EPISODE 833

[INTRODUCTION]

[00:00:00] JM: Africa is rapidly adapting the same software and hardware technologies that have transformed the western world over the last few decades. But access to computers and technology education is still uneven. Where there is access to computers, smartphone adaption often comes before access to laptops or desktops.

Nelly Cheboi is the founder of TechLit Africa, an organization that works to connect schools and families in Africa with computers and software. Nelly studied computer science and worked as a software engineer before leaving her career to focus full-time on building a scalable model to take refurbished computers and give them to Africans who can make good use of them.

TechLit Africa is also building a software stack to equip schools in Africa without an internet connection with an internal subnet, including Wikipedia and other educational resources, so that people in the school can get an internet-like experience despite a lack of access to the full internet. This is the first episode in hopefully what will become a series about emerging markets and their adaption of software and other forms of technology. This episode is focused on Kenya and we'll do more shows in the future.

The second FindCollabs hackathon has started. This is the FindCollabs Open, and it features $2,500 in prizes. We've got prizes for the best podcast project, the best React.js project, the best music project, machine learning project, much more. You can check out those prizes by going to findcollabs.com/open. FindCollabs is the company that I'm building around creating projects and collaboration.

With that, let's get to today's show.

[SPONSOR MESSAGE]

[00:02:01] JM: DigitalOcean is a reliable, easy to use cloud provider. I've used DigitalOcean for years whenever I want to get an application off the ground quickly, and I've always loved the

focus on user experience, the great documentation and the simple user interface. More and more people are finding out about DigitalOcean and realizing that DigitalOcean is perfect for their application workloads.

This year, DigitalOcean is making that even easier with new node types. A $15 flexible droplet that can mix and match different configurations of CPU and RAM to get the perfect amount of resources for your application. There are also CPU optimized droplets, perfect for highly active frontend servers or CICD workloads, and running on the cloud can get expensive, which is why DigitalOcean makes it easy to choose the right size instance. The prices on standard instances have gone down too. You can check out all their new deals by going to do.co/sedaily, and as a bonus to our listeners, you will get $100 in credit to use over 60 days. That's a lot of money to experiment with. You can make a hundred dollars go pretty far on DigitalOcean. You can use the credit for hosting, or infrastructure, and that includes load balancers, object storage. DigitalOcean Spaces is a great new product that provides object storage, of course, computation.

Get your free $100 credit at do.co/sedaily, and thanks to DigitalOcean for being a sponsor. The cofounder of DigitalOcean, Moisey Uretsky, was one of the first people I interviewed, and his interview was really inspirational for me. So I've always thought of DigitalOcean as a pretty inspirational company. So thank you, DigitalOcean.

[INTERVIEW]

[00:04:08] JM: Nelly Cheboi, thank for coming on Software Engineering Daily.

[00:04:11] NC: Oh! This is awesome. Yeah! I'm glad to be here.

[00:04:16] JM: So you are a software engineer. You've studied computer science, and you've started several initiatives around increasing the understanding of computers and computer science in Africa. I want to start with a discussion of your experience growing up in Africa. Describe the use of the internet as you experienced it in your hometown in Africa.

[00:04:38] NC: I think the internet is – We should go back to like the use of a computer actually, because it's another level of accessibility, right? So I grew up in Kenya and I first used a computer when I was 18. So I first used a keyboard when I was 18 when I was applying to schools here. So that's the first time I also like encountered the internet. I didn't really know much about it. So I think I signed up for an email account, and that was pretty much it.

Then right now when I go back and I see how my friends and my families are using it, I realized they're not using it the way people use it here. In America, there's certain level of curiosity. If you want to, let's say, know what the moon is made off, you just look it up. If you want to know like what is the unemployment rate, you just look it up. There's that level of curiosity there. I think that raises from just being able to find answers immediately.

In Kenya, I don't see that. So you're curious, but you don't find your answers quickly, and I think that inhibits the level of curiosity that you have. If you'll ever, ever going to be – As a kid or even growing up, if you have questions, and the way you'll get the answers, if it's limited in the way you're going to get the answer, then it's just going to be limited in how curious you become. Does that make sense?

[00:06:00] JM: It does. So can you describe in more detail to what degree computers are accessible by the average person in Kenya? Who has access to a computer and then who has access to computers with internet?

[00:06:14] NC: So I'd say in this series, in terms of computer access or in terms of internet access, most people have access on their phones. So you access computer on your phone, and you're mostly using this for WhatsApp or Twitter.

From what I've seen, most people would only use this to go online and to mostly be men. Women are a bit more shy. Maybe there's a lot of – Just women are a bit more shy to go online, but it's mostly be men. Also, you don't have unlimited access. You pay by bandwidth. So let's say you'll be paying a dollar for 50MB, and that's it.

So when you have to constantly worry about consuming all your data, you end up just using – Like let's say the best way to learn is using a video, right? But if you only have 50MB, then you'll

be like, "No, I'll better save these megabytes, this small amount of data, when someone texted me on WhatsApp, then streaming a video about like building your own website."

So there's mobile penetration. Everyone has a mobile phone, but internet is very expensive and you're buying it in – There's no bandwidth. You're buying it in sections, in small amount of data. On the other hand, in terms of computers – So I come from a small village in Kenya and I didn't grow up with a computer, and even right now going there, not so many people have computers. So in terms of growing up with a computer in your house, that's unheard of. You don't have computer in your house when you grow up. It may be the case in cities, like in Nairobi or in Mombasa, but in villages, they're not existent.

[00:07:51] JM: How good of a substitute is a phone with limited data access relative to using a laptop to access the internet in unconstrained data environment?

[00:08:06] NC: A phone might be a good substitute if you knew how to use it. Okay. So you're asking if you have unlimited data, right? So assuming you have unlimited data and you have a phone, but you don't have a laptop?

[00:08:18] JM: Yeah.

[00:08:18] NC: Okay.

[00:08:20] JM: What I'm saying, I'm trying to basically contrast my experience of the internet with somebody who has only experienced and is only experiencing internet through the lens of a smartphone with limited data.

