Developing Your Software Engineering Career

Words of Advice From Seasoned Professionals

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IN TODAY'S RAPIDLY evolving digital landscape, the demand for skilled software engineers has soared to unprecedented heights. As technology continues to shape the way we live, work, and connect with one another, the role of software engineers has become paramount in driving innovation across industries. From developing groundbreaking applica-

work is opening up even more opportunities for software engineers for whom relocation is not an option. With the increasing adoption of a "technical track" at companies, there are now opportunities available for engineers who wish to advance their career without transitioning to management. At the same time, since the pandemic we

his original specialty—mainframe programming—toward more current technologies. Successful and sustainable software engineering careers last decades and span multiple boom-and-bust cycles. As seasoned professionals, by way of introduction to this special issue on developing your software engineering career, we offer some humble words of advice.

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tions and designing robust systems to optimizing user experiences and solving complex problems, software engineers are at the forefront of creating the digital solutions that power our modern world.

A career in software engineering offers an exciting blend of creativity, analytical thinking, and problem solving. However, the path to becoming a successful software engineer is not without its challenges. As technology evolves at a breakneck pace, software engineers must continuously adapt and acquire new skills to stay relevant in the field. The abilities to learn quickly, think critically, and collaborate effectively are essential traits for navigating the ever-changing landscape of software development. For this reason, for the practicing software engineer, it is the best of times, and it is the worst of times. Software engineering is one of the most in-demand professions in the economy, and the rising acceptance of remote

have become increasingly aware of stories about hiring freezes and layoffs at tech companies. In addition, we continue to hear stories about burnout, with people choosing to leave software engineering altogether. And, while not a recent phenomenon, the software engineering interview process continues to be a source of anxiety and frustration for candidates. It is a turbulent time to be a professional software developer, but this is not the first upheaval in the technology sector's short history.

While this recent downturn may spark fear in the hearts of software professionals just beginning their careers, it can be viewed as another iteration in the boom-and-bust cycle that has long characterized the tech industry. In fact, some of us began our careers during a previous downturn; and, as a teenager, one of us witnessed the evolution of her father's software engineering career as he worked to move from

Job Satisfaction Is Shaped by Everyday Factors

Reflecting on our careers, there are three factors that we have found to have a surprisingly large impact on job satisfaction: who your manager is, who your teammates are, and the nature of the day-to-day work. You'll feel the influence of these factors viscerally each day that you work.

You Might Need to Try Different Roles

We humans aren't very good at predicting what will make us happy. You may aspire for a particular role but, once having achieved that role, discover that you don't actually enjoy it. One of the advantages of our field is that it is common to change employers and roles. We know several professionals who have changed from individual contributor to manager and then back to individual contributor again. The penetration of software into almost every industry and field also means that there is a huge selection of problem domains in which software engineers can work. The degree of specialization in technical roles means that individual contributors have a lot of choice in the nature of the work that they do on a day-to-day basis.

Different-Sized Companies Face Different Challenges

There are many different types of organizations out there: start-ups, small-and-medium-sized businesses, large enterprises, government organizations, academia, and nonprofits. Depending on the context and stage of life of an organization, the type of problems you face will be very different. An employee at a start-up will have to wear many different hats, whereas the employee at a large enterprise will need to coordinate effectively with multiple teams. You'll need to identify which sort of challenges are a good match for your own interests and skills. For example, larger organizations are more likely to depend on written communication for coordination work, whereas smaller organizations are able to get away with more informal communication.

Build a Strong Foundation

Master the fundamentals of computer science and software engineering principles. Develop a deep understanding of data structures, algorithms, object-oriented programming, and software design patterns. A strong foundation will empower you to solve complex problems efficiently and enable you to adapt to different technologies and programming languages.
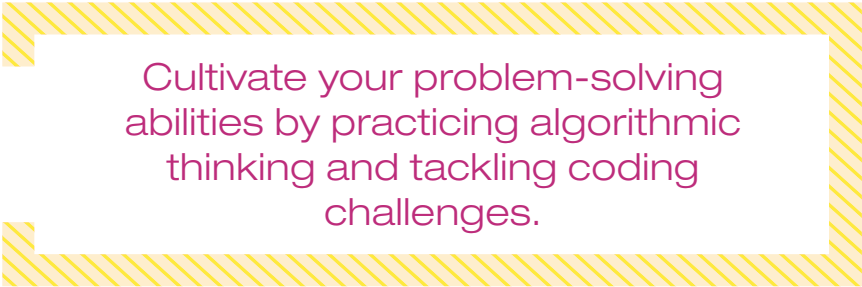
Collaborate and Communicate Effectively

Software engineering is a collaborative endeavor. Develop strong communication skills to effectively express your ideas, listen actively, and collaborate with team members. Be open to feedback, learn from others, and foster a positive working environment. Effective communication and collaboration are key to successful software projects.

