

SEI Podcasts

Conversations in Artificial Intelligence,
Cybersecurity, and Software Engineering

The Importance of Diversity in Software Engineering: Suzanne Miller

Welcome to the SEI Podcast Series, a production of the Carnegie Mellon University Software Engineering Institute. The SEI is a federally funded research and development center sponsored by the U.S. Department of Defense. A transcript of today's podcast is posted on the SEI website at sei.cmu.edu/podcasts.

Palma Buttles-Valdez: Welcome to the SEI Podcast Series, a production of the Carnegie Mellon University Software Engineering Institute. My name is [Palma Buttles-Valdez](#), and I am the director of the SEI Office of Diversity, Equity, and Inclusion. Joining me today is [Suzanne Miller](#), a software developer and principal researcher in the SEI Software Solutions Division. Today we are here to talk about and learn about Suzie's experiences and work in technology, transition, and adoption of Agile and Lean methods. Welcome, Suz.

Suzanne Miller: Hello, Palma. It is good to talk with you. We have had lots of fun together over the years.

Palma: Yes, we have. It is a real pleasure to talk to you today formally. You have been a guest on our podcast series before and a host of several podcast series. The chairs are a little bit turned for you today. Let's begin by having you tell our audience a little bit about yourself and the work that you do here.

Suzanne: My name is Suz Miller. I have been at the SEI, except for three years, since 1992. I started actually as what we call the resident affiliate in that time frame. I was working for [Lockheed Missiles and Space](#). I was essentially donated, if you want to think about it that way, to the SEI for nine months to work on the [Software Capability Maturity Model, version 1.1](#). That was my first contact with the SEI. Before that, my first 12 years in defense were with Lockheed, and I did a myriad of things, some actual software development. But I actually realized early on that I am better at dealing with people than I am at dealing with binary. I moved into several positions related to software quality engineering and software process improvement, which is what got me connected to the SEI. I have been at the SEI since '92. I did spend three years with an Irish software company. That was my sole sojourn into the commercial space. I realized that I am not somebody who is motivated by profit. I am motivated by mission. I came back to the SEI after that, and I have been here since here since 2001, primarily researching, since that time frame, technology transition, as you say. What is it that makes technologies adoptable, and what is it that helps people to adopt them, and then applying those kinds of principles to Agile and Lean, systems of systems, all kinds of other things. One of my tag lines about myself is that I am a twenty-first century cartographer. I map things out for people and help them to get to where they want to go. That is what I love to do. I love the SEI, the variety of things I have been able to do here. I have worked on capability maturity models. I have worked in COTS-based systems and systems of systems and Agile and Lean. I am starting to get a little bit into [artificial intelligence engineering](#). It has been wonderful because I don't have much of a chance to get bored. Bored Suzie is not a good thing. There you go. That is me, in a nutshell.

Palma: OK. Today we are going to talk about the importance of diversity, but, before we do that, I would like to talk to you a little bit about your early years. What or who influenced you to pursue a career in computer science?

Suzanne: It has to be my dad. My dad who is 94 and still programs, just so you know. He was in the Air Force up until I graduated from high school. When I first went to college, he got his first [TRS-80 Model III](#) and started playing around with that. He had been doing software programming as part of his astronautics and orbital mechanics kind of work, which was his specialty area. I know this is not going to sound right, but I was initially totally bored in computer science because he got me to go into the computer science program at [UC Santa Barbara \[University of California, Santa Barbara\]](#). I was like, *Why am I doing this? This is so boring*. And he said, *It is boring now because you don't know enough*. And he says, *It gets interesting once*

you know enough to do things. Of course, I was a freshman. I didn't listen to him. So I switched over to ergonomics, the study of humans and computers. That is kind of where the human thing first started for me. But that was also the beginning of a discipline called [human factors engineering](#). Through that—and UC Santa Barbara was a pioneer in that area. Through that, I was able to get into sort of human factors engineering. My last year in college was when the world moved from cards for writing out computer programs, typing out computer programs, and batch submitting them, to actual terminals, green screens, as we call them now. We were actually able to use video to type in our programs and get a faster turnaround than cards. I won't say it was real-time like we have today. In that last year it is kind of when I came back in to say, *OK, now, this can be fun.* But the biological, the ergonomics, was a really nice mix of biological systems and physical systems, kinds of engineering stuff, which really suited me because there are people that will disagree with me, but I actually think biological systems are way more complex than mechanical systems, even AI-based systems. That complexity really caught my interest. The sort of, *How does a human brain work?* was a big part of my interest. I was lucky enough when I graduated to get a job at [Lockheed Missiles and Space](#).