[00:08:33] NC: Yeah. I think that the issue is not the hardware. I think the problem is not the hardware. I think the issue is unlimited bandwidth. As I mentioned before, you can learn anything on the internet. You can watch any YouTube video and learn some that you're very passionate about. Just knowing that if I need an answer for this, I can just go online and find it. I can spend hours online and find it. That is lacking in Mogotio or in Kenya. So it doesn't matter if you have a laptop or a phone, but if you don't have access to begin with, then you don't have that habit of just going online and finding your answers.

Then if that habit is not cultivated, then you end up just not knowing that you have the power to learn everything you want, or you have the power to just find your answers, or you have the power to just diagnose simple health issues, or simple hygiene issues, or understand your civic rights. So I just think it's almost like it's killing curiosity in a way. That's what I'm trying to say here.

[00:09:37] JM: Yes. Well, so I went to Shanghai last year, and Shanghai obviously, internet connectivity is everywhere. But just the shift in not having Google and not having Google Maps was so disruptive to my state of being, my state of internal stability. It was a little bit shocking. So I'm just trying to empathize a little bit more or to put myself to gain a better understanding for what's going on there. What about these lite experiences?

So you have things like Wikipedia Lite, or Facebook Lite, or I think Twitter Lite. So perhaps you could go to environments, like maybe you go to a public library where there's like unconstrained bandwidth perhaps and you can download some stuff, or maybe you can just these lite experiences and they're subsidized by companies or they're free. What's your experience with these lite apps?

[00:10:34] NC: I haven't heard of them. I've been here for 7 years. So I came here when I was 18. So I may not have these experiences, and I came straight from the village. So I wasn't in the city. So I'm only talking from experience in the village where I grew up, and that's the village nearby. So in the village nearby that I grew up, I haven't seen whatever you're describing, the lite experience.

[00:10:59] JM: Oh, okay. So since then you have built a school in Africa, right?

[00:11:04] NC: Yeah.

[00:11:06] JM: Tell me about that experience. Where did you build a school? Why did you build a school? What are the parameters for building a school in Africa? What did you want to accomplish?

[00:11:15] NC: Okay. I want to give you a little bit of background about my story, and then it's going to see how it fits into the whole building a school and the current organization I'm leading.

[00:11:23] JM: Okay. Please.

[00:11:24] NC: Okay. So I was born in a small village in Mogotio. I'm the third born. So I have two elder sister and one younger sister. Growing up, it was abject poverty. We'll go for days without food. The roof will leak during rainy seasons and the roof will be blown away during windy seasons. So it was really bad.

I've always been very solutions-oriented. So I always look around and will be like, "Well, my situation sucks. But how can I fix this? How can I make it better?" That's always my approach in life. So back then I was really like just worrying about food as a kid, worrying about raising my younger sister because my mom was trying to raise tuition for my two elder sisters. I knew that my only way out was to study.

So I studied really hard. So the way the education system is in Kenya is that from 1st grade to 8th grade you just take basic five subjects, which is math, English, Swahili, which is the national language, biology, science and civic, civic studies. So you do that for 8 years. Then after these all 8 years, you do a placement test for three days. This placement test is more like a filter that depending on what grade you get from these three days of placement test determine which high school you go to. So I don't agree with that educational model. I think it filters a lot of talent out of it. But that's the education model I was in.

So I did very well after my primary school. Then I got admitted into a high school. Again, this high school is a boarding school, or most of the high schools in Kenya are boarding school. Then if you do really well on the placement test, you go to a boarding school that – If you go to a national school, they have better resources. They have computer labs. Not computer labs. They have like chemistry labs, biology labs. They have all these resources, and it puts you in a better position to go to a better university if you go to these better schools. If you don't do so well, then you go to district schools. They may not have the resources.

So I did really well and I went to this really nice high school, which was three hours away from home. It was also a bit expensive, which made it really hard for me to raise tuition. My life in high school too was also terrible, because I couldn't afford tuition. I always sent home to collect tuition. I was missing a lot of classes. I really hated that. All this time I wanted to be a pilot. Just the idea of flying out of poverty and just being up there.

So I did really well. Again, after school, so four years of high school, you do another big cumulative test for one month. What you get, the grade that you get from that cumulative test determine which program you go to. So you don't decide if you're going to be a doctor or you're going to be a biologist or anything like that. It's more about what grade you get from this one month cumulative test.

So I did well and I went into aerospace engineering. So let's say if you get a C and you wanted to be a doctor, then there's no way for you to be a doctor. You have to pay through expensive private colleges or you have to take the test. There're a lot of issues with all that. I really don't agree with all of these. That's why I'm trying to fix it.

So I did well and I got admitted into electrical engineering. At the same I got into another program in Kenya called the Zawadi Africa, and they prepare you to apply for scholarships in the U.S. So they require you to apply to 4, 5 schools. I applied to 20, because I'm very ambitious. Then I got a full scholarship to come into one.

Zawadi Africa is the first time I used a keyboard and it's the first time I encountered the internet. I wasn't really sure even what the internet was.

[00:15:08] JM: Wow!

[00:15:09] NC: Yeah. Then I came to the United States. So there was a lot of culture shock. I mean, a lot of things was just interesting. Snow was very interesting. Yeah. There's a lot of story there. But what was really interesting to me was how quickly people were typing. Someone will just type so fast and I was like, "Oh man! So if I practiced to look at the keyboard, then I'll type just as fast as them."

So I mainly just kept looking at the keyboard, like trying to be better at looking at the keyboard and typing. Three years ago by, I'm still not as good. Then during that time, like three years in, I discovered computer science.

So in my intro to Java class, I asked this guy, "How do you type so well? I've been looking at the keyboard for three years and I still don't know." Then he's like, "No, you don't look. You just place your keys a particular way, your hands a particular way, and then you know where the keys are."

That was just painful to me. The fact that just being in that class, they just assume that you knew the basics, that you knew how to turn on a computer, that you knew how to type, that you knew how to go to the terminal. All those basics was just given, right? I look around at the classroom, I felt so insufficient. I felt like I'm constantly playing catch up and I was like, "Okay. I'm going to fix this." So I was like, "I'm going to build a school, and this school is going to be a technology school. So this school is going to be looking – Just going and helping the people in village and the people like me and people in rural areas of Africa that are often being ignored and they're being left behind in this fourth revolution, like digital revolution. They're being left behind. I'm going to help them. I'm going to give them relevant skills so they can contribute to the global economy." So I was like, "I'm going to build a school." I didn't have any money.

