

Professor **Jonathan Rose**: Welcome to the second plenary lecture at APS 105. If you missed the first one, you missed me saying the point of all this is to have people come in and tell you stories about why software is great. This week we are bringing in a really exciting entrepreneur who does business in software. Let me tell you a little bit about our speaker today. His name is Bobby John. He grew up here in Toronto and twenty years ago he was here doing what you're doing. He is a graduate of the computer engineering program here at the University of Toronto. He graduated in 1997 and the reason I know him reasonably well, is in fourth year you have to do a big design project and I was Bobby's design project thesis supervisor. His thesis was to try to make two stationary bikes race each other over the internet. So people could race each other over the internet which was an interesting idea. Didn't get too far on it because at the time he had started a company called Caught in the Web, just when the web was becoming commercial. It was one of the first companies that created web pages for major corporations. And he was walking into my office looking sick every day because he was running a company and trying to finish fourth year engineering so I had a lot of sympathy for that. And I think by the end of that first year, that company billed a million dollars in revenue. So it's amazing that he survived that year. And he went on from there to be a serial software entrepreneur and we kept in touch over the years and I always enjoyed his insight and wisdom when it comes to business and software. Please join me in welcoming Bobby John. [Applause]

Bobby John: Good morning. As Professor Rose says he insists I call him Jonathan but I just can't do it. If anyone's been your professor you're just kind of stuck with that. I'm a graduate here at the University of Toronto, I graduated in 1997. When I sold my first company I actually moved to the States and so right now I live in Atlanta, Georgia and it's great to be back home and back here to visit. I always get a sinking feeling when I get to university campus because there's really only two emotions I had walking the streets of this campus. I am dead meat on this exam because I have not studied enough, that's number one. And number two is I did terrible on that exam and I'm not going to make it. And so contrary to popular belief even though I'm one of the U of T success stories, I was the guy who stood in front of that paper, I don't know if they still do it in a SF, there's a list of student numbers and if your numbers on there, you're out. I would always be looking at that list because I always kind of towed that line, but the reason I came to engineering is because I love to build.

I have loved to build ever since I was a little kid and maybe a lot of you are like that. When I was 10 years old my dad taught me some basic electronics theory on how things work and so I just loved building things. You would always find me designing something that involved lights, or motors or switches, batteries and wires and I would just about every Saturday morning that I woke up, I would be working on some sort of circuit. Now to do that, though, you have to have two things. You need money because you have to go buy equipment, like motors and switches and batteries and all of these things cost money. So you need to get to Radio Shack and you need to buy stuff. And then number two is you need someone to take you. If you're ten years old you need someone to drive you to the mall to get those things. And actually it wasn't a problem for us. We were a middle-class family. My dad worked in a factory but my mom was a nurse. She was actually a high-paying nurse that was recruited to Canada in the late sixties because there was a shortage of nurses. They actually came all the way to India and they recruited a bunch of nurses from the nursing school. As a middle class family my parents had enough money to buy me all the little pieces of equipment and supplies I needed to build stuff. But then one year my mom got hurt at work, she actually hurt her back and she had to stop working. That kind of changed everything for our family. We went from being a middle-income family to a lower-income family and my mom couldn't drive anymore. We didn't really have as much money, and my dad was super busy now because he had to do all the housework as well as work. So, he didn't have as much time to take me to Radio Shack anymore. My building career of electronics came to a halt and at one point I was so desperate for wire I realized that foil paper conducts electricity, so I would just sit there and make wire by taking foil paper and spinning it into thin strands and try and get stuff done. So that was kind of where that part of my life hit a halt but then I was in school and I came across the computer. And I built my first program and then a light bulb went off in my head and I realized - Man, with this computer I can build software. I can build anything I can dream of and I don't need anyone to take me to the store to get supplies and I don't need a credit card. I don't need my dad's credit cards, anything I can dream up I can build it. All I need is this keyboard and all I need is time and time is something that I had. And this is something we all know. That time is something we are all given equally no matter who you are, no matter where you are you are given 24 hours a day no matter what. And when God programmed this world and I believe he's a programmer, a computer

engineer, he sat there and as he was writing the code on how things would work, he wrote one line of code that said everyone will get 24 hours. Everyone will get 24 hours - rich, poor, black, white, American, Indian, doesn't matter, everyone gets 24 hours and to this day no one has been able to change that line of code.

