the external innovations from the software domain are computer viruses and spyware. Other negative innovations include pop-up ads, spam, phishing, and browser hijackers. The negative innovations have caused enormous problems and expenses for all users of computers. The negative innovations have also caused the creation of a sub-industry of anti-virus and anti-spyware companies.

Other forms of negative innovation include hacking and theft of corporate records. Identify theft is yet another form of negative innovation, and one which is becoming more and more common.

The term "phishing" has become prominent and refers to highly innovative methods of deceiving computer users into going to fraudulent web sites. The most common reason for phishing attacks is to lure users into revealing financial data, passwords, and confidential information by tricking them into thinking they are actually at the web sites of banks or government agencies when in fact the sites are merely replicas designed to look like the original, but created to route private data into the hands of identity thieves.

At the corporate level, a major negative innovation has been finding clever methods of hiding losses and exaggerating profits, as seen in the case of Enron, WorldCom, Arthur Anderson, Global Crossing and other large corporations. In recent years, negative innovations in finance and accounting have cost many billions of dollars.

Guarding against negative innovation is a major issue in the 21st century, and is likely to become even more important.

The measures and metrics for positive external innovation are standard business measures that include:

- Patents issued to employees
- Invention disclosures
- Technical publications
- Research and development spending
- Morale surveys of technical workers
- Market share
- Market growth
- Profit and revenue growth
- Customer focus group results
- Customer survey results
- Trade show editorial reviews
- Successful completion of government tests

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