I worked as a janitor on Saturdays and Sundays. I could only work for 20 hours a week. So I cramped on those 20 hours during the weekend. After I discovered intro to Java. I was like, "Oh man!" I mean, Java is not the best language. I was like, "Oh man! I want to be –"

[00:17:19] JM: It's not bad.

[00:17:21] NC: I know.

[00:17:21] JM: It's not too bad. Hey! I've done a lot of Java.

[00:17:25] NC: I know. But I'm saying, I'm coming from chemistry here, right? I don't like being in a chemistry lab. So being in a computer science, it took me like a whole class to see Hello World, like, "Oh man! I really want to be a computer scientist."

[00:17:38] JM: Okay. So side note. As you're starting to think about education, what's the best programming language to start with?

[00:17:45] NC: I want to say Ruby. No. No. Ruby for backend, and I want to say JavaScript for frontend. With JavaScript you can actually just see, you can just see the result immediately.

[00:17:55] JM: Totally.

[00:17:55] NC: And I want to optimize or that.

[00:17:58] JM: Totally. Okay, continue. I agree with you, basically. I think Rails, rails is just like the easiest onboarding for like seeing your magical things appear on the web.

[00:18:09] NC: Right. Right. Yeah. So I was in this class and then I was like, "I'm going to build a school." So I worked as a janitor, and I think I underestimated how much I needed. So I said I needed 5 grand to build school. So I saved a lot, and then I just kept talking to people. I'll be like, "Hey, I'm building a school in Kenya. This is the mission," and they'll just be donating. So that was really exciting to get that support.

So I got the school started. So since people were interested in donating – So I was going to build like a small shack just made of like really cheap materials. But then since people were showing interest, I was like, "Okay, I want to build a better school." So I set out to build a better school, and the fund is still coming. So I needed to get more money somehow.

[00:18:59] JM: So quick opportunity for the plug, and we'll hopefully do more plugs. How can people give you money?

[00:19:05] NC: Oh, we have a website, techlitafrica.org. So you can go the web –

[00:19:11] JM: TechLit Africa, T-E-C-H-L-I-Tafrica.com.

[00:19:16] NC: Yes, org too. We have both domains. Yeah.

[00:19:19] JM: Nice.

[00:19:21] NC: Yeah. So I built this school, and then the school on its launch. So another thing I'm really big off, I'm really big of identifying, looking at people around me finding their best talent and then their best skills and emphasizing that in them.

[00:19:36] JM: I love it.

[00:19:37] NC: Yeah. So my first person that I found –

[00:19:39] JM: By the way, I just want to emphasize, that is not a common way of looking at talent, I believe. I mean, I completely agree with that philosophy, and to me, this is something that seems completely crazy about the world to me is that, basically, as an individual in the working world, you're oftentimes encouraged like, "Look for a career that matches your skills." When in fact, you probably should just be looking at what your strengths are, amplifying those strengths, and then looking at what places in the market begin to collide with those strengths that you're amplifying. I think it might be a subtle difference for some people, but I think it's a really, really, really important difference. As a teacher, or a mentor, or an aggregator of talent, or a manager, or a CEO or whatever you describe yourself as, it's heartening to know that that's your philosophy, is to find people's strengths, amplify them and assign them to roles that fit those strengths.

[00:20:34] NC: Yeah. I mean, in fairness, my life purpose is to obsolete poverty. So I know that I cannot obsolete poverty by giving money, just giving money all over the place. So I need to empower them to be able to be self-sustaining on their own. That's why right now for starting technology and making these individuals that are being left out in this digital revolution, technological illiterates, and putting them in a position where they can, first of all, identify is any of the tech jobs are good for them or if they can solve problems in the society just by having technology. Because the unemployment rate in Kenya is 40%, like 40%. In the depression, in the great depression, the unemployment rate was just barely 20%.

So you can imagine just how bad it is. But when you are in the ground, when you see the economy where, everyone is just hustling. There's a lot of side hustle. A good example is my sister. So she did studies in animal health and she would wake up in the morning, collect all her medicine, put it in a bag and go from door-to-door and find out if anyone needed help treating their cattle, so like treating their goat or treating their cow or treating any of their livestock.

So, to us, like, "Okay, let's open you a pharmacy, like a place where you can sell these different medicines. So instead of you just saving a little bit on going and buying these medicines from shop, what if you're the supplier of the medicine?" So I give her like only a grand, like $1,000. I gave her a grand as initial investment. She opened this pharmacy where she sells animals. Then she, on the back – I don't know if you know this, but it takes like 21 days to hatch a chick. A hen lays on the eggs for 21 days and then it hatches, right?

She formed her own form of incubator. She somewhat find the right temperature that it takes to hatch an egg and she was able to hatch all these eggs without having a hen possible. So she's buying these eggs at 10 cents. So she's buying them at a dime. Simulating this perfect temperature, hatches it within 21 days, and in three weeks she's selling these chicks with $2. $2! I didn't tell her that. I was just giving her a position where she can help herself and she was able to –

[00:23:13] JM: It's great margins.

[00:23:17] NC: You see that a lot. Even though the unemployment rate is insane, you just see people just like really hustling, really grinding, finding ways to be very entrepreneur. So imagine just having a little bit of tech on top of that. It's amazing.

[00:23:32] JM: It's an inspiring vision and it's a disheartening reality.

[00:23:37] NC: Yes, it is. I mean, for me, it has – I started doing this when I was in college. So built this school and then I realized that the school is not going to be scalable. So the idea was to build technology schools in different areas in rural Africa. Then I realized that building a technology school each time, I'll have to fundraise hard each time and then like build the next

school, build the next school. So I came up with TechLit Arica, which is technological illiterate Africa and the idea is to just go into existing schools and replicate this.

So instead of building schools myself, I go into schools, identify schools that have electricity and just provide the computers. So I provide the hardware. Then I provide the software and my version of the internet.

[00:24:33] JM: Your version of the internet. That's like downloaded Wikipedia and stuff, right?

[00:24:36] NC: Yes.

[00:24:37] JM: That's brilliant. It's so brilliant.

[00:24:39] NC: Yeah. I download Wikipedia. I download Khan Academy. I download TED Talks. I download –

[00:24:44] JM: Interesting.