So I was hooked, I was hooked. I wish I had this keyboard in my hand, I could stay up as late as I want. I could work on weekends. I could build stuff. I could build to my heart's content. And to this day a computer keyboard has been my toolbox to really change the world. I've had the privilege, since I graduated, to help hundreds and hundreds of founders, hundreds of companies build software that makes yours and my life better. And it's been so rewarding and nothing has ever got in the way. I thought I would ask you guys - how many of you want to own your own business? And how many of you just want to be a CEO, you want to have people working for you, you want to be the boss of something? And the rest of you just want to work for someone, OK, got it. Since a bunch of you want to run your own business, I'll just give you a little taste of my story here at U of T and it was kind of like when I was in elementary school and I saw a computer for the first time and I started programming. So I was in a SF, everyone's familiar with Sandford Fleming. I don't know if it's still the computer lab, I believe it was 102. OK so I was in there and working on some assignment and I looked over someone's shoulder and I saw a flashing N, the letter N, in the corner and they were clicking these blue links. And I just asked my friend, what is that, and my friend said it's the internet. He just kind of described it to me and explained what it was and I just couldn't believe it. My eyes just lit up and I said this is gonna absolutely change the world - this is in the nineties. I immediately started searching what company in Canada was doing stuff on the internet because I wanted to work there. My original plan after I graduated was to go to Microsoft, but Bill Gates was just interviewed by a reporter and they asked him, "Is Microsoft going to do anything specific regarding the internet?" and he said "No, the internet is just an extension of the network, we're not doing anything internet wise". So I was like, I'm not working there and as I looked around the country there was really no one doing anything and so I'm one of those guys who's like I only can do what I like, and so I was like I've gotta start something. It's the only way I can work in this technology and that's how I got together with a few friends and we formed Caught in the Web, which was an internet development company. And back then all you could really do, everything was HTML, so all you could really do was build websites and we were trying to figure out how to get this company off the ground.

Obviously there are three of us, we each have a credit card with a \$700 limit, student card and that's about all we got. Again our parents are all blue-collar, they don't know anybody, they don't have any connections, and they said there's no way they could help us out. And we're just like how do we get our name out there. There was a music trade show coming into town and we figured out a way to get in there, and I won't get into all the details, but we had to finagle our way to get a booth in this trade show and we set up there, and we borrowed some computers from the school and we got volunteers, and we were promoting other companies there so that they paid for our booth and whatnot. And as we were sitting there we had a website that we built and put up. We had a friend of ours who had a band, so we built out his website for free, and we just said in return he needs to come to the trade show and tell everyone that passes by about the web and about the internet and why it made sense for his band to be online. The president of Warner Music Canada walked by our booth and he kind of asked the same question I asked, about a year later, what is that, and we said it the internet. And we just explained what it is and how it worked and whatnot and ultimately a couple days later he gave us a contract to build sites for every artist in Canada. So I've done Alanis Morissette or Metallica, or you name it, all these bands we were building sites for. And then we got Virgin Music, and then we got Sony Music and we were just building, building, building like crazy. And that's when Professor Rose said, we got into front-page business sections of all the newspapers and McLean's and you know, we were three kids in our twenties and we have a million dollars of revenue in our first year of business. I ran home and I showed my mom. I really didn't like school, to be honest with you. I don't know why they keep calling me back but I say that every single time I come [laughter]. I really didn't enjoy it, I'm more of a real-world person and a theory person. So I ran home, I opened up the newspaper, said Mom, look, I'm already successful, can I drop out of Engineering. I can't stand it, Signals and Systems, you'll know all these courses. Remember - Signals and Systems is going to kill you, Electromagnetic Fields is going to kill you. Just stay away from bridges when you're taking those courses because you're really gonna be tempted to jump off [laughter]. So I told my mom I've made it, can I please just drop out. And if your mom's anything like my mom, the smoke started coming out of her ears and her nose puffed up and she's like, we came to this country for you to get an education, education is the

only thing no one can take away from you. You better get back to school or I'm going to come to that company and nail the doors shut myself and you'll never walk into it again.

