

Other Skills and Activities

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Pressman Ch 23, 28, 29

Notes

- Practice final is due before today's quiz, i.e. by the end of this slide.
- If you don't have a project 3 grade, I was not able to meet the pre-requisites needed to build and test at least part of your program. I need a volunteer from each group to take 5-15 minutes for a walkthrough to verify contents as of the last commit on the due date.
 - If any other groups would like to present a walkthrough to me as well, it would be welcome.
- For project 4, I will remove the *requirement* that your in-class presentation includes a software prototype demo. This is still *encouraged*, and again any kind of functionality is an adequate result of one sprint or less of work. If you do not perform a demo in class, you will need to take a time and give a demonstration to me individually.

Learning Objectives

- Preparation for other tasks required of practicing Software Engineers.

What do software engineers do? [Revisited]

- Write code.
- Design and architect programs to meet requirements.
- Test, troubleshoot, and maintain code.
- Integrate new and modified code with other developers' code.
- Communicate with product managers, customers, and others to ensure software meets users' needs.
- Track tasks being worked on, complete, and still pending.
- Work with other departments to meet company objectives.

What do software engineers do? [Revisited]

- Write code. **Most of the rest of Computer Science Dept curriculum**
- Design and architect programs to meet requirements. **Lectures 7-12**
- Test, troubleshoot, and maintain code. **Lectures 13-20**
- Integrate new and modified code with other developers' code. **Lectures 5-6 and Git/GitHub course activities**
- Communicate with product managers, customers, and others to ensure software meets users' needs. **Lectures 2-4.**
- Track tasks being worked on, complete, and still pending. **Lect. 21-23**
- Work with other departments to meet company objectives. **Today!**

Business Activities of Software Engineers

As a technical expert on the product:

Marketing content

Sales enablement

Solutions Engineering

Field Sales

Operations support

Product documentation

Education and training materials

Product presentations

As an employee with technical skills:

Research and data science

System administration

As a general member of the workforce:

Teambuilding

Interviews

Performance reviews

Security and trust measures

Company meetings

DEI and employee groups

Certifications and audits

M&A and reorganizations

Conferences and events

...and more

Company Objectives

- Most software companies exist to make money (you know, capitalism). They raise profits by increasing revenues and decreasing expenses and risk.
- Most companies will have business objectives or mission statements, as well as company values, principles, or virtues
 - Microsoft: ~~"A computer on every desk and in every home"~~ "To empower every person and every organization to achieve more"
 - Facebook: "To make the world more open and connected".
 - Google: "To organize the world's information and make it universally accessible and useful".
 - Keyfactor "To promote a world where all digital identities are trusted".
- So a software company aims to create profit by working toward its mission statement while maintaining its values. And typical software companies aim to convince customers that their software can help them do the same.
- There are many ways software engineers help achieve these goals, both by contributing unique skills and expertise, and by working with the rest of the company toward a common goal as part of the same team.

As a product expert

- Nobody knows the software better than the development team.
- Nobody is better suited with the technical skills to speak confidently with a technical audience who might have questions about the product.
- Nobody is better positioned to publish certain content that will make the software more visible and attractive to users.
- Nobody is better positioned to consult with staff in other roles to ensure alignment with product capabilities and expectations.
- Nobody has more expertise with the technology and domain involved with your product, independent of the product itself. This makes engineers valuable consultants as *Subject Matter Experts (SMEs)*.

Marketing Content

- Potential users need to be able to find your software and easily become convinced that it will meet their needs. Existing users need new features.
- Walkthroughs, how-to guides, and videos or blog posts on the product help users to see the potential of the product features.
- "Whitepapers" are documents published by the company addressing the technical domain related to the software that aren't directly related to your product. (e.g. I have whitepapers on cryptography and certificates without mentioning Keyfactor products).
- Peer-reviewed research raises organization's credibility.
- Media will seek comments and interviews from relevant experts for stories.
- Quality technical results that appear early in online searches for terms related to the company's business draw more customers (Search Engine Optimization or SEO).
- Companies may ask employees to share linkedin/social posts. It's good to participate, but too much corporate shilling degrades your credibility.