[00:24:45] NC: I download Wikibooks. So terabytes and terabytes of content and then I just have it over Nginx.

[00:24:51] JM: This is brilliant. I didn't realize this.

[00:24:54] NC: Yeah. So one just goes to the school and they already like can find answers on Wikipedia. They can just be like, "Okay, what is the moon made off?" Then go to the IP address on the browser just like you would the internet and you find your answers. So you're already cultivating that curiosity.

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[00:25:21] JM: FindCollabs is a tool for managing hackathons and innovation within your company. FindCollabs allows anyone within the company to create new ideas and build momentum around a new initiative. FindCollabs allows your smartest, most driven employees,

to build projects organically. If your company is looking for new ideas and innovations, check out FindCollabs. It's free and it was started by me. It's something I genuinely believe in, and if you have any ideas or complaints or criticisms of FindCollabs, you can always email me, jeff@softwareengineeringdaily.com.

FindCollabs lets people within your company create new ideas. Whether you want to run a hackathon and generate new ideas, or you want a long-term system to manage innovation within your company, check out FindCollabs at findcollabs.com.

[INTERVIEW CONTINUED]

[00:26:26] JM: Okay. So now you got me really thinking. This is kind of an internet.

[00:26:31] NC: It is.

[00:26:32] JM: This sounds like an entire platform thing. Like you could make an internet – It's basically like internet all over again. We used to have these things in the 90s where like you had a private internet, basically, and some people thought that's like how the world would involve. It could have worked, but you could have basically like a server that you could just put in a school, for example, and this is like the internet server and you could have like messaging, you could have like some kind of social networking thing. You could just have everything take place in the school.

[00:27:07] NC: Yes, pretty much. That's what we did from the get go. Because the internet is coming, we have all these organizations focusing on getting the internet to Africa. So we're not trying to solve that, but it's more than just access, right? Because right now, when someone decides whether to watch a video or just go to WhatsApp, someone will decide to go to WhatsApp, right? So how do you show them how valuable the internet is and how powerful it is? By simulating like things that you would do in the internet. Cultivating curiosity, finding answers, doing research, finding your skillsets and emphasizing that.

Just like trying to create – The way like people use the internet net her and the way people use the internet to empower themselves, we're trying to give that, so that when the internet gets

there or at least – It becomes like a crucial decision. I'd rather watch a video and then how to write a website than just keep chatting with friends on WhatsApp. There's nothing wrong with that, but I'm just saying – Right now if you ask someone, "Hey, do you want to watch a video about web programming or do you want to stay on WhatsApp?" They'll be like, "Well, WhatsApp only causes me 10MB. The video will cost me 50MB. Chatting on my friends is cheaper."

But how do you switch the other way? A video is more powerful. Yes, it's expensive, but it's more powerful. So we want to cultivate that curiosity. I think by just providing access, by just providing hardware is not enough. There has to be some kind of just immediate results. You build a website, you see the answer immediately. You ask for questions, you get your answers immediately, and then you keep doing that over and over again. As you find answers, you become more curious.

[00:28:46] JM: I was reading your site and I didn't fully grasped what your strategy was until just now. But there were some anecdotes that really stood out. There's some boy who didn't like going to school and then he shows up and he plays around with a computer, basically he plays like a single computer game and he's like, "My mind is being blown. Like I only want to go to school."

[00:29:12] NC: Right. Yeah. I mean, there are other stories of that. I think she's 8 now. So she was there when we were setting. So I went to Kenya last October with my boyfriend, Tyler. He and I are confounding this organization. So we went to Kenya and we were setting this. So we took 10 computers with us. We prepared an image, Elementary OS image, and we installed all these educational software, including typing. We took one week downloading our version of the internet. Set up this summer when we got to Mogotio, and then we were mostly on the terminal.

So there were three parts to this. The kids that were really young were just like using all these games. They were learning these games. Then the high schoolers in the neighborhood will come and watch the Khan Academy videos and then the adults will come in the evening and we'll just take them through like a 5 minutes tutorial on how to build a website with Ruby on Rails. So five minutes, already have their website. Then we tell them, "Hey, if you like this part, then – If you like the terminal, read more about –" We just pretty much use the book Learning *Enough Rails to be Dangerous*.

Well, if you like the Rail's tutorial, just read this book, *Learn Enough Rails to be Dangerous*. If you like the terminal part of it, just learn enough terminal to be dangerous. I really like the guy who writes this tutorial. We bought the book just in case he's wondering. We didn't pirate it. We bought it. Okay.

The seven-year-old, my niece, she just was watching the whole time, because she was supposed in the cohort just playing games, right? So like the IP addresses and the music playing was mostly just for the adults. As far as she knows – From seeing all of these, as far as she knows, they only editor there is is the terminal. So she'll pull up the terminal and she'll type Zawadi Prep, which is the school. Zawadi Prep over and over again. So that was a way of typing.

Then we're like, "No, you don't type like that. Just open this editor that comes bundled with Elementary OS," and she wouldn't do that because she keeps the terminal and she wants to use the terminal. So this seven-year-old is already using the terminal, just typing Zawadi Prep over and over again.

Then my friends came over to the lab and she was like, "Hey, do you want to see our content?" Then she does, "192.168.0.1", and then she navigates to the landing page and she clicks to her videos and be like, "Hey! Here's our content." So she really knows how IP addresses work and she's only 7. Then she brings all our neighborhood friends. She sits in the middle and then she teaches them how to use the computer, how to play various games. She kept asking us, "How do we play this game?" We're like, "We don't know." Then she comes back and be like, "Okay, I found out how to play this game. Let me show you." They've very curious. They're already very entertained and they really like the whole program.

[00:32:09] JM: Okay. So I'm convinced and intrigued by your project here. What's your scalability strategy? How do you make this purveyed the entirety of Africa?

[00:32:21] NC: Okay. So right now, actually, my apartment, I have 300 computers that I need to get to either Kenya or Ghana in the next – Actually, one week. So I quit my job on Monday. So I'm doing this fulltime now.

[00:32:36] JM: Congratulations.

[00:32:37] NC: Thank you. It's kind of scary, but okay. So I'm doing this fulltime.

