ABSTRACT

Traditional software engineering methodologies have mostly evolved from the environment of proprietary, large-scale software systems. Here, software design principles operate within a hierarchical decision-making context. Development of banking, enterprise resource and complex weapons systems all fit this paradigm. However, another paradigm for developing software-intensive systems has emerged, the paradigm of open source software. Although from a traditional perspective open source projects might look like chaos, their real-world results have been spectacular. This chapter presents open source software development as a fundamentally new paradigm driven by economics and facilitated by new processes. The new paradigm’s revolutionary aspects are explored, a framework for describing the massive impact brought about by the new paradigm is proposed, and directions of future research are outlined. The proposed framework’s goals are to help the understanding of the open source paradigm as a new economic revolution and stimulate research in designing open source software.

Keywords: GNU Manifesto, GNU Public License, Open Source, Open Source Revolution, Paradigm Shift, Proprietary Source, Software Engineering Methodologies, Software Design Principles, System Architecture

INTRODUCTION

The open source revolution is having a dramatic impact on the computer industry. Web services based on open source technologies play a major role in the Internet. The Linux® operating system has achieved the dominant position within the embedded controller segment of the telecommunication industry. Recently, open source applications have passed Mac applications in penetration into the PC market. Why is this happening? Should we be surprised? Is this a major, self-sustaining phenomenon? This chapter proposes a framework for understanding the open source revolution by identifying a number of market forces driving the revolution and placing these forces within historical perspective. From the birth of open source—the
socialism of the GNU Manifesto—to the dominance of current Web services, we show that the open source revolution is a natural response, and part of a continuing effort by users to increase their returns from technology by controlling the market power of commercial software developers. The core argument is based on economics. As users pursue optimal economic returns of their software portfolios, they gravitate toward software solutions that limit the market power of commercial developers. An example of this is the movement toward more and more standards. The adoption of open source is a natural next step for users in the battle for the control of market power. Thus, the open source revolution is the current “front line” in the battle between software developers and users on how economic returns from technologies are allocated between the two. In addition, open source is shown to be a “disruptive technology” in the sense defined by Clayton Christensen in his “The Innovator’s Dilemma” (Christensen, 2003). This market force explains the “why now?” issue. As the current commercial software leaders’ effort for “sustaining technology innovations” exceeds the users’ ability to absorb new features and power, the seeds for the entry of a disruptive technology are sowed. Open source software fits all three criteria for a disruptive technology, which are discussed in this chapter. The disruptive technology framework is also used to provide behavioral and economic models of personal and organizational participation in open source development and delivery. It is important to note that a sweeping paradigm shift like this—the shift from proprietary code to open source—always changes the faces of winners and losers and the processes and the economic models, and, thus, will affect everyone in the industry.

Many discussions on open source software center on questions about what this “new” and “strange” idea is about. How could free source code ever work, isn’t its quality poor, and who would ever work on such a project? Yet the reality is that most computer users interact with open source technologies every day as Google, Yahoo and eBay all utilize open source software. Open source is a key component of the most dynamic segment of computing, the Internet. Almost 70% of Web page accesses are provided via the over 40 million Apache™ servers (Netcraft, 2005). This is a market share two and half times greater than the nearest commercial technology.

The dominance of open source Web servers is one example of a stealth paradigm shift (Kuhn, 1996) taking place and discussed in this chapter. And, let us make it clear that when we say paradigm shift, we are referring to the full scientific revolution concept defined by Kuhn.

Kuhn said that all the powerful stakeholders of the old paradigm will resist and belittle the new paradigm. It is with this insight that we start the discussion of a new, powerful force present today within the technology market. From this view we will be able to understand how the excitement of ever-growing success within the open source community co-exists with the skepticism and hostility of the established software community. This is the classic, painful process of an old paradigm being replaced by a new paradigm.

WHAT IS THE OPEN SOURCE REVOLUTION?

Any discussion of the open source revolution needs to begin with the observation that open collaboration, open publishing of findings, and building on the breakthrough efforts of others are at the heart of the scientific process. Society emerged from the Dark Ages and has experienced a 400-year period of accelerating technological innovation using this process. However, in the current climate of hyper-commercialization, ever-increasing amounts of research and innovation are closed-off in proprietary technology. The open source movement was born as a reaction to this trend and at its core is a return to the scientific method.

There is no question that the open source paradigm shift started as a social movement. However, it is our position that the open source
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