

0:00  
0:10 MALE SPEAKER: Good afternoon, my dear  
0:12 colleagues, dear friends.  
0:14 It's my real privilege and pleasure to welcome here in  
0:18 the Czech Technical University Mr. Douglas Merrill, who is  
0:24 currently a vice president of Google.  
0:27 You may see that Google is just rolling over the Czech  
0:31 Technical University, because we have got an excellent  
0:34 opportunity in April when Vinton Cerf was here and he  
0:39 was speaking about the internet on Mars, while  
0:43 Douglas is going to contribute on the  
0:46 search side of the Universe.  
0:49 So it means his lecture is about the search  
0:53 possibilities, and I think he is going to be quite excellent  
0:57 in this field, because he's not far away from your age who  
1:01 are sitting over here, and he's of your mentality.  
1:06 And I think the main point is, please, this lecture will be  
1:11 around 45 minutes.  
1:13 Then, of course, it is expected at least hundreds of  
1:17 questions rising.  
1:19 Please write them down on the paper to smooth the process,  
1:23 and send them to the girls who will be going down and up.  
1:27 So please do it in this way.  
1:30 And as well, if there is some presence paper, please sign  
1:36 it, because it is fine to know who is really interested in  
1:39 such a field.  
1:40 And in fact, I'm not really to be upon your time, Douglas.  
1:44 It's your floor, and possibly even your microphone.  
1:48 You have got it.  
1:50 So the floor is yours.  
1:52 DOUGLAS MERRILL: Thank you very much.  
1:53  
2:02 Hi, thanks for coming.  
2:03 It's a great honor to get to come to talk to a university  
2:10 that's 300 years old about a little tiny company that was  
2:13 founded eight years ago, nine years ago by two crazy  
2:18 graduate students.  
2:19 And Stanford University, where Larry and Sergey were  
2:25 students, has a bunch of classrooms that  
2:27 look just like this.  
2:29 And so I guess my deepest hope is that the next Larry and  
2:33 Sergey are sitting in the audience right now, and will  
2:35 be inspired by something stupid that I say during this  
2:38 lecture to go out and prove me wrong.  
2:40 So that's my challenge to all of you.  
2:42 Find what I say that's wrong and fix it.

## EXHIBIT 2078

*Facebook, Inc. et al.*

v.

2:45 Thank you so much.  
2:46 My name is Douglas Merrill.  
2:47 I'm a Vice President of Engineering at Google.  
2:49 So just for those of you who are in the front, I recommend  
2:51 that you loosen up your neck a little bit, just relax.  
2:54 I pace a lot.  
2:56 And so down here, you guys, you're going to  
2:58 get a little seasick.  
2:59 It's OK.  
3:00 If you feel seasick, close your eyes and  
3:02 breathe, it's OK.  
3:03 Up there, you guys are going to forget who I look like.  
3:04 It's all fine.  
3:05 You cannot see me up there anyway, so it's irrelevant.  
3:09 This is Alex.  
3:10 Alex is right now having a nightmare that he has a test.  
3:14 Do you guys all have that nightmare where you're in the  
3:16 front of class, and you have a test,  
3:17 and you haven't prepared?  
3:18 Alex is unprepared.  
3:19 Next slide.  
3:20  
3:24 Well done, sir.  
3:26 So Larry and Sergey met at Stanford in the computer  
3:29 science school.  
3:31 They were both students in an information theory class in  
3:36 about 1998.  
3:37 And they didn't like each other.  
3:40 Larry thought that Sergey was argumentative, and Sergey  
3:45 thought that Larry was arrogant.  
3:47 They were probably both right.  
3:50 However in their class project, they came up with the  
3:55 idea to try and apply some basic principles of  
4:00 information theory to unstructured web search.  
4:03 Now, it's 1998.  
4:04 Keep in mind at the time, web search is a solved problem.  
4:09 Everybody knows how to do search.  
4:12 There's no questions left to be worked on.  
4:15 So these guys said, oh, but wait, there is.  
4:18 And they're really kind of interesting questions.  
4:20 And they set themselves a goal to organize all the world's  
4:23 information and make it universally  
4:24 accessible and useful.  
4:27 That's a kind of a small goal.  
4:29 These guys didn't shoot high.  
4:30 All the world's information, universally