[00:32:41] JM: Don't be scared. Hey, if you run out of money, you run out of money, I got your back. I'll send you $5,000. Just let me know if you get to zero. I'll send you $5,000.

[00:32:50] NC: Oh, so sweet.

[00:32:51] JM: Just let me know. I got your back.

[00:32:53] NC: Okay. Oh! This is awesome. Thank you. Okay. As I was saying –

[00:32:56] JM: But you won't get there. I don't think you'll get there. I just want to give you some safety net.

[00:33:02] NC: Okay. Good. Thank you. What was I saying? Yeah. So I have these computers in my house, 300 computers. I need to get to Kenya or Ghana. So the strategy here now is to, as I said, identify schools. So our goal for this year is to build 10 more schools. So we're going to identify 10 schools. First of all, we'll take these computers. We'll take computers in any condition. We just take them in any condition, and then we refurbish them, right? So we're going to take these computers into – We're going to get a warehouse in an African country, and right now we're looking at both Kenya and Ghana. So we're going to get a warehouse. We're going to hire local talents.

So the whole idea is to make the African operation self-sustaining. So we're going to open a warehouse and then we're going to ship all these computers. Then these areas are going to be – We're going to try to get a lot of bandwidth and then we're going to curate the content there. We're also going to like refurbish the computers and then equip them with our image version of Linux Distro images and all these games and then go set up the computers.

Then the whole idea too there is that when we set up the computers in the schools, the schools need to open up those labs to the community. It's not only for the school. The schools during the day can use the labs. WE trained the teachers on how to use computers and the programs in this computer to supplement they're already teaching. So that is already part of the curriculum. Kids are already learning how to types. Kids are already learning how to do math on a calculator.

So we train the teachers to use the labs. Then in the evening, the adults come in and they use the labs mostly to learn web programming, or they learn like graphic design, or accounting, or all these. So another big part of this is the content. We, in good conscience, cannot curate all the content. That is not fair for everyone that two of us can be like – Like the people who are deciding on the content. So the content is going to be – We're working on this right now. It's going to be an open source site. It's going to be quick – So if you're an expert in, let's say, Ruby on Rails, you're going to write a 5-minute tutorial really quickly that open the terminal, Rails knew this, and then all that. Then you add, "What part of this tutorial did you like? Did you like the terminal? Okay. Now, read these tutorials about this. Did you like the UI part of it? Then you might like graphic design or being a frontend developer. Did you like the database part of it? Then you might like more about being a backend."

So this tutorial, it's like – Because even right now, if you want to pique into programming, there's a lot of resources out there. Most of my friends who have tried, even my friends here who applied to go into programming, they just get overwhelmed, because they're like, "Okay, you got to set up Git. You got to find an IDE." So you never which tutorial is that. Another problem is that once you've past all that, you forget where you came from. You forget how long it took you to get into programming.

[00:36:08] JM: Oh, yeah. Definitely.

[00:36:09] NC: So we're going to find these people already experts and it's going to be in every single field. It's going to be in accounting. It's going to be in graphic design. It's going to be in – Even trading. We're going to find people who have already done all of these and we're going to encourage them to create – To write a quick tutorial. If you're to get someone interested in trading in 5 minutes, how are you going to just highlight all of these and how are you going to

give them more resources to go learn about it? So this is going to be open source. Anyone in the world can use this. Anyone in the world can access this tutorial.

The tricky part right now, the technical challenge, we want this to be both offline and online, right? So we're trying to find a good way to curate the metadata, so that if you're online, you just click a link. If you're offline, this link is going to be pointing to our server. In order to have the content in our server.

You're asking about scaling. So we setting the warehouse – We're putting it in a way that if we're to drop dead tomorrow, this will still be going on. So we're going to make the African side self-sustaining. Then on the [inaudible 00:37:17], in America, on the American side, it's going to be getting the computers getting everyone who's really expert on all these things to create the content. So that's going to be the American side.

[00:37:28] JM: Quick question. Are you a nonprofit or a business?

[00:37:32] NC: Right now we're a nonprofit.

[00:37:34] JM: Why? Why not just make this a business?

[00:37:38] NC: Okay. We're not a profit because – I mean, most people have asked me this, and I think that's the reason I didn't get into Y Combinator because I was a nonprofit. Anyway, most of the business – So because we want the hardware – So I think most business would give us hardware if we were nonprofit. We're for profit, we'll have to make a case for giving us your hardware and we'll going to give you any money for it is good for you. So that is one part.

Another part is on the Kenyan on the African side. If we're going to be importing these computers as a business – So Ghana would charge us 30% of the value of the computers if we're for business. As a nonprofit, then we can bring it for free. Kenya charges 22% of its value to get it to the country, but you can get a waiver as a nonprofit, right? So as we're coming into these different countries, because we're trying to form relationship in every African country. So if we're coming in into this country, we'll come in as a for profit. So we're going to incur a lot of costs, right?

On that note, very entrepreneur, and I realized that I'm going to be training a lot of people to become very technical. So maybe we might spin up a for profit side that gives these people who've acquired all these skills like a way to connect them to jobs or a way to like consult with them and start their companies a way to utilize all these network. But right now it's just for the nonprofit. We're really focused on the impact, and this is our version of eradicating poverty. We realized just by giving them technology access and giving them these skills, it's one of the most [inaudible 00:39:24] way to eradicating poverty.

[00:39:26] JM: So I don't know you've thought about this, but you probably have. But like I think there will be – If you scale this thing as a nonprofit, if you basically scale influx of hardware – Like I used to give away my computers to Goodwill. So Goodwill is an organization in the United States at least where you can give them anything and they basically either try to sell it, or if they can't sell it, then they give it to people who are less fortunate or don't have computers or don't have clothes or whatever. They accept almost anything. So Goodwill is a great organization.

I used to give them my computers and they would refurbish the computers, put new operating system on them, etc., and give them away to people. If you build kind of that and then you build some kind of distribution thing for it and then you start to have some kind of like program where you have people that are installing these internets in schools or installing them in – I don't know, other organizations, libraries, or something. I feel like there is just so much opportunity – I mean, maybe this is just me being like a greedy American capitalist thinking like this. But it feels like there's so much exhaust opportunity from that nonprofit that there is a business opportunity.

Maybe your internet thing turns into like some kind of open source tool, that it's like an open source platform for building your internet and there's some onboarding thing. Yeah, I don't know. You just got me thinking.