So be it, I came back for my fourth year and kept studying and finished my degree. And after school was done I got to focus solely on the business and basically within two years we were a 120 people, 130 people. And then by the year 2000 we were approaching 150 and we got acquired by a large public company called CGI. I had already hired a CEO to run the company because once it broke around 100 people I was getting out of my comfort zone and I didn't know what I was doing any more because I was really young. So I had a full executive team and we got acquired and I had one requirement, because the company that bought it was like 10,000 and 100,000 employees and I just said I will not fit in a company like yours. If you want to buy my company, that's fine, but I'm not coming, you just have to take it and you have to let me just go, and they agreed and they acquired the company. And then after that I moved to the States and that was kind of my business story and it was amazing what software allowed me to do. Because once we got that client, and we had to do a lot of things to get that client, so that's true of all businesses, we had to get the client Warner Music. But once we got it, three of us with a computer keyboard in our hand, was able to generate one million dollars' worth of value. It was a lot of all-nighters and a lot of hard work and a lot of code. But that was about it, we didn't need anything else. Our cost of goods sold was just the computer, which probably cost around two grand, and then our time which was absolutely worth nothing because we were in our twenties and if we weren't doing that we'd be playing video games. So our time was worth nothing and that's what's so amazing about software. And so you're asking yourselves, a lot of you want to start a business, and you're asking yourselves, maybe does software really matter? Does it really matter for what I'm doing, like maybe you're thinking I'm going to build a better mousetrap, it has nothing to do with software. I am going to start a restaurant, which has nothing to do with software. Fashion has nothing to do with software. I want to be, I don't know if you're going to do this, some people finish engineering and then go into medicine and become a doctor too, so maybe it has nothing to do with software and you're sitting there going, why is this significant to me.

I want you to imagine you are talking to your great-grandparents and this will hit home for you. You're talking your great-grandparents and you're explaining the business world today. So you say Grampa, you know there's this company that was started in 1994 and today it's worth 140 billion dollars. It's called Amazon and they're like well what kind of company is it? And you say, it's a bookstore and your grandfather will scratch his head and say a bookstore that's worth 140 billion dollars? I knew so many bookstores growing up, there is nothing special about a bookstore. And then you're like, you know there's this other company that started in 1999 and it just got sold for 1.2 billion dollars. And he asks what kind of company is that, and you're like well its name is Zappos and it's a shoe store. And he scratches his head, a shoe store worth 1.2 billion dollars, and then you go on and you say there's a company that was founded in 2002, it's now worth seventeen billion dollars. It's called LinkedIn and he's like what kind of company is that, and you're like it's basically a recruiting site. You can go there and you can find people that you would like to hire. And again a recruiting company worth seventeen billion dollars, ten years after its created, just boggles his mind. You keep going and say another company that started in 2009, it's called Whatsapp, its worth 19 billion dollars. It has 55 employees and he's like, what kind of company is that and you say it's basically a phone company, like people can kind of just talk to each other. And he's scratching his head and he's like you know T-Mobile, the phone company T-Mobile, has 38,000 employees and Whatsapp has 55. Whatsapp is worth 19 billion, T-Mobile is worth 29 billion. It's crazy when you just divide the value per employee and your grandfather will be just scratching his head, like how can a phone company with 55 employees be worth that much more than a lot of the phone companies that have been around for decades. And then finally, the kicker, you tell your grandfather there is this company that started in 2009 and it's called Uber and it's worth today 17 billion and just climbing like crazy by the minute. And he's like what kind of company is that, and you're really just scratching your head and you're like, I don't know how to describe it. It's a taxi company but they don't have any cars and they don't have any drivers on their payroll, but they move thousands of people around every single day and they're worth seventeen billion dollars and again your grandfather's now just in a coma.

