How Open Source Is Changing the Software Developer’s Career

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Software developers with open source project experience acquire verifiable technical expertise, peer-certified competencies, and positional power--advantages that align with companies’ need to obtain a competitive advantage.

Open source software development is adding skills to the labor market and offering the promise of increased salaries and job security to those with open source project experience. This trend is not surprising, given that open source software development has long overlapped with the commercial world. For example, a 2012 Linux Foundation study found that more than 75 percent of the Linux kernel is being developed on company time or with company sponsorship (http://golinuxfoundation.org/who-writes-linux-2012). A more recent independent study found that about half of all code contributions are being performed Monday to Friday between 9 a.m. and 5 p.m., likewise suggesting paid work. Clearly, this growing commercialization of open source is influencing software developer careers.

Moreover, the vast majority of successful open source projects are community owned, and community open source software is embedded in nearly all commercially relevant software today, open or closed source. The Apache webserver and Firefox browser are notable examples. Thus, most software products are building on community open source software. Apache CloudStack is a case in point.

Because of this embedding, the importance of open source for innovation and the software industry cannot be underestimated: a startup company can now launch a prototype relatively cheaply using free software and services. An example is the rapid growth of Sonatype’s Central Repository, which served nearly 8 billion requests for Java open source components in 2012 (www.sonatype.com/news/sonatype-secures-access-to-the-central-repository-for-component-based-software-development). With this growing dependence on open source software, companies increasingly need and want to influence the direction of its development. Software developers in important positions of economically relevant open source projects are highly sought after in the labor market.

To determine how open source is affecting software development as a career, we interviewed practitioners from 2011 to 2012 and reviewed pertinent literature. Our investigation revealed that respected open source software developers often enjoy higher salaries, greater job security, and a richer work experience. Their competitive edge stems from their verifiable skills, peer-certified...
COMPUTING PRACTICES

FIGURE 1. Three models of the open software development career ladder: the three roles on the left represent the simplest progression model. The center boxes show roles from the Onion Model. The box on the right builds on the Onion Model with individual tasks defined by Brian Behrendorf, Apache's primary developer.

competencies, and positional power. At the same time, the open source movement is leveling the playing field and reducing labor market entry barriers, making life more difficult for those software developers who lack open source competence or status.

Erich Gamma, co-recipient of the 2011 ACM Software System award for his work on the open source Eclipse platform, related his experience in hiring software developers:

... when I received the first job application with a link to a code contribution to an open source project, immediately followed the link, reviewed the code, invited the candidate for an interview round, and eventually made an offer. A link to a code contribution to an open source project is a great differentiator in a job application.

That said, participation in open source software development need not limit traditional pursuits. More often than not, it enhances the developer's corporate career and provides new work opportunities.

A NEW CAREER LADDER

In a traditional software development career, a developer enters the labor market and eventually finds employment at some company. A mature enterprise defines the developer's career ladder, and a step upward typically implies increased seniority, power, and salary. The developer might evolve a technical career into engineering or product management, or choose something entirely different.

Behind this corporate ladder, career steps in open source software development have emerged based primarily on the status the developer enjoys in one or more open source projects. Although distinct, the career ladders can be mutually supportive; skills gained in a traditional career are applicable to open source projects, and the reputation and status gained in open source projects can help the developer advance within the company.

Role progression

Figure 1 shows an individual's career path in open source software development. The simple three-role model (left) starts with a user, any individual (including a developer) who uses the software. As its name implies, a contributor is someone who contributes to the project, for example, by submitting a bug report or a code patch. A committer decides which contributions should be included in the project.

The Onion Model (center) subdivides these roles into eight categories based on participants' proximity to the open source project. People start outside the project as readers and passive users; then move to the project periphery as bug fixers, bug reporters, peripheral developers, and active developers (developers without commit rights); and finally enter the project as core members and project leaders. Other models more explicitly define these career steps. For example, Brian Behrendorf lays out a complex role migration process built on the Onion Model that specifies 11 tasks (Figure 1, right).

In a career ladder analysis, the focus must be on one's formal status within the open source project and power to determine its content, scope, and direction. Individual competencies to become an open source software developer are less important than ably fulfilling the roles of user, contributor, and committer.

User and contributor. Because open source software is free, anyone can be a user. The number of contributors is more restricted: a bug report or patch submission must be accepted as relevant before it can become a contribution, and a typical project rejects many patch submissions or pull requests (code contributions) as irrelevant. Achieving contributor status is thus an implicit promotion, albeit an unannounced one since no one but the contributor notices the role change.