[00:40:55] NC: Yeah. If I think of a for profit part of it, it should be like giving these really highly trained Africans like a job opportunity, right?

[00:41:03] JM: Sure. There's another one.

[00:41:04] NC: So connecting them to, let's say, companies here or companies in the country. This is one upside thing. A friend of mine has a startup and she was looking for talent. So she was looking for I think like a data scientist will do something, but she couldn't find a Kenyan to do it. So she had to hire a British guy to do it. So that's just insane.

So if we could also just provide talents to the startups in Kenya and also like find a way to connect them to like the demand of talent all over the world, like building like some kind of a remote consulting or even a recruiting.

[00:41:42] JM: You've heard of Andela, right?

[00:41:43] NC: Yes, I have. Yes. Yeah.

[00:41:45] JM: What do you think of Andela? You've talked to them.

[00:41:47] NC: Not really.

[00:41:50] JM: Really? I should introduce you. I've interviewed I think one or two people from there. What do you think of them?

[00:41:58] NC: So I don't know them personally, but I think also – This similar thing is happening here. I think jobs are becoming obsolete quicker and quicker, and I think that in terms of playing catch up, in terms of trying to play catch up to all these new jobs, we are forgetting that it's not scalable to play catch up today. Right now, let's say being a programmer is the most lucrative thing you can do, or being a machine learning, it's the most lucrative thing you can do.

So I think that trying to get everyone interested in machine learning, not everyone is going to be interested in it. But trying to get everyone interested in it and then trying to train them to meet the market demand. I think it's very exhausting. Our better approach would be how do you teach people to reskill. As jobs are becoming obsolete quicker and quicker, how do you teach them to just be able to retool and rescale to adapt the next job? I think this is very common in being a programmer. In being a programmer, you can pick any skill, any language, because you know

how to find your answers. You know how to go to stack overflow, hot to Google your answers. But I think that's not the case in other fields.

Right now if I want to be a trader, I have no idea how to do it. I have no idea how to start. But being a programmer and also being an entrepreneur, I know that if I want to be a trader, these are the steps I need to look into. I need to find these tutorials. I need to find these hardware. So I think this skill, this habit of – I don't know if it's a skill, but like having this mindset of teaching people how to rescale and how to find their own resources is lacking in schools, is lacking in various aspect of the industry, and I think that's the one we should emphasize.

I think, yes, we should try to meet the current demand of software engineering talent, or the current demand of machine learning, or the current demand of data science. But a better way would be how do you teach them to be able to teach themselves. If you teach someone –

[00:44:04] JM: Isn't it the best way to learn that to have an experience where you learn something? In my experience, teaching myself programming, which I didn't entirely do, because I studied at a university, but much of the way that they teach is so old and deprecated and didn't fit my learning attitude that I really did have to do a lot of self-teaching. But it was just like – It took only kind of one self-teaching thing to kind of learn all the others. So isn't the best path to education in that regard to actually learn something directly. Like you learn software engineering directly, maybe Andela teaches you software engineering. By virtue of learning software engineering, you learn that you can actually learn everything else on the internet.

[00:44:48] NC: Yeah, I think software engineering and programming in general already has that just by learning programming, you're actually equipped to be self-teaching, because the job itself, it's like nobody has all the answers. I think that it shouldn't be like an afterthought.

[00:45:06] JM: Maybe like if you were to learn accounting on the internet. You're not necessarily learning everything else. It's not necessarily going to teach you to teach yourself everything else.

[00:45:15] NC: Yes. Yes. Yes. I mean, it happens that learning programming equips you to be like, "Oh, yeah. I can just self-teach myself, right?" Because it's such a vast field. Nobody has all the answers. But then if you look into other fields, you can just find all the answers.

[00:45:28] JM: So if you were to teach a class on the internet, or even have the entire curriculum revolve around using a computer on the internet, what would that curriculum look like? How would you sequence it?

[00:45:39] NC: I think I'll just give like a quick how-to on like – Let's say I'll tell you that, "Hey, I have all these resources. So this is our server. Our server has Wikipedia. This is what Wikipedia is. This is Wikibooks are. This is what it is." Your assignment this time is to find an answer about this question. I can post a specific question, "How about you go find me an answer about this?" It's okay to ask everyone. It's fine. It's okay to collaborate. It's okay to team. But when you do that, make sure you give credit. Make you sure –

[00:46:11] JM: Wow! That's brilliant. That's brilliant.

[00:46:16] NC: Yeah, thank you.

[SPONSOR MESSAGE]

[00:46:26] JM: Whenever someone asks me where they should start if they're trying to learn to program, the answer is easy; freeCodeCamp. FreeCodeCamp is the best place to start your programming journey. You can learn to code for free, and there's a support of community of millions of coders. There're projects that you can work on. You can get experience by coding for nonprofits. Again, it's entirely free, making it easily the first place that you should start your programming journey as you decide to learn to code.

If you want to go to a boot camp from there or take some online courses that cost money, those are options as well, but there's really no downside to starting with freeCodeCamp. We've done several shows with Quincy Larson from freeCodeCamp, and his true mission is to make coding accessible and free.

FreeCodeCamp is also open source and there is a nice onramp to working on open source if you want to start with freeCodeCamp by just taking the courses and then eventually you can become an open source contributor by working on freeCodeCamp itself. So it has that kind of cool meta element to it.

Thank you to freeCodeCamp for existing and being my go-to source of referrals to get started with your coding career or your coding education. You don't necessarily have to be a career programmer. Thanks, freeCodeCamp.

[INTERVIEW CONTINUED]

[00:48:10] JM: So what would be your first question? You've got all these resources – Or do you have to teach some typing first? Because, I mean, typing can be boring. You could have dropped off during the typing session. How do you prevent drop off before typing?

[00:48:22] NC: I don't think typing would be the first thing. Even if I knew that I needed to place my fingers a particular way back in junior college, I didn't just go ahead and learned typing. Instead of learning typing I realized my first year into the industry, it really affected my productivity. I could think. I knew what to say, but if I had someone peer programming with me or if I had my boss nearby, I couldn't type anything. I was really scared. I was so – So I think for them, I think typing will not be like one of the things that you first teaching, because the same way is that if you want to get someone into programming, you don't teach them about the history of databases? You teach them, "Oh! Look at this cool thing you can build in two minutes." I don't think typing will be the first thing. I think you get them interested in whatever they seem very interested in and then you'll be like, "It really helps if you can type. It really helps if – And this is how you learn to type." There's so many games that makes it easy to type for you. So it will just be like, "Okay. Just type jkjk over and over again." Right.