Sales enablement

- Sales staff needs to understand the capabilities of your product and what value they provide to users.
- This includes internal staff as well as technical alliance partners and channel distribution (reseller) staff.
- Understanding the best way to present the software as a simple solution to customers' real-world problems makes an enormous impact on revenue.
- At some point, you will be an expert on features you develop extensively and will be the go-to person for questions on related use cases and functionality.

Solution Engineering

- Customers don't intrinsically want to purchase and operate a new software product; they want an *engineered solution to a particular problem*. Your product may only be one part of this larger solution.
- With enterprise (business-to-business, or B2B) sales, the customer's question is "what money am I losing by not having software for this, and can I use the software for less money than I'm currently losing".
- For complex, expensive platforms, one piece of software could potentially be replacing an entire team of experts, but it needs to fulfill (or allow a much smaller team to fulfill) all of their responsibilities (and maybe more).
- Competing products that could solve customer's problems may work very differently, in which case the customer wants the solution that does the most, works the best, and costs the least.

Proofs of Concept

- When evaluating a software product, especially for a large multi-year contract, prospective customers want to verify that your solution will meet their needs (and better than competitors do).
- Customers may have unique requirements that a product does not do out of the box (or does not do easily) or that's never come up at other customers, and want to see how you propose to meet those requirements as part of due diligence before signing a contract.
- Software engineers can be invaluable in writing extensions, API clients and adapters, software integrations, automated scripts, other prototype components, and "smoke and mirrors" that show how your product can (or could) be made to meet their needs.
- Software engineers can also provide an authoritative voice explaining why customers can't do what they want or what it would entail.

Field Sales

- The role of a "Solutions Engineer" or "Sales Engineer" is to develop & maintain clients' confidence in their technology as the best solution.
- Software engineers' product, technical, and subject matter expertise make them excellent candidates to be included in product pitches, sales calls, and onsite visits with prospects in addition to Solution Eng.
- This can reduce communication barriers between stakeholders resulting in a more efficient business, happier customers, and ultimately more revenue.
- It is especially beneficial to include engineers that may be involved in proof-of-concept engineering work for a sale.
- This is my current job function as "Lead Field Software Engineer".

Operations Support

- Software products can be extremely complex, with operating environment requirements, bugs, limited documentation, and other sources of frustration.
- The operations team at a company works to make sure existing customers and newly-signed customers get what they're paying for.
- This includes software deployment and onboarding, training, license renewals & upgrades, and responding to customer support requests.
- Software engineers may help with troubleshooting installation issues, answer customer questions that the operations team isn't equipped to handle, and communicate with customers about bugs and bug fixes

Documentation, Training, and Presentations

- Users and prospects need to figure out how to use your software. Ideally, competent technical writers have been involved for the whole project, but there may be some sections that engineers' expertise may be needed for, and engineers may need to review for accuracy.
- Many companies will also produce training and education documents or videos for various stakeholder audiences, and engineers may similarly be involved with this.
- Software needs to be shown to different stakeholder audiences, sometimes on short notice, and engineers are frequently relied on to demonstrate functionality they've recently developed – within the team, to the larger company, & to external stakeholders & the public.

As an Employee with Engineering Skills

- As previously discussed, everyone has tasks that could be automated.
- A lot of data analysis tasks useful for budgeting and company decision-making require some amount of code.
- Research into possible solutions to new problems relies on technical understanding.
- Especially at smaller companies, software engineers may wear other hats as a system administrator and tech support for other, less computer-savvy coworkers.
- Even when software engineers don't have to take on anyone else's IT problems, you may have significant administration work managing your own environment or an environment shared by the dev team.

Security and trust measures

- Companies really care about keeping their systems and data, as well as their customers', safe from rogue or malicious actors.
- It's common to require all employees to go through "security training" periodically, which may consist of online videos, games, and quizzes.
- Some policies ("scan your badge every time you go through the door") apply to everyone, but software engineers may have additional role-specific requirements and training:
 - Codebase is one of the company's most valuable assets. Since you have access to it, that's a target for attackers.
 - Most attacks at some point go through the company's IT system. Developers have more sophisticated work environments that may present additional risk exposure (e.g. may be admins on their own workstations).
 - Some security measures only apply to developers (e.g "keep VMs patched")

Other Activities Within a Development Team

- Teambuilding – Development teams usually get budget for events like happy hours, movie nights, and occasional outings (e.g. Cedar Point, Dave and Busters/Scene 75). This is a great way to build better relationships with teammates and foster more communication – you're more likely to seek help from someone you're comfortable with. They're supposed to be fun, too, and usually free.
- Interviews – At some point, you'll be on the other side of the interview table. Consult with your manager, team, and Google on effective (and legal) interviews.
- Performance reviews – Most companies do reviews annually, sometimes more often in the first year. You should track your accomplishments ("implemented __", "contributed to sale for __", "devised a solution for __") *as you do them* to prepare for this.