Both the user and contributor roles come with little power, since they only involve requesting the project to make a particular choice such as to add functionality or decide on a supporting technology.
Committee. The committee role carries considerably more power. Committers are named for the commit bit in the project’s configuration management system (code repository). When the bit is set to true, that user is free to change the code base without permission. Users and contributors cannot write to the code repository; their commit bit has not been set. A committer can declare whether or not to include a contributor’s patch or pull request—quality assurance responsibility and power rolled into one.

Moving from contributor to committer is an important career step. Most mature projects restrict committer status to those with proven loyalty to the project, typically measured by prolonged activity as a contributor. In most cases, existing committers discuss a proposed committer’s merits and ultimately vote on changing that individual’s status. The Apache Software Foundation (ASF) and Eclipse Foundation have even codified most of the committer election process and, once committers have arrived at a decision, the foundation publicizes it, sometimes with great fanfare.

The advent of decentralized configuration management systems and services, notably GitHub and Atlassian’s Bitbucket, has sharpened the definition of committer from the arcane “someone with the commit bit set” to trusted project stewards. The traditional contributor-to-committee career step, however, remains an important event in a project, particularly those run by open source foundations.

In short, committers help lead a project and determine its direction. They perform important quality assurance and are indispensable in rallying contributors around project goals and motivating them to pick up development work.

From roles to foundations
In response to the rapid growth of commercially relevant open source software, foundations have evolved to ensure the stability of such projects—that they are valid intellectual property and evolve collaboratively—and to protect their developers from legal challenges. As such, these foundations have expanded the open source career beyond the committer role, adding stages and expanding management status. As Figure 2 illustrates, developers with committer status can join project management committees (PMCs), become PMC leaders, and even achieve foundation membership.

Before open source foundations, projects evolved without formal authority. Open source foundations now coordinate previously independent projects and start new ones. The ASF, Eclipse Foundation, and Mozilla Foundation coordinate many projects under their respective auspices to ensure that the projects are working together smoothly to form one or more viable software platforms.

Martin Erenkrantz, a former ASF president, remarked:

At the ASF, PMC members are recruited from project contributors. As recognized project stewards, all PMC members, including the appointed chair, wield significant power over the project through veto power.

This need for coordination has led to the creation of additional career steps, extending the committer role to management. In the role’s original scope, the committer reviews contributions and enters them in the code repository. As a PMC member, the developer helps determine the roadmap for one or more projects. As a PMC leader or one of several leaders, if a management committee has oversight for multiple projects, the developer gains even more power and influence.

The details of these final career steps vary by foundation, since only a few individuals can assume a PMC member or leader role. However, the steps always signify increasing power and influence. In the basic career model, a committer determines a single project’s direction, but in the extended model a developer in the final foundation member stage (management role) might influence an entire industry platform.

OPEN SOURCE COMPETENCIES AND STATUS
A software developer’s open source activities serve as a signal to prospective employers that the developer has a certain collection of competencies and development status, including verifiable claims to technical skills and peer-certified competencies as
well as demonstrated influence in a particular project.

**Verifiable technical skills**

An open source software developer performs work for everyone to see, showcasing to the public technical skills that are independent of a particular project and documenting them for any interested party. This transparency is in sharp contrast to closed source work, which no one but the employer can view.

A host of websites and services make it easy to evaluate a developer's reputation and open source work. For example, Black Duck Software's OpenHub.net provides a comprehensive assessment of a software developer's open source activities and how other developers relate to that individual.

**Peer-certified competencies**

A sufficiently large, well-working open source project validates a developer's competencies simply by making the developer one of its own. A hiring manager can gauge technical, social, and leadership skills through peer certification.

**Leadership.** A developer who becomes a committer, or better yet a PMC member, signals the makings of a project leader worthy of trust to inspire project members to persevere in meeting goals.

Robert O'Callahan, a distinguished engineer at Mozilla, commented on the value of open source contributions to corporate culture:

Open source contributors tend to believe in and practice the values that characterize successful open source projects, such as community, meritocracy, and transparency. Hiring those people strengthens those values within your corporate culture.

Thus, hiring open source developers can also be a means for embracing or strengthening corporate values of collaborative software development. This applies not only to open source software but also to firm internal or in-house software, where it can help tear down development silos.

**Position of influence**

In achieving committer status, a developer assumes significant formal power. Not only can contributors insert code without peer review, but they also can influence the project's tone, content, and strategic direction, including architectural decisions.

Such influence can be used within the project to lead and inspire collaboration, and it can also be projected externally—for example, to keep competing developers out of the project by causing their bid for committer status to be rejected.

The committer becomes visible within the community and often
A COMPANY THAT HIRES A DEVELOPER WITH PROVEN SUCCESS IN OPEN SOURCE WORK ATTRACTS OTHER COMPETENT APPLICANTS.

Beyond it. As a committee, a developer might become the project voice and be asked to publish project details or speak at conferences, for example.

