Phil McKinney: This week's podcast is an interview with Sir Tim Berners-Lee, the inventor of the web. I caught up with Tim at the Web 2.0 conference in San Francisco. In this interview, Tim looks back to the early days of the web and looks forward to what's next. Enjoy

This is the Killer Innovations podcast with Phil McKinney. Keep in mind that the information and opinions expressed in this podcast are Phil's and Phil's alone, and they don't necessarily reflect those of his past, current or future employers. Now, here's Phil McKinney.

Phil McKinney: So Tim, we're here at the Web 2.0 conference. Lots of changes happening, but let's take a little step back to the work that you did that actually started this whole ground swallow with the invention of the web and HTML. Think back to your CERN days. What was going through your head? What was really the trigger that resulted in the invention that you came up with?

Tim Berners-Lee: I think one particular trigger was a mounting frustration that the web didn't exist and having to deal with all these different networks, different computers, different programs, different documentation formats when trying just to have a life as a software engineer within a huge organization. It just made me think more and more about how the world could be better.

Phil McKinney: Right. So you did the project. You came up with the original work. Any indication of how widespread that was gonna be? You think back to that time and you look at where the web influences everybody's live today, the number of people it touches. Any indication? Did you have any kind of an inkling back then on the impact?

Tim Berners-Lee: I did call it the "World Wide Web," but it was also very clear that it shouldn't be for just one narrow discipline or one narrow application. But then, obviously, there was no indication that it would go on, taking off. The first load on the first web server just went up by a factor of 10 every year for three years, an absolutely solid exponential. When you put it on a log scale paper, you could put a ruler through it. So that was a great indication that this was very serious. That was not a normal curve, but all the time, there are so many things which they look off. They definitely have this exponential takeoff and then they falter and the stall and they collapse. That's the normal curve for most things.

Phil McKinney: Correct.

Tim Berners-Lee: And most of the thing I'd done, they had their day, they faltered and they collapsed. So there were so many ways and still are. Quite a lot of them still exist – ways in which the web could have faltered. So it was just constant work trying to figure out which is the most important thing to do tomorrow to make sure it kept on going as one open web.

Phil McKinney: So what were the key things that you think were the catalysts that allowed it to keep on the curve – the involvement that you have on W3C and kind of being that leader as far as keeping the standardization activities under control? Is it that? What were those key ingredients?

Tim Berners-Lee: I think, first of all, remember the internet has been really well designed as an open platform, and I just use that. The internet is spread across American universities, so it had this Petri dish, all set for the mold to be dropped onto it. So credit to the people who designed the internet to not design it for a particular application, but design it as an open platform. We try to copy that with the web.

So as the web has taken off, yes, I think the spirit in which the way people have joined in. There are a few critical points, which it looked as though it was gonna be dominated by a particular company and there were points at which it looked like the patents would be a huge issue. So the point, the large companies got together and realized that the web technology had to be royalty-free was crucial. So once that was set up as being the rule of how the consortium worked, then the rule, basically, for these open standards on the internet, that maybe would work, then, I think, it became much more solid.

Phil McKinney: It seems to be, always, the challenge with the industry standards, right? You get that small group that wants to control it, who wants to figure out a way to make the money on it versus the open give it away, royalty-free to encourage that growth. So what was the process of getting everybody to align on that thinking, because, like you said, it was such a crucial stage?

Tim Berners-Lee: I think it was a big battle between people coming from different camps in some large companies. And, of course, the consortium that we're trying to reverse engineer what's happening with these companies, but it looks as though they would have, typically, a separate division that reported separately to the CEO that just made money by suing people who had used the patents. Going and digging up patents. They're exclusively legal, _____ technical, to

dig up patents to try to figure out who they could sue, and that brought in a certain amount of money and it paid for itself. That was a business model.

Meanwhile, you'd have people in the engineering division who wanted to produce any product, somebody who wanted to do web on mobile phones or something. But the web on phones was going to take off. That was going to be a huge market. The revenue that was gonna come, even a small part of that market was gonna absolutely draw off the income from trying to get royalties from patents.