Other Team Activities Directed by Company

- Process improvements – Companies like their business units to be efficient and make the best use of their resources. Your management team should periodically collect feedback and review process limitations, but taking the initiative yourself to improve on this are usually welcome (remember you have the skillset for automation).
- Certifications and audits – Companies, customers, insurance providers, and more may require developers, products, teams, or organizations to meet certain standards and verify compliance. Reviewing SCM system and external code reviews are common.
- M&A and reorganizations – Major developments in the company's business strategy can have substantial impacts on the software portfolio, roadmap, and dev team, but are fortunately infrequent.

Other Activities Coordinated with Coworkers

- Diversity, Equity, and Inclusion (DEI) – Many companies have stated goals to provide an inclusive work environment (beyond the legal requirements), and except for very small companies will have HR staff dedicated to related initiatives, but they will regularly look for input from employees across the company to ensure perspectives from different demographics, and a process for collecting feedback.
- Employee Resource Groups (ERGs) – Some DEI initiatives will be coordinated with a representative employee group (created and led by employees) - e.g. Keyfactor has a women's network, LGBTQ+ group, and veterans group.
- Social groups may form based on common interests, like video games.
- Company events like march madness, holiday food drives, etc frequently depend on employee initiative. This is a good way to build relationships across departments.

Other Employer Expectations

- Company meetings and reports – Companies will have periodic "all-hands" meetings, internal newsletters, and similar mechanisms to share information across a business. Product updates, project schedules, and software demos may be part of this, and it's important to understand what's going on in the rest of the business.
- Time and expense tracking – Accounting teams make a significant distinction between "Cost of Goods Sold", where your labor is directly tied to new revenue, and "R&D/operating expenses", and software engineers may need to carefully track which is which. Some of your time may also be billed toward specific client contracts.
- Workspace management – Maintaining an elaborate environment of physical and virtual machines, remote servers, and other infrastructure can be time-consuming. Simplify and automate what you can.

Other Activities in the Discipline

- Conferences and events – Many engineers have opportunities to attend, and sometimes present, at conferences and other events related to their business (e.g. computer security events include RSA Conference, Black Hat, Defcon, etc.)
- Industry associations and trade groups – There aren't any popular software developers unions, but some engineers may wish to participate in the ACM, IEEE, IETF, or domain-specific groups, (e.g. PKI policy is largely set by the CA/Browser forum, which we participate in).
- Open-source contributions and outside projects – What's much more common than active participation in IEEE or other trade groups is to actively participate in open-source projects, writing/reviewing code and/or making decisions in a steering committee or working group. In some cases this can be paid company work. Some companies will also allow limited time off for contributions toward a non-profit charity/cause.
- Consulting – Software engineers frequently get asked for technical advice on other projects. You can get paid to answer questions even with no coding!
- Guest lectures – For example, I'm teaching this class as a full-time software engineer with employer support. Public speaking skills are very helpful.

Summary

- Software engineers are expected to participate in a wide range of activities outside of writing code, even outside of the software development project lifecycle.
- Software engineers are leading experts on some aspects of the programs they write, and this makes them a great resource for other areas of the business like sales, marketing, and support.
- Software engineers bring a lot of valuable experience and skillsets that can be applied to provide value to the company in other ways.
- Some aspects of the workforce affect software engineers differently, such as company security training.
- Many software companies are rich workplaces that enable their engineers to succeed at a wide range of tasks. Find a good fit for you.
- Software engineering offers exciting opportunities beyond your employer.

References

- JD Kilgallin. Personal experience.
- *Next lecture will have minimal examinable content, which will be available in the slides and clearly labeled.*
- *Happy Thanksgiving/Black Friday/World Cup!*