NEGOTIATION POWER

Open source competency is a powerful negotiation tool for prospective employment. Companies look favorably on open source project participation, which can lead to higher salaries, greater job security, and a richer work experience.

Value of verifiable technical skills

As a general hiring rule, an applicant's skill set is commensurate with the salary the applicant can negotiate. However, one study has empirically validated that ASF committees have a higher salary than those with equivalent skills but no committee status. Another study found no such increase when looking at a broad array of open source projects, although most were not commercially relevant.

Even so, employers tend to give higher salaries to individuals who present less of a hiring risk. Managers who can view an applicant's sustained open source work will be more certain of the degree and nature of that individual's technical skills. Such confidence reduces the uncertainty discount that is part of any salary negotiation.

Comments from Marten Mickos, CEO of Eucalyptus and former CEO of MySQL, support this point:

"From a software vendor's perspective, open source work on a developer's resume ... shows that the developer has a genuine passion for writing software and a level of self-confidence."

developers even contributed to our open source projects, ... ramp-up time will be shorter and we know they are likely to be a better fit than an unknown developer. All of this leads us to prefer open source developers when hiring.

If the technical skills are from a project of commercial interest to the employer, the developer can expect even greater salary negotiation power. The value of verifiable technical skills accrues to contributors, committees, and PMC members and leaders alike, and is by far the most common benefit of open source work.

Value of peer certification

These with committee or PMC member status also get peer-certified for their work, making their recognized technical and social skills even more compelling and further reducing the hiring risk.

Rachel Chalmers of Ignition Partners, a boutique venture capital firm based in Silicon Valley, commented on the value of the work that open source software developers publicly perform:

"When we look at a startup, we look at the GitHub repositories and
"Dribbble and other Open Hubs. We drill down to the level of individual developers. It informs our investment decision. That fact alone gives open source software developers significant leverage when negotiating their position, salary, and benefits with startups."

Value of positional power

A committee in an open source project of value to an employer has positional power that other job applicants lack—the employer's products might be building on the project, for example. Regardless of the relevance source, employers reap a number of benefits from hiring an applicant with open source experience:

Future visibility. A committee is a project leader and thus has unique insight into the project's direction, which is strategically important to a company with products that build on the project or that offer a full foundation-managed platform.

Project influence. The committee is in a position to channel the company's work into the project and to lead and inspire outside developers to contribute work that aligns with the employer's strategic goals.

Increased attractiveness to other prospective hires. The committee's reputation attracts other developers, so by association the employer might be attractive to other competent developers, giving it a competitive edge.

Community goodwill. The committee's community visibility is a positive reflection on that individual's employer. Paying the developer to work on the open source project creates community goodwill.

Competence by association. Along with the developer's skills, the company acquires project competence. Trust in the company's products and services increases to the extent that they are related to the open source project, which helps the company's marketing and sales.
This increased insight, influence, and visibility are commercially pertinent to the company and hence afford the developer an improved negotiation position when it comes to salary and other job conditions.

Kai-Uwe Maetzel, an IBM employee in 2003 and later elected director of the Eclipse Foundation, observed:

Companies want to secure their influence on the Eclipse platform, and one way of doing so is by employing commiters to Eclipse projects. Increasingly, I see regular developers being hired with the goal of "making them commiters" within a few months.

LABOR MARKET INFLUENCES

Although contributors to an open source project are valuable, they are not scarce; many users become contributors and build a public reputation and without running into financial or educational barriers.

Comments by Richard Seltz, president of the Open Source Business Foundation, support this free entry to the labor market:

With diminishing barriers to entry, everyone can contribute to open source and earn a living. Both software vendors and IT user firms are increasingly turning to open source foundations as a means for organizing software development. This provides ample employment opportunity for software developers who are skilled in open source development.

In contrast, closed source software development is exclusionary. To join this labor market, a developer must purchase a license and undergo commercial training. Sometimes, access is possible only through a mediator, such as an employer or academic institution. For the most part, no such complications exist for open source software development.

In addition, open source and associated Web services have facilitated the growth of end-user programmers—people without formal computer science education who can complete lightweight programming tasks using scripting languages and perform Web design. These individuals are also competing with traditional developers in the labor market.

As more software products build on open source components, the importance of these components will only increase. Consequently, well-heeled and highly skilled software developers may face more competition from...
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Open source project participation is creating a new career ladder with tangible benefits for software developers and employers. As more products incorporate open source software, the overall developer labor market is becoming more competitive. Closed source software that once afforded wealthy Western developers some protection is giving way to open source projects that are eroding the expertise silo. In the future, people from low-wage countries that are not already in the developer market will join, intensifying competition. Developers with open source project experience will have the edge over those still relying on their closed source software development skills.