Here's the reality. Every single one of those examples is an example where software, someone looked at what could be done with software, and they completely reinvented an industry which everyone thought was. These are all industries that have been around for hundreds of years, and everyone thought they had reached the limit and now if you're going to come up with an idea you need to invent some new material

or come up with some ridiculous cure to cancer, or something like that to make money. And these are people who just looked at some old industry and then wondered what software could do and then completely reinvented it. And so I want to remind you as you go into the business world, as you start something, trust me, trust me, trust me, software is going to be your biggest competitor. No matter what you start it is going to come and nip you in the butt if you don't get ahead of it. It's going to be your biggest competitor and in all these industries, thousands of companies did not pay attention and now they no longer actually exist because of what software was actually able to do. So what should you do, I want to give you some advice as you become CEO's, as you become VP's, as you become founders and owners of companies. No matter what kind of businesses you start, no matter what industry it is in, if you want to beat your competitors, if you want to be different than the people across the street who are trying to put you out of business, whether it's a software company or not, as you're running your business you should always be looking at every part of the business and saying is this an area that software can help make us do it better? Just ask the question, just ask it to your employees, ask it to your managers, ask it to your clients, just keep asking yourself is this an area, is there any area in the business where software can help. You don't have to always build something from scratch. Actually, a lot of the solutions we build today, we're just knitting together the services that are already out there. It's like Lego now, we're not even always writing everything from scratch, there are so many services that are available just on the internet that you can rent and we just knit them together in a very unique way to solve a business problem and it completely takes that business owner and puts them above every other competitor that they have. I mean of course there's going to be times when you think of building something original and you're going to be like OK. Like the other day I was talking to someone who, they just install shutters in homes, and they have an idea to just revolutionize that industry and they're going to build something from scratch and it's going to completely change the landscape for that industry. And that might be your case, you might come up with something, you might take your own parents business and completely transform it with software. You might just sit there and have an experience tomorrow at some company or some service and you're like I'm going to change this with software. When you're building a business there are only three things you're trying to do: reduce costs, increase quality or increase revenue. So you're going to look at every single idea you have and you're going to say can software help me reduce costs, increase quality or increase revenue. And if the answer is yes and you're not scared of software then you're going to build something.

So software is your best friend, that's why I'm being paid to be up here. I'm not getting paid, but I'm here to tell you software is your best friend. When you innovate using software, you are not limited by where you live, you're not limited by how much capital you have, you're not limited by your age. Which was a big thing for me because I was a really young person who had a lot of people who were older than me working for me, a lot of clients that were older than me and age could have worked against me and traditionally did. But because I was in the software business, age actually worked in my favour because I understood something that a lot of them didn't. And I was able to demand top value. It's amazing that you are in a situation, you are in a point in time where you can build something. You guys you can honestly build something more valuable than the most connected person, the most wealthy person, the most experienced person on earth. You could build something more valuable and those examples I gave you are people who built companies that are worth more and they probably knew no one but they understood software and they understood how to leverage it. You have that exact same opportunity. So I just want you guys to remember as you walk out of here and you go about your day, to remember that without software, social media is just media. Without software, your smartphone is just a phone. Without software, if you wanted to buy music we'd have to all get in a car and go to the mall to what we call a record store and pick it up in person. Without software, you want to watch a movie in the middle of the next class, you would have to go to Blockbuster and rent it. Without software, Amazon would just be a big river in the rainforest [laughter]. Thanks, guys.

Jonathan Rose: So we have lots of extra time, so you can ask some questions if you have some. I know it's frightening to ask questions in a place this big, but I'm sure somebody has a question.

Question 1: So you said you and two friends started the company together. Did they stay with the company when you sold it?

Bobby: No, we all exited. We wanted to go on and do the next one. We had actually already hired a CEO, a VP of Engineering, an HR Manager, a CFO. We had all those positions in place and so when they acquired it we just told them to take that and we moved on. So it's a really weird experience because they came and they took my security card, they took my laptop and they escorted me out of my own company. But at least I had lots of money so it was OK. I wasn't upset.