Bob Bowles, my first supervisor, was my other sort of mentor in this area. He hired me to do programming display visualizations using Fortran display, a library of Fortran. That language that allows you to do graphics, which was not an easy thing to do back in those days. I am like, *I have never done this. Why are you hiring me?* I asked him, I said, *Why are you hiring me? I have got Fortran in my background, but I mean I have never done anything like this. I have never worked in missiles and all that stuff.* He says, *You graduated with a high GPA.* And he says, *And you were a Regents Scholar,* which he was, like, the only person I would ever meet that even knew what that was. It was a scholarship that I got from the University of California. He says, *Every Regent Scholar I have ever known, don't care what it is. I wouldn't care if you were a history major because I know you can learn.* That was what he was looking for, somebody that he could teach the things that were important to what we were doing there. He was the one that set me on the path of, *What have you got to lose? Let's learn about it, and see what we can do with it.* My first couple of years at Lockheed really were about learning, learning different languages, learning how to do different things. In addition to sort of the programming stuff that I did, he had me do the overhead budget for our division. That was one of the responsibilities of our branch. In having to do that budget, I had to talk to people all over the place, which, I wasn't conscious of the fact that I am pretty much an extrovert at that time. I am conscious of it now, certainly. But yes, I had to go out, find people, talk to people, build relationships, get them to

give me the data. So he was also schooling me in that side of things. I really credit him with a lot of the, *Who cares if I don't know it, I can learn it*. My dad was also in that a lot of that same, *You could learn anything*. Those early influences I think were the ones that really kind of set me on the path to, *This is new and wonderful, and I'll just learn about it*. I did not have the typical fear of failure because I knew that if something didn't come out right, Bob had my back, and we would fix it. We would figure out how to do it better the next time. That has really helped me through my whole career. I learned two things. One is don't fear failure and know who has your back. If you have got somebody in your chain of command that has got your back, you could go off and do anything. That has kind of been what I did. I worked in submarine missiles for a while. My first job in actual technology adoption is I was the technology consultant for our division director. When I got my master's degree, I moved over to the satellite world and did satellites and helped to stand up the software quality engineering office at Lockheed Missile. That is what got me into contact with the SEI, and eventually led me here. But my dad and Bob Bowles, those are the ones that really did it for me in terms of really getting me to a place where... I had to think about that question when you sent me the question list. I had to think about that because there are a lot of other people who will also have influenced me. But those two are the ones that really set me on the path that I am on today.

Palma: It sounds like they both really invested in your success. Interestingly, Suz, I think that the gentleman from Lockheed Martin really gave you a broader perspective of business.

Suzanne: Yes, he did.

Palma: That is a really interesting way of building somebody up for their career.

Suzanne: The thing that was really interesting about that job in that group. I was 20 years younger than anybody else in the group. There wasn't just diversity in relationship to gender and other things but diversity in age. I was the young whipper snapper, and my colleague, Deb Salisbury, and we were hired a week apart. We were the young whipper snappers, and everybody was older than we were. That was part of the learning was learning how to bridge that age gap. Lockheed also had an interesting thing that leads into some of the diversity stuff. When I was there they had a practice—I don't know if they have it today. But that time they had a practice where, when you signed a memo, at the bottom of the memo, you didn't use your first name. You used your initials and your last name. If you didn't know the person, if

you are just reading something that somebody sent you, unless you already knew them, you don't have any idea who they are. That was an interesting practice that, at the time I didn't think anything about it. That is just what we do. *That's the standard practice at Lockheed. Okay, fine, whatever.* Later, as I became more aware of some of the things going on in the world of trying to get different kinds of people into engineering, I was, like, that was actually pretty forward-looking in terms of one of the very simple ways to reduce the gender bias.

Palma: That is interesting. It would be interesting to see if they still do that today.

Suzanne: Yes. I should look.

Palma: I have a question for you, Suzie, based on I have spent a lot of time in academia, and I know today that people tend to really focus on an area, and they don't have that holistic perspective. You talked about the benefits that you were given by working at Lockheed Martin and your mentor there who kind of rounded you out in giving you insight into other perspectives. A student coming in and maybe just joining an organization, they may not understand the budget piece or other aspects of running a project. Any advice to someone on how they might reach out to colleagues or find out who they talk to about learning this more well-rounded component of business?