But when you try to get royalties from a patent, it destroys the market. So I think what happened was it got to the point where it was being discussed in *The Wall Street Journal* and then at a CEO level, which realized that, really, there had to be a company-wide shift in policy. So these large companies made significant decisions and you could see it from outside. The engineers came out of the meetings looking relieved, because they knew that they would be able to go on working on *[crosstalk]* –

Phil McKinney: They could actually go on inventing versus worried about the

Tim Berners-Lee: Suddenly, the lid was off the box again, and everything was possible.

Phil McKinney: So now you fast-forward. You're here, Web 2.0, so what are you talking about here? What's the new thing that's got you excited?

Tim Berners-Lee: Well, there are so many things happening at once. When you have something as broad as Web 2.0, looking across, there are things straightforward, if you like, apparently straightforward such as HTML 5 evolution, which, of course, is not straightforward, because there is no specification on the planet, it seems, which has got so many people who wanted to say, "We have got ideas and serious constraints on how it should evolve."

So the release of HTML 5, but maybe under the radar of HTML 5 evolution is the fact that where that application's platform is maturing into a very serious distributing computing platform. Behind that are all the questions about how you do security and trust. There are some web applications buried in HTML 5, but also there's web application happening in web apps and other working groups, things like being able to find out where you are on the planet, being able to access the attributes of the local devices, the local storage, local swipe-able screens, local cameras, all sorts of

things. Those will make it really going in a new direction. There is data on the web which is exciting and a big push there.

Phil McKinney: One of the things that you've also been evangelizing for quite some time is this notion of the Semantic Web. Can you give me – some people may not be familiar with the context. People hear the term, but can you give a two or three minute view on Semantic Web and what the value from that activity will be on people's lives?

Tim Berners-Lee: Semantic Web is a fancy term for putting data on the web, putting it on properly, using standards. We call it "links data," because when you put it on – with the Semantic Web's standards, you can take something, which, at the moment, you got sitting, typically, in a CSV file. When it sits in the CSV file, you can load it into a spreadsheet and you can look at it and you can print it out and you can graph it, but a computer can't really figure it out, because very often, your CSV file has got little motes around the edges and all kinds of decoration. It's not obvious what it means.

So when you export that as a Semantic Web file, then you change it in little ways. You export the same data, but it means that now each row of the spreadsheet or whatever it represents, a car or product, for example, it gets the URL. It gets the URL for the concept. That's different. It's moving from where the web, what we think of as a web of pages about things, to where your actual product or you as a person gets the URL. When that happens, then you can ask the system data-like questions about it. You can do queries on it. So instead of searching for things and just dropping it into somewhere, when you found something with Semantic Web, then you can treat all the data in the world, in principal, as one big database, which is very powerful.

Phil McKinney: Right. So what's been the roadblock, because the cemented web concept has been worked on for a number of years and you see pockets of it, but is there a roadblock that's preventing it from taking off or is that –

Tim Berners-Lee: No, it is taking off. The link to open data world is taking off in really interesting ways. We talk about some of that. The reason why I think it didn't happen; first of all, we didn't put forward the data layout, which is the simple layout, as link data. What we first did was to design quite complicated languages for designing ontology. But quite powerful languages, like OWL language, which is more powerful than other people need. We designed that

before we had the query language. Now if you can imagine trying to promote rational databases without simple –

Phil McKinney: That's a little tough to do.

Tim Berners-Lee: It's not gonna happen. Now we've got SPARQL. SPARQL is like SQL, but it queries many web stores and is a protocol that goes across the internet. So now we've got that really. We've got the _____ and we've got OWL. We've got everything we need to put stuff on the web and to aggregate it and to search it. Once you have a Sparkle endpoint, that will return you – you can pick what query you want to do and then you can get XML back to use in any XML application. You can get, typically, Jason back and CSV files, even, back to use your spreadsheets. There are also ways you can go once you've gotten into that link data form.