Question 2: In the industry right now, what is the language most used?

Bobby: So we've seen that change year over year all the time and it depends what industry it is. I mean, the older industries and maybe more regulated industries could be using some older languages. Any start-up we see today, in the States anyways is always going to be PHP, and now we're starting to see node.js and really what it is everyone wants to build faster and faster so they're just picking languages based on what frameworks and open source software is available. So we can just grab it and go faster, so if it's a specific industry and there's a lot of frameworks available in PHP, and frameworks means someone's already built it and you can just take it, we'll use that to go faster because everything's about speed. Speed of building it. They all operate great, you can make any language do what you want. So that way, I guess computer engineering was good for me in that sense. I'm pretty well language agnostic because I do understand the fundamentals of how software works.

Question 3: What do you currently do?

Bobby: I am an angel investor. So, I love just hanging out with founders. I'll do anything I can to be with founders. So I'll invest in early-stage companies and also I run now the second version of Caught in the Web. So when I sold it, and this goes to your question, three of us left, the founders, but there was a bunch of young people that I had hired. A lot from the labs here in school and so at a hundred and thirty employees, a lot of engineers, to find engineers that understood the internet back then you had to go into the dark caves of the University, where they work in the night, in the dark and type stuff. And so a lot of them weren't that happy in the new company that acquired them, so about two years in they were calling me up and yelling, you sold us to this evil empire. We hate it here and I said ok, ok I'm sorry. When you guys are done, when the non-compete is finished, come on out and I'll get behind you to start another company. And you guys can come up with the name, and these were all engineers, and I'll coach you and I'll mentor you as you're building it. And they came up with the name Band of Coders and that's what it exactly was, a bunch of engineers who want to code for business. And so that's what I do right now. I run a company called Band of Coders and we have an office here, we have an office in Buenos Aires, Argentina and an office in the States, in Atlanta. And so we build software for mostly start-ups.

Question 4: If you build the most amazing piece of software, how are you going to leverage it and get it to the market?

Bobby: That definitely is a challenge, how do you get the word out there. I think that is the key part of understanding what problem does your software solve. It's tricky when you build software and there isn't a problem that you're thinking it actually applies to. So when you're looking to solve a problem you should actually think through that exact question. How am I going to get the word out? Who's going to be my first client? For us, when we build businesses we think who is going to be our anchor client. Like in Atlanta that would be like, let's get Coca-Cola as our client and if we can build something that solves a problem they have then we can get the word out through them that we built this. You'll find that a lot of companies just kind of follow suit when they see a few companies are using a solution, they will use it as well. But definitely marketing is something you're going to have to think about.

Jonathan Rose: There is a course in the business minor called Markets and Competitive Strategies.

Bobby: So, take Markets and Competitive Strategies in the business minor and all your problems are solved!

Question 5: How saturated are the computer and software engineering markets?

Bobby: So I can't speak for here, I haven't been in Canada for awhile, but in the States we can't find enough people to build all the ideas out there. So as you move on from the 150 billion dollar ideas and you're moving down, we're just seeing tons and tons of people and individuals and companies with 100 million dollar ideas or 50 dollar ideas or five million dollar ideas. Twenty percent of our clients are someone who has a job, they might be the neurosurgeon at Emory University hospital in Atlanta, and they've come up with an idea for an app that will make neurosurgery more efficient than the hospital floor. And so that app, you know obviously it's not going to be worth a 150 billion dollars because the whole world isn't going to use it, only neurosurgeons are going to use it, but they have an idea and they're building that now and it's going to be worth 50 million or 100 million. And that's just starting the smaller ideas from non-technical people who are now getting the courage to say, I need to build an app. I need to make this better because I find this so frustrating. And that just wasn't even there five years ago and so those ideas are flooding us, just flooding us because we can build something for, in our industry you can build something for one hundred grand which used to cost one million. In the States anyway, everyone can afford that, so everyone's trying to build something. So no one can find enough people and there's this course how to try and make you a programmer in eight weeks and things like that. It's getting pretty silly actually.