[00:49:25] JM: I love that game. That's my favorite game.

[00:49:27] NC: Really? Awesome. Yeah.

[00:49:29] JM: Okay. But going back to that first day in internet class, if you ask somebody, "Hey, go find an answer to –" I don't know "How is plastic made?" If you're in front of a computer and you can't type, what do you do? How do you figure that out?

[00:49:44] NC: I think you can type. I mean, the first instinct when you see – I think even with the kids, the first they – When you see a typewriter, you try to locate the letters on the keyboard, right?

[00:49:55] JM: Is spelling a problem or like if I enter –

[00:49:58] NC: No, it's not.

[00:49:59] JM: Spelling is not. Okay.

[00:50:00] NC: What I mean about learning how to type, I just mean like placing your hands in the right post so you can type faster. So the way like the kids, the kids will learn how to – Will be typing. They'll have this little fingers and they'll try to find all the letters on the keyboard, because it's not arranged as ABCD. So they'll try to find the letters.

[00:50:19] JM: Right.

[00:50:21] NC: But I mean, [inaudible 00:50:21], we have to stare at the keyboard for like two minutes to find one letter over and over again.

[00:50:26] JM: Right. Okay. One interesting problem that I think you have to solve to scale is how do you get people to send you a bunch of computers and what do you do with that influx of computers? How do you build a standardized process for wiping them and getting them ready for distribution?

[00:50:44] NC: Yeah. We'll have a warehouse in every African country, even a couple in every country. Then we hire local talent. No, don't hire local talent. We encourage the students to volunteer, because to be like a way of them to learn wiping computers and learn about just the hardware. So, remember, the unemployment rate is 40%, right? So we have all these

graduates, high school graduates, that are just in the area just hanging out. So we just invite them, "Hey! Come learn programming. Hey, if you like hardware. Come, wipe this." So that's the main reason we're building the warehouse in the African side as supposed to building the warehouses here, because want to train them there. We want to make it self-sustaining. Yeah.

[00:51:26] JM: If I'm like a person who, let's say, I run a startup or I ran a data center. Let's say I run a data center. I've got a bunch of old servers, like they're on their last legs, or at least they can't run like deep learning workloads anymore. So they're useless to me. I want to give them away. I want the tax write off. I've got a server. How do I get it to your warehouse in Africa in a way that is low-friction to me?

[00:51:52] NC: Oh, yeah. So we actually had some volunteers come up and offer to take computers in different location. We have one in New York. So we'll just allocate like what is the nearest town you can ship to, or if the people in your town are willing to come pick it up. So this is just – What I've really found interesting with this project is that everyone in their small little way find a way to help.

So we've taken this really sad problem and we've broken it down to just kind of part where everyone feels like they can help. So if you donate a mouse or donate a keyboard or donate a computer or even if you donate $50,000, in your small way you're already helping obsolete poverty and you can actually see – We already have a live stream on the website. [inaudible 00:52:35] system. We'll send you pictures all the time. You'll be always involved in this journey of trying to eradicate poverty and trying to make a more literate technological illiterate Africa.

[00:52:48] JM: Yeah. Uber is looking to improve their public image. What if you asked, you approach Uber and you're like, "Look, give me your five star drivers that are trusteed." They've got thousands of rides. Can they just go and pick up computers at these locations, drop them off at this other secure location and – I don't know, or maybe you get TaskRabbit people, like maybe IKEA, which owns TaskRabbit. Maybe they need a task right off. They can donate some work or something. That would be cool.

[00:53:15] NC: I love that. Yeah, I never thought of that. Yeah. I'll consider that. Thank you.

[00:53:20] JM: How else could you solve this? Because this, to me, seems like a really big supply chain problem.

[00:53:26] NC: Really?

[00:53:28] JM: Right? Isn't it?

[00:53:29] NC: I don't think so. Actually, I got these 300 computers – I don't know, in three weeks, and this is just Chicago. I think I've gotten them in batches of a hundred.

[00:53:40] JM: But you must have had to drive around and be like, "Hey, I'm Nelly. Can I take your computer?"

[00:53:45] NC: No. I'll just be like spamming them on LinkedIn.

[00:53:49] JM: Spamming them on LinkedIn. Yeah. I mean, that doesn't really scale, and people trust you. If you show up to somebody's office and you're like, "Hey, can I take your computer with sensitive information? I promise I'm going to wipe it. I promise I'm going to reinstall –" or do people wipe it before they give it to you?

[00:54:03] NC: Yeah, they wipe it beforehand, and –

[00:54:06] JM: That's the bottleneck. That's what I'm talking about. It's like, "I've got an old Apple computer that I haven't wiped, and I don't want to spend time wiping it, but I don't trust anybody else to wipe it."

[00:54:17] NC: I can write blogs about wiping a computer. It's only two commands. You just like upload a Linux image and then just say shred this, point to the drive, and then that's it. Specify the number of turn, then that's it. Just wait like 5 minutes or like 1 hour, depending on how many times you want to shred. By shredding, it's like you're taking the original data and you're writing random bits, 0 byte, like 7 or 8 times over and over again. Some companies will do it for like 27 times. Other companies will only do it three times depending on sensitive information. Yeah.

[00:54:53] JM: So I know you're an economical person because of your background and your attitudes and so on. The average American tech worker is going to be like, "I've got to do two commands to make this thing work for me." Then I have to like open my door and hand the computer to somebody else. This is just too much for me.

What I'm going to need is I need somebody who's either going to show up at my door and they're going to do the shredding operation in front of me, or I'm handing it off to them and I trust them, because I trust the organization not to grab my data, not to do any bad extraction or something. I can trust them to shred it on their premises. I fully believe in your vision. I think everything is going to be perfectly fine. It's all going to go great. I'm just saying in terms of scaling up the computer donation thing, I think this is one bottleneck.

[00:55:43] NC: Really?