Phil McKinney: So that's what you're working on. If you had to look out a little bit to the future, where do you think this is all going? What do you think the web looks like in two or three years –

Tim Berners-Lee: I'll talk onto that a little bit, on linked data. This year, 2009, has been for me, a year for just particularly focused on pushing government data onto the web, so that's something which has created quite a ball of interest. Of course, it has coincided with an interest in government in the U.S. The Obama administration has been very positive about being open, putting government data out there. This government data has got a lot of value to industry.

If you're working in the U.S., then having government data available is going to make like easier. I think U.K. government is like that as well. There's been a personal push down to get data out there, to be more transparent of other people in the U.K. in a very bipartisan way, pulling for more transparency and putting data out there. So that's the big stimulus of whole linked data open movement.

Phil McKinney: In that case then, it's really about the innovators of the future are now gonna have this wealth of data that's gonna be much more usable for them in whatever innovations they're gonna drive. It's really kind of a component piece to help drive some of these new innovations.

Tim Berners-Lee: Yes, I think that you'll just be working at a higher level. Just as now, if you're working on an essay for school and you need to look up about the capital of the state. You can look it up on Wikipedia and you can find out what the population is.

But if you're writing application in the future and you've got the idea of a city, you take it for granted that you'll just be able to look up its population as a property of that object, if you like, just a simple query. You'll see all the basic data on how the country works and what state it's in. It's gonna be available and that will really change the way you design any application that will have this backup data behind it to ground it and give it much more power.

Phil McKinney: I see it from a standpoint of external use. Do you see enterprises thinking about using this as part of their internal data source? Because I'm thinking about all the data – just look at a typical corporation. It gets locked up in all these disparate databases and spreadsheets.

Tim Berners-Lee: It is amazing. In fact, I thought it was just gonna be disparate databases, but a lot of them, in a lot of cases, is a spreadsheet.

Phil McKinney: You'll be amazed at how many businesses run on a spreadsheet.

Tim Berners-Lee: Yeah, and they go to a huge amount of effort, and with spreadsheets, it's manual effort. It's manual effort to take the spreadsheets from all the people who run different groups and bring them up to the department level and produce a summary spreadsheet and to send that up to the boss.

Phil McKinney: And it ultimately gets put in a PowerPoint.

Tim Berners-Lee: It will end up in a PowerPoint and nobody will be able to click through and say, "Where did you get that from? Really?"

Phil McKinney: Is that data –

Tim Berners-Lee: "What book is that? Can I compare that with 2007? Can I compare that with our competitor? I'd like to graph that against the NASDAQ over time." These are the thing that, typically, if you could do that, you'd wanna be able to do. And, yes, when you talk to the CEOs, often, about sharing data outside of the company, with suppliers, which is a very good thing to do, of course to make the whole _____ chamber a lot more efficient, and you say, "Look, I'm in a situation where you have this – aren't you a stovepipe? Aren't you a silo of information? Don't your partners want to be able to see inside your company to see a little bit about what's in store for them in terms of orders and that sort of thing?"

And he says, "Look, don't talk to me about silos. We've got them all inside." In a big company, yeah, you need this integration technology, this decentralized integration technology inside the company a lot.

My guess is it's going to happen inside the companies first and then bit by bit, there will be this competitive syndrome like we saw with the web, initially on the bookshops on the web. But they didn't put the catalog of the books on there, because that was proprietary information until somebody did. Then once the catalog of the books was on the web, then all the bookshelves had to, but they didn't put prices on, until somebody did. But they didn't put stop levels on, until somebody did.

And then now, to be competitive, if you're selling books, you've got to have the whole thing. You've got to come clean whether or not you've got the thing in stock. So life works much more efficiently because that data is available, but it's still available when you go to the website and order a book. I can't pull that into a spreadsheet. So I think we'll get the same syndrome of competitive, incremental disclosure. To be competitive, you're gonna have to give me that stuff as a feed.