Suzanne: So Palma, I am going to go back to actually earlier than when I started my career. I am going to go back to my education because that interdisciplinary education that I got from ergonomics, biology, engineering, physics, math. All of those things together made me appreciate that holistic view of things and made me ready. When Bob gave me the opportunity to be more holistic, I was ready to take it. I really think that we have got a big focus on STEM right now, science, technology, engineering, math. It should really be STEM-C, right? STEM plus communication. Because if you can't communicate effectively your ideas to people who are not part of your little tribe, you are not going to get your research proposal accepted. You are not going to get your business proposal accepted in your organization. You are not going to be able to do the things that you actually know how to do, but you need to know how to communicate them to people that are not deeply involved in your discipline. That is one of the things that I would say: If you are in college, take the comms classes and pay attention to them. Don't just write them off. I know in my day we've all had a tendency to do that, but take those classes, learn from them. When you get into business, look for the

opportunities where you can write, where you can speak, where you can use those communication skills to get your point across when you are trying to make something happen because that is really what we all want to do is we want to make something that we believe can happen.

Palma: Interesting. We are going to go back into the computer science side and talk about lack of diversity in computer science and computer science diversity can include... We are fortunate to be part of Carnegie Mellon University, which has one of the largest enrollment of women in computer science, but across our nation and across the world in general, it is not always an option or something that women might consider. Any advice or things that you think about, that we can use to address the lack of diversity in computer science?

Suzanne: One of the things I see in the generation... I have nieces and nephews that are sort of trending out of high school into college. That is the population that I look at. I have a niece who wants to be an aerospace engineer. She wants to design airplanes. One of the things that her parents did that I thought was really good is, in addition to the clubs and things like that she was part of, they also encouraged her to be involved in something physical. It didn't have to be a sport, she ended up being a flag twirler for the color guard, but still very physical, very social, very not science, right? I think part of it is making sure that children have that balance.

I also know people from that age group that all they think about is the computer, and their social life is on the computer. They are playing video games with their friends in New York or wherever. They are not really getting the diversity of experience in the world to be somebody who is going to be able to function in a social setting. Even with as much remote work as we are doing today, we still have social settings around work, and we still have to be able to do that. One thing is balance. I would say, if you are interested in computer science, go for it, go there, but give yourself some balance. Don't make that your total 100 percent focus because you are going to need the social skills as well. The other thing I will say is, if anyone tries to make you afraid of math, find another teacher or find a tutor. Math is not just something that supports computer science, it supports so many disciplines. Everyone in my family was good at math. I had one brother who had a teacher that was just not good at teaching math, is the way I think about it. He had a really hard time with math. He sees all his brothers and sisters who are having no problem at all, and he is having problems. Dad figured out, it was really the teaching. Giving him some tutoring helped him to get... He had to get past being afraid of it. That is what bad teaching sometimes does. It

makes you afraid of that thing because you think you are never going to be able to master it. Don't let anybody ever make you afraid of math. I will never forget my fifth-grade math teacher. I was in Catholic school. Her name was Sister Francis Mary. For every section that we went to, she had songs that she had written about some aspect of that. She would teach us the songs. Then we would do whatever it was we were doing, the distributive principle or whatever it was we were studying. The fact that you could turn math into a song immediately reduced the barrier for so many people in the class that probably would have been much more hesitant about those math skills if she hadn't done that. It is one of those things that, at the time, it was just something she did. But later in life, I went, *She was brilliant. She was a brilliant teacher.* To the extent that you can find the brilliant teachers, go for it. But even if you can't, there are online academies. There is the [Khan Academy](#). There are all kinds of things now that if the normal school venue is not where you are getting the good teaching, you can get that on your own, and it is fantastic. Don't be afraid of math.

The other thing I would say to people that are not typically drawn to the sciences... Probably one of the reasons that I stayed in this field is this is where you change the world. Science is both the source of some of our problems. I won't say that it isn't, but it is also the source of many of our solutions. The more people that are well versed in scientific principles, in mathematics, in the ability to use logic, in the ability to problem solve, to use a hypothesis and test it. The more people we have like that, the better chance we have at solving many different kinds of problems, even ones we don't even know about yet. This is where you can change the world. And so, if you have that kind of passion, then the sciences, whether it is computer science or one of the other sciences, is the place to go.

Palma: I was gonna ask you about advice for younger women starting out. But I think I want to switch this up a little bit because you kind of are harking onto mission as something that can drive women or anyone into the sciences. Can you talk a little bit about, say, a young woman starting out in a computer science field, maybe they want to find a mission-focused career like at an [FFRDC \[federally funded research and development center\]](#) or a Lockheed Martin, something that is making an impact. They may not have considered a job or a career in that field. Can you talk about that a little bit?