[00:55:43] JM: I do. I could be wrong. I could be totally wrong. Maybe I'm wrong about the charitable attitudes of the average American.

[00:55:50] NC: Yeah. I think like from what I've noticed that – Okay. So for the people that donate the computers, personal donations. They're not worried about their data, but we do actually wipe it. We actually make sure we wipe it and we wipe it by using the shred command. We do it like 7 times [inaudible 00:56:05] over and over again.

But another thing that we're optimizing for, we're optimizing for donations from companies. So companies, they'll be doing like – Most companies will be like, "Okay, we're doing Windows X upgrade, here's a hundred computers. Then companies, they already have staff. They already know how to wipe it. So some companies will pay some money for recycling, but then if they give it to donation, to an organization, that [inaudible 00:56:33]. So we're mostly optimizing for companies. But personal donations are welcome.

[00:56:37] JM: Interesting.

[00:56:38] NC: Yeah, but it's very interesting that you find the supply chain to be the problem. For me, it's like building relationships in every African country. That is going to be a challenge,

because like Africa is so segmented. Each country has its own culture. Each governing bodies and you just have – Some of them, they have a different language, and that will be the challenging part.

[00:57:00] **JM**: Right. I mean, I see a lot of different challenges. That's why it's actually really interesting, because like I think also the whole – I mean, you have a really interesting software problem with the whole internet. I mean, I don't know about internet software. Maybe there's internet software that already exist that does this, or maybe it's just Linux. I don't know. How does your internet work? Is it standardized? Is it very easy – How long does it take you to set up one of these internets?

[00:57:23] **NC**: I think the biggest part is actually just the data. So downloading these terabytes of data takes a longtime. It would take like 7 days depending on the amount of data. But we're just serving it over Nginx. You serve it over Nginx. Nginx already has an index paging builds for you and then it just connects you to a home router. So we already have people donating routers as well. So you have one computer that already has the hard drive mounted that has terabytes of data and then just serve it over Nginx and then you hook up to the router and then they just go that IP. Than that's it. They already have the IP memorized. That's it.

[00:57:59] **JM**: You're blowing my mind right now. I only know about clicking on the AWS console and that is how my computer gets to me.

[00:58:08] **NC**: Oh, that's cute.

[00:58:10] **JM**: Yeah. It's sad. The thing is this what people had to do in the 90s when they were setting up their companies in the 90s. You had to actually know how to set up a "computer". A lot of people in tech, myself totally included, despite hosting Software Engineering Daily. I have no idea how to set up a computer.

[00:58:32] **NC**: If wanted to know, you'll find out in 10 minutes or in 10 seconds, right? That's what we're trying to teach. You can find the answers if you need to. I know this because I had to do it. It's not because I knew this beforehand.

[00:58:45] JM: All right, Nelly. Well, we should begin to wrap up. I've really enjoyed talking to you and I look forward to continue to track what you're doing, and I certainly want to know about continued progress and see which problems crop up, and if I can help you solve them, I would love to. It's an inspiring project. I think it's really cool, and I think it's going to work, or maybe I don't this space well enough.

[00:59:09] NC: Yeah, I'll be remiss if I don't say this. So I got into this Software Engineering Daily when I was a business analyst. So my first job out of college is a business analyst. Then my boss introduced me to software engineering because there was this podcast about Ruby that we would like.

So because at the time I didn't want to be – I wanted to be software engineer, but I only had one year degree in software engineer. I only had a degree in software engineer that I got it within one year. So I kept listening to Software Engineering Daily like every single day. I kept listening to it. I listened to a lot of them. Then when I'm doing these projects, when I'm doing like, let's say, when I was building the school or when I was doing TechLit Africa, I was like, "How will Jeff Myerson introduce my project." I write my speech in your voice, like, "Okay, how would this sound in SEDaily?"

[00:59:58] JM: Hilarious.

[00:59:59] NC: And how to be in this show? It's like, "Oh my God! This is awesome.

[01:00:03] JM: That's hilarious. So can you write my preamble for me for this show? It sounds like you can do my job for me.

[01:00:09] NC: I've been listening to you for so long. Yeah. What? Anyway, thank you, Jeff.

[01:00:16] JM: Of course. It makes me really happy to hear that. I mean, you probably sense this in the shows that I do, but like Software Engineering Daily, it's partly like a Trojan horse. Like it's really about like, "Okay, we've got this cool stuff in the world. Why aren't we doing anything? Let's do more with it, right?" I was literally at Amazon – When I was in Amazon before I started Software Engineering Daily, I would like tell my coworkers, I'm like, "Did you see the

new AWS service? Imagine all the things you can do with it. Imagine all the things you could build." They're like, "Yeah, that's cool. Sorry. I'm just working on the service that I was assigned." I'm like, "What are you doing? What world am I living in?"

That's why I had to start this thing, is I had to share that – That's really what I'm trying to do with Software Engineering Daily, is like convince people that, "Holy cow! There's so much opportunity and there's so much need. You are the embodiment of this. You just saw how much need there is for more software, more software knowledge, more understanding of software. How much empowerment comes from that technological understanding?

[01:01:35] NC: Yes. Yes. Yeah. I agree with you on that.

[01:01:40] JM: Nelly, thanks for coming on the show. It's been really fun talking to you, and we will definitely do another show in the future. I can't wait to meet you in person at some point. If you're ever in San Francisco, please let me know.

[01:01:49] NC: I will. Okay, thank you.

[END OF INTERVIEW]

[01:01:54] JM: GoCD is a continuous delivery tool created by ThoughtWorks. It's open source and free to use, and GoCD has all the features you need for continuous delivery. Model your deployment pipelines without installing any plug-ins. Use the value stream map to visualize your end-to-end workflow, and if you use Kubernetes, GoCD is a natural fit to add continuous delivery to your project.

With GoCD running on Kubernetes, you define your build workflow and let GoCD provision and scale your infrastructure on-the-fly. GoCD agents use Kubernetes to scale as needed. Check out gocd.org/sedaily and learn about how you can get started. GoCD was built with the learnings of the ThoughtWorks engineering team who have talked about building the product in previous episodes of Software Engineering Daily, and it's great to see the continued progress on GoCD with the new Kubernetes integrations. You can check it out for yourself at gocd.org/sedaily.

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[END]