Phil McKinney: When you think about the executives that are leading, let's say, corporations, but also government leaders, there's a new skill set that has to be almost ingrained in the DNA in those people, because today, they don't think about data in that context. They think of it as the traditional spreadsheet, roll it out and give it to the PowerPoint. When you think about the executive of the future, thinking about how they manage, whether it be a city, a country or corporation, what should they be thinking about? How do you think they should be aware of or conscious of? A lot of executives you talk to have no – other than they know how to go to a URL to find a page?

Tim Berners-Lee: I think the mindset in which they eventually – which took a few years, but they got, for the web, but they don't get for data yet, is the unexpected reuse. You know when you put something on the web that you put it on there for a friend or you put it on there for a colleague, but all kinds of other people, by the end of the year, would have used that information. They'll be pointed to it. There will be links to it, all sorts of places people will use it for different reasons than the reasons you put it on. And people might end up, as a result, buying your products for reasons you didn't expect. That's all good news.

When you put data up, it's the same, and in a way, a more powerful way, because when you put data up, people can join in this stuff, which is in other databases. They can compare it with stuff from other companies, but also, they can compare it with stuff from a different domain. The value of the data suddenly increases, and that's why putting stuff on the web is a good idea, because it just increases the value of each piece of information. People need to get that about data.

Instead of thinking of a spreadsheet as something I made and something I emailed to somebody, thinking it was something that I put on the web and I update every now and again, and there's a feed, which other people then become part of an information flow and I am part of this information flow and I'm providing value and I'm making my company more efficient and more valuable by making that data reliable and up-to-date and usable for all kinds of things.

Phil McKinney: One of the things that I get pulled into is how we bring technology, for instance, to emerging markets? My argument is it's not about technology in emerging markets. It's about getting those citizens of the emerging markets access. It's not about the device; it's about getting them bandwidth and getting them access to the information. I know you've got an interest and passion on how you bring the web into the emerging market where people haven't had access before. So what are some of the things you're thinking about or working on in that space?

Tim Berners-Lee: This is all a huge area, of course. We're just launching the World Wide Web Foundation and it's very exciting. It's fascinating to look at – when you look at the world and realize that we've been operating with the 20 to 25 percent of the people that use the web and then the vast majority of the world doesn't use the web at all, although quite a lot of them have signal.

So we wonder – don't they have a device? Does their device not work? Do they have a device and a browser, but does their browser not work? Does the website not work for them? I think there are also questions we can ask. Have we designed the web, really, for Silicon Valley? Was it designed by the early adopters for the early adopters? How does it need to be different? How can you reprogram it so it's gonna work for somebody in rural Africa? It's been really interesting to go out and have a look at how people are using the internet in rural Africa.

We've got more visits to come. We've got a huge amount of learning to come, but I agree with your passion that people have to – for me, for creativity, I want to say, they have to participate. They have to be involved, so it's not just being able to browse the web; it's having a web server. It's not just really people blogging. It's not just being able to look at a map. It's when you find that your village isn't on the map, going in there and fixing it so that it is.

A couple of us were out there with a BBC trip trying to see how people were using it and trying to persuade a couple of people – when you go to Wikipedia and you find that Ghana is in Wikipedia, but then you go down and find that there isn't really much information about the districts, you can change that. When you go to OpenStreetMap and you find that some of the roads you know about aren't there, you can change that.

I think it's a very important attitude, actually, for everybody, people in the developed world are getting that, especially with blogs and with wikis, but I think even in the developed world, we still have to make the web very much more of a creative space, pretty much more of a collaborative space, so that we're really building ourselves a combined web of all our shared common knowledge and our shared common hopes and aspirations.

Phil McKinney: So talk about what the foundation's real objectives are. What's the purpose of the foundation right now?