Question 6, Jonathan Rose: You said that you didn't like being here at all. When I was an undergraduate here I didn't like it either. It's hard! And when people ask you to reflect, which you did a bit a moment ago, there is something that takes place in four years here that did make you a part of who you are. We kind of annoyed you with Signals and Systems. By the way, Signals and Systems is a really hard course in ECE, but it is one of the most fundamental things you need to know how to do stuff. Process signals coming in from the computer, to do clever things with it, like see what's there or hear what's there. And so it's the fundamentals of it, and yes, I didn't like it either. I didn't like Electromagnetics either, gosh we used wireless for everything. OK back to my question.

Bobby: Yes, I want to encourage you because you might not like it too, but you should see it through, like I did. My mom was actually right, education is the thing no one can take away from you. And it's true to this day, and I'm a God because I'm a computer engineer, basically in the States anyways. What it did teach me is literally how to learn anything. Really, I'm not scared to learn anything. Because everything is easier than Signals. Everything [laughter]. So, I think understanding those fundamentals has allowed me, though it is painful in retrospect, I can see patterns of how things work and how things are going to work and so even though now I've been out of school for a while and I'm probably on the older side of tech, I can keep up. I can honestly just keep up because I didn't just memorize something and or just go online and copy and paste a bunch of Java Script code to make something, I actually understand the fundamentals of how a computer works. So every time a new language comes out, every time a new device comes out, every time anything comes out, it's not intimidating because I know these are really just, you know, pretty dumb machines and I think a lot of people don't understand that. And I can see that in the industry - those who don't have the degree that we have, you can just see that they're at a different level and it's down. They just really don't truly understand what they're doing and it gets them to a certain point and then they just kind of hit a ceiling. And so I'm really appreciative of and thankful, even though it was so hard, partly because it make the rest of the world look easy and secondly because I didn't even realize the confidence it has given me and the ability it's given me to stay relevant, you know, twenty years later.

Question 7: Do you think that Virtual Reality (or VR) companies are going to change the software industry?

Bobby: I would say just looking at the patterns, and one of the patterns you look at is, where is all the money flowing and you just kind of decide why is all the money flowing there and definitely seeing that. All the VR companies are being picked up and purchased and what not. So there's a lot of hope that it is going to change things. And just that experience opens up, like mobile did, it just opens up a whole new range of applications that couldn't be there before. So yeah I would suspect we're going to see something happen there.

Jonathan Rose: Does everyone know what virtual reality is, by the way? Put up your hands if you know what virtual reality is?

Bobby: Not everyone. OK, so you're going to see these ugly goggles that you put on. And these are the ones that are being picked up, it is an immersive experience where you are actually in another environment because you're wearing these goggles and it looks like you're in a different room, or in a different city, or in a different situation. And there are so many different aspects on how that could be applied. Not just video games and that's what everyone's really dreaming up now, is the horsepower on our computers to be able to actually generate a virtual world. And the devices are there to actually let you see it.

Question 8: Do you think you can fix Blackboard? [laughter]

Bobby: So my understanding of Blackboard is that it is an educational platform. A content management system. I can encourage you to make something to replace it. All of you guys should get together and make some new one and put them out of business. The only problem with Blackboard is they keep acquiring everybody that gets anywhere, so I think that's why we don't see a lot of evolution. But, you know, you could be one of those who gets acquired and then get in there and be a troublemaker.

Jonathan: But they wouldn't fix it if you got acquired.

Bobby: OK, so don't get acquired. Just keep going until you kill them.

Question 9: How does engineering and the way we learn to think in engineering and the method of thinking, how does it apply in other industries or even in the business world?