4:32 accessible and useful.  
4:34 What I want to talk of it today is a little bit of what  
4:36 the web looked like in 1998, before most of you were born,  
4:43 and what it looks like today, and what we think it's going  
4:48 to look like in the next 10 years.  
4:49 Next slide.  
4:50  
4:53 In 1998, there were a couple of dominant search engines.  
4:58 Neither one of them exists anymore, don't worry about  
5:00 their names.  
5:03 And they knew how to do search.  
5:05 Here's what they did.  
5:07 They had these people who sat in these big rooms, kind of  
5:09 like this, with computers in front of them, kind of like  
5:11 all of you.  
5:13 And they were surfing the web-- kind of like all of you.  
5:16  
5:19 And what they would do is they would find a page and they  
5:21 would read the page.  
5:22 And they would say, oh, you know what?  
5:23 This particular page is about soccer.  
5:26 I'm American, I know you guys call the game something else.  
5:29 Sorry.  
5:31 And they would have this little toolbar that they would  
5:33 pull down and they label "soccer." And then that page  
5:35 would be indexed.  
5:37 And they knew that this was going to work.  
5:41 They were wrong.  
5:44 They were wrong because the world changes too fast. On  
5:50 average, 10% of the web changes every month.  
5:56 Here's the interactive portion, boys and girls.  
5:58 If 10% changes every month, 10 times 12,  
6:02 carry the one, right.  
6:04 Likely everything changes every year, which means that  
6:07 these poor horrible people with this awful job of surfing  
6:11 the web and making down each page have to look at every  
6:13 page every year.  
6:15 Additionally, the web is doubling at this point in  
6:17 history about every four or five months.  
6:21 So twice a year or so you've doubled the size, everything  
6:25 that's already existed has changed at least once, and  
6:29 keep in mind that it turns out that the web's  
6:32 not entirely in English.  
6:35 Who knew?  
6:36  
6:38 So now you have to have rooms full of people who speak all

6:41 these languages.  
6:42 Not a scalable model.  
6:44 Next slide, please.  
6:47 Really not scalable today.  
6:49  
6:52 So this slide is more shocking to Americans, because it turns  
6:55 out that Americans think that no one else  
6:56 in the world exists.  
6:59 You guys have all heard the joke, right?  
7:00 If you see three languages, you're trilingual, if you  
7:02 speak two, you're bilingual, if you  
7:03 speak one, you're American.  
7:05 [LAUGHTER]  
7:13 It turns out most of us aren't American.  
7:17 So the approach used by the search engines in 1998 would  
7:20 not have gotten us today.  
7:21 They would not have gotten us here.  
7:23 What got us here was an insight that Larry--  
7:27 mostly Larry had, but Larry and Sergey had together--  
7:29 called Page Rank.  
7:32 So what does Page Rank do?  
7:34 Page Rank allows you to figure out whether a particular web  
7:39 page is interesting or not.  
7:40 That makes sense.  
7:41 Is this particular page useful?  
7:43 So it's called Page Rank.  
7:45 Obviously it's named because you're ranking web pages.  
7:50 No, Larry named it after himself.  
7:52 Larry's last name is Page.  
7:54 What is today's lesson, boys and girls?  
7:56 Computer scientists are not funny.  
7:59 Next slide, please.  
8:01  
8:09 In a second, I'm going to talk about how the  
8:11 stuff actually works.  
8:13 I'm hoping that's more interesting to you.  
8:14 But first, I want to pull back a little bit, and I want to  
8:17 talk about the context.  
8:19 So I mentioned that web search is about more than web pages  
8:23 in English.  
8:26 It matters a lot to actually understand the context within  
8:31 which you are working.  
8:33 So for example, if you do a search for BMW on google.cz,  
8:39 you ought to get different results than if you do a  
8:42 search for BMW on google.com.  
8:45 And indeed you will.

8:46 We'll recognize that probably you want to go to  
8:48 the .cz site instead.  
8:50 Part of our ranking signals are more  
8:51 than just page ranked.  
8:52 It also is about the context from which you come.  
8:54 Next slide, please.  
8:56  
8:58 Google publishes--  
8:59 [LAUGHTER]  
9:01 I'll give you a second to enjoy the list. The previous  
9:13 slide was called "Being Local Matters." It turns out it only  
9:19 matters in certain regards.  
9:21 So we publish a list called the Zeitgeist. The Zeitgeist  
9:24 captures the most actively growing and most popular  
9:28 queries, and we do it by country and by language and a  
9:31 bunch of things.  
9:32 And there's a couple of truths.  
9:34 Apparently, they are universal.  
9:36 The most popular search in every country  
9:38 is a beautiful woman.  
9:39  
9:41 And apparently game shows and television are also pretty  
9:46 popular to every one.  
9:47 Prison Break, for those of you who don't know, is a really  
9:49 bad American television show.  
9:50 So fundamentally, it matters, if you're going to do search  
9:54 right, you need to understand that the web is growing too  
9:58 fast, it's changing too fast, and it's not all in English.  
10:04 So the lesson that I want to talk about is,  
10:06 how do we do that?  
10:07 And I'm hoping, again, to reiterate that you guys-- one  
10:11 of you, or two of you, or 10 of you-- are going to hear  
10:13 something that I get wrong.  
10:15 And you're going to say, hey, I have a better  
10:16 idea and go try it.  
10:19 OK, how does it work?  
10:22 All right, let's build a search engine.  
10:24 This is the first of the interactive portions of  
10:26 today's talk, boys and girls.  
10:28 How many of you have had to build a search engine in a  
10:33 computer science class?  
10:34  
10:37 How many of them were any good?  
10:41 Oh, good.  
10:41 OK, so back in the day, when the web was first created, the  
10:51 terms were all coined by Tim Berners-Lee.

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