Tim Berners-Lee: Well, generally put, it's to make sure that the web serves humanity to its utmost, the best that it can. That means, in fact, various things. It means, clearly, the standards which all of the consortium has been doing for 15 years are still important. We're making sure that those work well is part of it. Doing what we are calling "web science," looking at the web. It's a huge thing. It's got 10 to the power of 11 web pages, and it's got really interesting structures and nobody, really, is analyzing it. And getting academics to look at the web and not only analyze it, but also think about how we could engineer it better.

But then the third piece of it is looking at how it can tweaked, how it can be made better for the people who don't have it at the moment. And it's not just people in rural Africa. It's people in the cities. It's not just people who don't have the right character set. It's people who are illiterate, who cannot read or write at all, but can handle audio and video. There may be places where making the web very much more a video web is gonna be really exciting as

bandwidth comes up. It's such a huge, open question. There are just enormous challenges. It's a very exciting time.

Phil McKinney: Yeah, it is. When you think about what's happening now with the web, you're seeing this – if you read some of the reports on the amount of content and data going across and its shift being heavily towards audio and video as an example. What's your take on that, given just the shift from what used to be text-based pages until now, the role of audio and video in that overall experience?

Tim Berners-Lee: Well, I think on one side, yeah, it's great if you can get something in video. It's even better in HD, and later, we'll say it's better in stereo and then we'll say it's better in full 3D immersive. Yeah, the bandwidth will go up and up and up, but then our compression technologies will get better and better. So there will always be people pushing the edge for the immersive experience.

On the other hand, it's amazing what people do with 140 characters. When you download your bank statements, you know that's not a lot of bits. It's a lot of power. When you download a calendar or share a calendar, then it's not a lot of bits that you're using.

So the really interesting, functional things, my sharing my trip and my flights, very small number of bits, very useful for all the people who know me to figure out where I am and remind me that I ought to go to the gate now. So I think that we shouldn't worry about the internet getting swamped. There will be applications which will always push the boundaries on it, but the good news will mean that if we're cabling up for HD and video-on-demand, then HD bidirectional conferencing, for example, then everything else will be cost per bit of doing all these other things will get lost in the noise.

Phil McKinney: To wrap up here, one question that I wanted to have you think about an answer is we're here to day and you're sitting in probably the best chair of anybody in the industry to see what the future holds. What do you think the web will look like in two to three years? I'd go 10 years, but I think that would be pushing the envelope. What do you think the next two or three years are –

Tim Berners-Lee: Well, two to three years, in fact, it's amazing how sometimes it can change very fast and sometimes it doesn't. We talked about web applications, so I think that's gonna become a really valuable – there may be markets for web applications just like you have phone apps now. You may have people building all kinds of little

web applications that will work together if we can get the trust models right.

The amount of computing, which will be kicking around on people's desktops and things will be interesting because we'll get normal path of processes for when they want to handle graphics and compression and so on. So as a result, you'll be able to do all kinds of things for data analysis and distribute it. I think it's really exciting.

So there is maybe even all the browsers will actually implement scalable graphics, which will be a wonderful little step, working in a few years like that. I think the move to the web of data is happening. That will have some spin-offs of applications that nobody has imagined yet, because the ways you can combine data and the ways that you can't combine text.

What I'd like to see and hope will happen in the future is that we get a resurgence of interest in PubSub, in notifications, streaming and real-time updates of things. People have been looking at that every now and again, about trying to use protocols like HDDP or Jabber to send off streams of information about what has changed, allowing me, for example, to do a SPARQL query and then say to the SPARQL server, "Okay, you've given me a list of people with that criteria. Tell me is it changes from now on."

So then the world becomes a set of indicated streams of novelty. For people, it's always been "What's New." The What's New page has always been the most interesting thing on a website and I think we'll find, also, for machines, after a while, though, they'll learn all the basic data and the machines, also, will be making money out of "What's New?" So the protocols for sending What's New will be important.

Phil McKinney: Interesting. Well, Tim, I thank you for your time and I appreciate you spending a few minutes with me.

Tim Berners-Lee: My pleasure.

Phil McKinney: Thank you.

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