Suzanne: I think in that sense I was lucky that I grew up as an Air Force brat. My dad was in the Air Force, so that sense of mission to the country, to all of the people in the country that he served was ingrained in me from the very beginning. I knew when I went out into the world that I wanted to be part of

that. I also knew that I didn't want to necessarily be part of the military. That is kind of a funny story. My dad wanted me to go to the Air Force Academy because it was the first year that they accepted women into the academy. I knew, having lived in a military lifestyle, that wasn't the lifestyle I wanted to live for the better part of my life. I was really rude. I said to him, *Dad, when I get out of the academy, are they going to give me a retirement salary?* He said, *What are you talking about?* I said, *Well, I will have already been in for 22 years.* He says, *What do you mean? You'll only have four years.* And I said, *No, no! Eighteen years as a dependent and four years, I have been living in the military for 18 years already.* Oh, he was mad at me for a week. But that is how I felt about it. It is like I love working with that cadre of people, but there are other places to have a mission, right? That was the really interesting thing about my sabbatical. I started out at Lockheed, did 12 years there in various roles, came to the SEI. I was here for five years. Then this opportunity came up with this Irish software company with a fellow that I really thought was a good leader, had a good idea. I decided I'm going to go with this startup. I was employee number 10. It was tons of fun. It was all kinds of different learning. But after about two years, I realized that once we got the product under control, that running a business, being part of running a business for profit, that was not motivating to me. I want to make enough money—I am the classic for that study that that Dan Pink talks about in the [Drive](#) book. Knowledge workers need to be paid enough to take the issue of money in their lives off the table, but they're not motivated a lot of them by money, and that's so true for me. There was a point at which the leader of the organization he says, *You'd make a lot more money if you let me put you on an incentive plan*, and that would reduce my salary by a small amount. I said, *No.* And I said, *I don't ever want to talk to a customer and think that I am giving them advice that is based on how much I'm going to get in my paycheck.* That does not work for me. Works for other people, does not work for me. And he said, *All right.* So we continued on, but I did come back to the SEI because I realized that that mission focused on two things. One, I didn't want to work for a single company anymore because I wanted whatever knowledge I generated and was able to codify, I wanted it to be available to everybody, and the second thing was that I just didn't want to be bothered by the profit motive. I wanted to have a salary, know what to expect, and take money off the table, and just let me work. So if you have any of those kind of personality traits, nonprofits there are tons of nonprofits, they don't have to have anything to do with the defense industry. There are nonprofits for the arts, nonprofits for music, nonprofits for economic development, health care. There are lots of places that you don't have to be burdened in the way I think about it. I will also say I was married to a wonderful man who was an IBM salesman for the better part of his career. He thought I was crazy. He said, *You could make so*

much more money consulting. I said, I don't care. But he loved the competitive aspect of it. To him the money was something that showed that he had done something as a tangible reflection of whatever he had done. It is like, All right. That is how you work. This is how I work. Figure out what it is that motivates you. I don't know if, [What Color Is Your Parachute?](#) Do you remember that?

Palma: I remember that.

Suzanne: I don't know if that is still around. There's probably a web version of it, but I used that a couple of different times in my career to sort of help me figure out, *What do I really want to do next? What am I thinking about?* Anything like that where you can get to know yourself better and what motivates you is going to help you to make decisions about what is the mission that you want to focus on. I also know people who work in profit-based companies, but their real mission is outside of their work. They have a vocation of a different type. They are a fantastic coach, and they coach high school football teams. Whatever it is, you need to find out what is going to make you excited to get up in the morning. That is when you have your best life.

Palma: I want to put in a plug for mission-focused to let everyone know that not only computer scientists can work in these STEM fields but every role inside an organization that is mission-focused/nonprofit contributes to the mission.

Suzanne: Yes, absolutely.

Palma: Well, that's the end of our time today, Suz. Having you return as the interviewee instead of you being the interviewer.

Suzanne: It is a little weird, but it was fun.

Palma: It was fun. We will include links in the transcript to resources mentioned during this podcast as well as links to your work. Finally, a reminder to our audience that our podcasts are available every place you download podcasts as well as the SEI's YouTube Channel. If you like what you see and hear today, please give us a thumbs up, and Suz, thanks again for joining us today.

Suzanne: It was an absolute pleasure.

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