Develop Problem-Solving Skills

Software engineering is all about solving problems. Cultivate your problem-solving abilities by practicing algorithmic thinking and tackling

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coding challenges. Several platforms, like LeetCode and HackerRank, offer a wide range of coding problems to sharpen your skills. Additionally, seek opportunities to solve real-world problems through personal projects or involvement in open source initiatives.

Seek Mentorship and Be a Mentor

Find experienced professionals who can guide and mentor you in your career. Mentors can provide valuable insights, share their experiences, and help you navigate the challenges and decisions you may encounter. As you progress in your career, consider becoming a mentor yourself. Sharing your knowledge and experiences with others not only helps them but also deepens your own understanding and expertise. Mentorship does not always have to happen under the auspices of an officially designated mentor–mentee relationship: perhaps you already have functional mentoring relationships that you can grow further.

Never Stop Learning

Software engineering is a field that constantly evolves with new technologies, frameworks, and methodologies. Embrace a lifelong learning mindset and stay updated with the latest industry trends. Invest time in taking continuing education and online courses, attending conferences, and exploring new programming languages or tools. This commitment to learning will keep your skills sharp and enhance your career prospects.

Find Balance

Burnout is a common problem in the technology industry, and many software engineers face it at some point in their careers. The intensity of software engineering work plus the need to keep abreast of a constantly changing industry can add up to a lot of pressure. Most of us do not thrive on a constant grind of work and work-related learning. Cultivate reasons to log off at the end of the day: it's better for the longevity of your software career, and, as an added bonus, you will find that the solutions to your thorniest work problems will often coalesce while you are doing something unrelated.

Overview of Articles in This Special Issue

This special issue covers a broad range of topics related to achieving

a fulfilling career as a software engineer across the entire career lifecycle, from obtaining that first job in the field to senior-level advancement. We received a significant number of high-quality submissions and were able to accept 10.

In the article by de Souza Santos, Stuart-Verner, and Magalhães,[A1] the authors describe a qualitative study that explores the perspective of transgender software professionals, touching on issues such as career choice, interactions with coworkers, and how work experiences influence the resulting software products.

Fritzsch, Wyrich, Bogner, and Wagner[A2] examine the phenomenon referred to ironically as *résumé-driven development*. Using survey data, they look at how trendy technologies are perceived from the points of view of both hiring managers and applicants for software engineering positions.

In the article by Sonsoles López-Pernas, Enrique Barra, Aldo Gordillo, Álvaro Alonso, and Juan Quemada,[A3] the authors describe the impact of introducing a bot to provide formative feedback for students studying software engineering through MOOCs. MOOCs provide a potential solution to the chronic shortage of software engineers, but it is difficult to scale the feedback process to a large number of students. The researchers found that the feedback bot appeared to be effective in improving the performance of a significant number of students.

Isadora Cardoso-Pereira, Geraldo Gomes Cruz-Júnior, Danilo Monteiro Ribeiro, Alberto Tavares, Danilo Lucena, and Gustavo Pinto[A4] discuss a bootcamp provided by a company to train incoming software developers with disabilities. By analyzing the participants' experiences,

the authors propose recommendations for organizing similar training programs.

In the article by Hüseyin Ünlü, Ozan Raşit Yürüm, Özden Özcan-Top, and Onur Demirörs,[A5] the authors present the results of a survey aimed at practitioners who have traditional software backgrounds versus practitioners who switched careers through certifications and other nonstandard education paths. They found that practitioners with non-software-related backgrounds face more barriers, fewer benefits, and less satisfaction in the field, but these differences reduce with long-term experience or after completion of a software-related graduate program.

Ronnie de Souza Santos, Luiz Fernando Capretz, Cleyton Magalhaes, and Rodrigo Souza[A6] compare the experiences of software professionals with the perceptions of undergraduate students regarding careers in software testing. The objective is to increase awareness about the importance of adequately preparing testing skills in academia and rewarding these skills in industry.

In the article by Nils Moe, Viktoria Stray, Darja Šmite, and Marius Mikalsen,[A7] the authors present a case study conducted in an organization that underwent an agile transformation and subsequently transitioned to remote work because of the pandemic. The return to office or adoption of a hybrid work model posed novel challenges in terms of team cohesion and job satisfaction.