Bobby: So I'm a good example, because I don't have any business education. I don't have an MBA and the engineering program did not provide, when I went to school, a ton of options. There was an entrepreneurship course but there wasn't much more than that. So I don't have any business education, and so all I can do is apply what I've learned in engineering. And so my approach to building a business is I engineer a business. That's exactly what I do, so it's no different than when I engineer anything else. I iterate through, I design, I try it, I make a change, I try it, I make a change, I try it. I just keep iterating through and I actually engineer a business and then that makes me a very different business leader than a lot of those out there. And my way, if you ask my employees, they'll say that there's just something different about the way Bobby does business. Which is why it's a big thing for me to see more engineers become CEOs and founders and owners because I think it's really refreshing the way we approach it and I think it's becoming more and more important as less and less businesses revolve around data and processing and analyzing that data and it's becoming more and more about every single day. So I think you have a huge opportunity to succeed in the business world.

Question 10: Did you encounter any patent issues when you were building your businesses?

Bobby: So no, I didn't encounter any patent issues myself. We have got patents for our clients and I've had a few businesses that have gotten patents, so generally my position on patents is it's good to have because it's a good negotiating point. If you do run into a problem you can negotiate the patent you have with someone who's fighting with you with their patent. And of course if you're an acquisition talker it's one of the things you can hold up and say we've got a patent.

Question 11: Do you feel that hardware has hit a limit and is it preventing us from doing what we need to do with the next generation of software?

Bobby: I personally have not seen a lot of that. I can give you a great example. The question about programming languages and what's popular out there is, so if you built a chatting system with PHP or Java it would take, let's say to get thousands of people talking to each other, it would probably take hundreds of servers if it's a java-based back end. And then recently in the last year a language came out, node.js, and we were able to take that and we were able to build the same chat system and take a hundred servers and get it to work on one. And so I think you just constantly have this kind of back and forth, where actually software can work better, there's still room for software to work even better with the hardware that's out there and of course you know there's room for the hardware to improve. I think again,

you guys in ECE, because you truly can understand the fundamentals of how software works, you'll be in a position to really take advantage of hardware in ways that those without your education could do. They wouldn't be able to come up with this new programming language like node.js that is able to work so much more efficiently and so we find that a lot of improvements in hardware really does help people who are maybe a little more sloppy with their code or doesn't know how to fine tune it. It definitely allows more people to get into the field and get stuff done but for those who know what they're doing, I think you know, there's still a lot of room for you to improve your software.

Question 12: How do you get investment in the early stages of your company?

Bobby: You probably don't. If it's really, really early like you haven't even built it, you're going to probably got some money from friends and family or what we would call angel investors. The venture capitalists tend to have a formula they like to follow and they get involved at a certain point. Or, they'll get involved if it's your second or third success. There's always exceptions to that rule definitely but I would encourage you, when I built my first company I didn't even have a concept of investment, I didn't really know it existed. So I just tried to build something of value and I'm not an accountant and I don't have a finance major so I only had one rule for my business when it came to finance. More money has to come in then go out and I was happy if that was the case. So I think as soon as you start building something of value, people will come knocking at your door.

Question 13 Jonathan Rose: Can I get you to describe how your company, who develops software, has a way to invest in the companies it works for.

Bobby: Basically for us as an organization, we don't invest just when it's an idea on a napkin because we do want the entrepreneur to learn how to raise some money, even if it's from family or friends or just saved up some money. Once they've got their first version of their product done, at that point we would start becoming, on their next round of financing, we will become an investor as well. And then we become partners and co-investors in the idea and the products. So Band of Coders, on the surface you just see a service company that builds software for other people, but really we own a lot of companies that we've built software for. And so when those get acquired or go public or whatever may happen, we will benefit from that as well.

Jonathan Rose: There is that one interesting twist, that you don't actually invest money in them.

Bobby: No, we don't invest money, so we actually just do work. In exchange, we get equity. So we don't invest money. They'll always need to do more work because one thing if you build software, you have to build it forever, you have to keep building it. And that might be what's happening on Blackboard, they're not building enough new stuff for you guys but you got to keep going. And so the client eventually realizes how essential we are to their business and they will trade us equity for our time.

Jonathan Rose: Bobby, thanks, this is awesome. I appreciate your insights. [Applause]