Anthony Wasserman[A8] describes his experiences running a graduate-level course geared toward preparing software engineers for management roles, which he ran for six years at Carnegie Mellon University Silicon Valley. He describes his methods for enabling his students to "think

like a manager," when their education and careers to date have focused on individual technical work. Not all of Wasserman's students go on to become managers, but the course broadens their perspective on the software industry and their careers.

In the article by Iñigo Luja Beraza, Juan Manuel Vara, David Granada, Cristian Gómez, and Francisco Javier Pérez-Blanco,[A9] the authors examine the existing literature and provide answers to questions regarding the impact of project management certifications. Specifically, the article investigates the extent to which these certifications contribute to project success and the benefits they offer to those who pursue them at a significant cost in terms of time and money.

The article by Andrei Furda, Alessandro Soro, Erwin Fielt, Nicola Bartlett, Colin Fidge, Jesse Steineck, and Lionel van den Berg[A10] explains how a major Australian university is partnering with the local IT industry to better prepare IT students for the start of their careers in software engineering through real-world industry projects. The article presents experiences from three viewpoints: that of the education provider, an industry partner, and a recent graduate.

The task of editing this special issue was both challenging and exciting. As technology continues to evolve and shape our society, software engineers remain at the forefront of innovation—solving complex problems and creating the digital solutions that drive progress. This special issue has shed light on the vast possibilities and potential inherent in a software engineering career. We hope that the content presented here can inspire and motivate

software engineer practitioners in the years to come. 🔷

Appendix: Related Articles

A1. R. de Souza Santos, B. Stuart-Verner, and C. Magalhães, "What do transgender software professionals say about a career in the software industry?" *IEEE Softw.*, vol. 40, no. 5, pp. 34–40, Sep./Oct. 2023, doi: 10.1109/MS.2023.3257743.

A2. J. Fritzsch, M. Wyrich, J. Bogner, and S. Wagner, "Resist the hype! Practical recommendations to cope with résumé-driven development," *IEEE Softw.*, vol. 40, no. 5, pp. 41–49, Sep./Oct. 2023, doi: 10.1109/MS.2023.3277034.

A3. S. López-Pernas, E. Barra, A. Gordillo, Á. Alonso, and J. Quemada, "Scaling student feedback in software engineering massive open online courses," *IEEE Softw.*, vol. 40, no. 5, pp. 50–57, Sep./Oct. 2023, doi: 10.1109/MS.2023.3275035.

A4. I. Cardoso-Pereira, G. Gomes, D. M. Ribeiro, A. de Souza, D. Lucena, and G. Pinto, "Supporting the careers of developers with disabilities: Lessons from Zup Innovation," *IEEE Softw.*, vol. 40, no. 5, pp. 58–65, Sep./Oct. 2023, doi: 10.1109/MS.2023.3282544.

A5. H. Ünlü, O. R. Yürüm, Ö. Özcan-Top, and O. Demirörs, "How software practitioners perceive work-related barriers and benefits based on their educational background: Insights from a survey study," *IEEE Softw.*, vol. 40, no. 5, pp. 66–75, Sep./Oct. 2023, doi: 10.1109/MS.2023.3270959.

A6. R. de Souza Santos, L. F. Capretz, C. Magalhaes, and R. Souza, "Myths and facts about a career in software testing: A comparison between students' beliefs and professionals' experience," *IEEE Softw.*, vol. 40, no. 5, pp. 76–84, Sep./Oct. 2023, doi: 10.1109/MS.2023.3267296.

A7. N. B. Moe, V. Stray, D. Šmite, and M. Mikalsen, "Attractive workplaces: What are engineers looking for?" *IEEE Softw.*, vol. 40, no. 5, pp. 85–93, Sep./Oct. 2023, doi: 10.1109/MS.2023.3276929.

A8. A. I. Wasserman, "Preparing software engineers for management roles," *IEEE Softw.*, vol. 40, no. 5, pp. 94–99, Sep./Oct. 2023, doi: 10.1109/MS.2023.3266700.

A9. I. L. Beraza, J. M. Vara, D. Granada, C. Gómez, and F. J. Pérez-Blanco, "On the impact of project management certification for software projects and practitioners," *IEEE Softw.*, vol. 40, no. 5, pp. 100–107, Sep./Oct. 2023, doi: 10.1109/MS.2023.3286118.

A10. A. Furda et al., "Jump-starting software engineering careers," *IEEE Softw.*, vol. 40, no. 5, pp. 108–115, Sep./Oct. 2023, doi: 10.1109/MS.2023.3283278.

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