Do The Right Thing
Building Software in an Age of Social Responsibility

Jeffrey Snover
Microsoft Technical Fellow
Agenda

- Why we need to become better engineers
- What the issues are
- How do we move forward
# Software eats the world

## Eats traditional businesses

<table>
<thead>
<tr>
<th>Bookstores</th>
<th>Amazon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ads</td>
<td>Google</td>
</tr>
<tr>
<td>Music</td>
<td>iTunes, Spotify, Pandora</td>
</tr>
<tr>
<td>Telecom</td>
<td>Skype</td>
</tr>
<tr>
<td>Recruiting</td>
<td>LinkedIn</td>
</tr>
<tr>
<td>Financial</td>
<td>PayPal, Square</td>
</tr>
</tbody>
</table>

## Eats the value chain

### Car
- Engine/safety control
- Entertain passengers
- Guidance
- Connectivity (OnStar)

### Defense
- Satellite imagery
- Smart weapons
- Communications & logistics

### Retailers
- Logistics and distribution
- Price optimization
- Route optimization
# Largest companies by market value in 2017

<table>
<thead>
<tr>
<th>Ranking of the companies rank 1 to 100</th>
<th>Market value in billion U.S. dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>752</td>
</tr>
<tr>
<td>Alphabet</td>
<td>579.5</td>
</tr>
<tr>
<td>Microsoft</td>
<td>507.5</td>
</tr>
<tr>
<td>Amazon.com</td>
<td>427</td>
</tr>
<tr>
<td>Berkshire Hathaway</td>
<td>409.9</td>
</tr>
<tr>
<td>Facebook</td>
<td>407.3</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>242.2</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>338.6</td>
</tr>
<tr>
<td>JPMorgan Chase</td>
<td>306.6</td>
</tr>
<tr>
<td>Tencent Holdings</td>
<td>277.1</td>
</tr>
<tr>
<td>Wells Fargo</td>
<td>274.4</td>
</tr>
<tr>
<td>Alibaba</td>
<td>264.9</td>
</tr>
<tr>
<td>General Electric</td>
<td>261.2</td>
</tr>
</tbody>
</table>
# Largest companies by market value in 2017

<table>
<thead>
<tr>
<th>Ranking of the companies rank 1 to 100</th>
<th>Market value in billion U.S. dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>752</td>
</tr>
<tr>
<td>Alphabet</td>
<td>579.5</td>
</tr>
<tr>
<td>Microsoft</td>
<td>507.5</td>
</tr>
<tr>
<td>Amazon.com</td>
<td>427</td>
</tr>
<tr>
<td>Berkshire Hathaway</td>
<td>409.9</td>
</tr>
<tr>
<td>Facebook</td>
<td>407.3</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>242.2</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>338.6</td>
</tr>
<tr>
<td>JPMorgan Chase</td>
<td>306.6</td>
</tr>
<tr>
<td>Tencent Holdings</td>
<td>277.1</td>
</tr>
<tr>
<td>Wells Fargo</td>
<td>274.4</td>
</tr>
<tr>
<td>Alibaba</td>
<td>264.9</td>
</tr>
<tr>
<td>General Electric</td>
<td>261.2</td>
</tr>
</tbody>
</table>
Largest companies by market value in **2011**

**Ranking of the companies rank 1 to 100**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>JPMorgan Chase</td>
</tr>
<tr>
<td>2</td>
<td>HSBC Holdings</td>
</tr>
<tr>
<td>3</td>
<td>General Electric</td>
</tr>
<tr>
<td>4</td>
<td>Exxon Mobil</td>
</tr>
<tr>
<td>5</td>
<td>Royal Dutch Shell</td>
</tr>
<tr>
<td>6</td>
<td>PetroChina</td>
</tr>
<tr>
<td>7</td>
<td>ICBC</td>
</tr>
<tr>
<td>8</td>
<td>Berkshire Hathaway</td>
</tr>
<tr>
<td>9</td>
<td>Petrobras-Petroleo Brasil</td>
</tr>
<tr>
<td>10</td>
<td>Citigroup</td>
</tr>
<tr>
<td>11</td>
<td>BNP Paribas</td>
</tr>
<tr>
<td>12</td>
<td>Wells Fargo</td>
</tr>
<tr>
<td>13</td>
<td>Banco Santander</td>
</tr>
</tbody>
</table>
Largest companies by market value in 2017

<table>
<thead>
<tr>
<th>Ranking of the companies rank 1 to 100</th>
<th>Market value in billion U.S. dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>752</td>
</tr>
<tr>
<td>Alphabet</td>
<td>579.5</td>
</tr>
<tr>
<td>Microsoft</td>
<td>507.5</td>
</tr>
<tr>
<td>Amazon.com</td>
<td>427</td>
</tr>
<tr>
<td>Berkshire Hathaway</td>
<td>409.9</td>
</tr>
<tr>
<td>Facebook</td>
<td>407.3</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>242.2</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>338.6</td>
</tr>
<tr>
<td>JPMorgan Chase</td>
<td>306.6</td>
</tr>
<tr>
<td>Tencent Holdings</td>
<td>277.1</td>
</tr>
<tr>
<td>Wells Fargo</td>
<td>274.4</td>
</tr>
<tr>
<td>Alibaba</td>
<td>264.9</td>
</tr>
<tr>
<td>General Electric</td>
<td>261.2</td>
</tr>
</tbody>
</table>
Every company is a software company

“Silicon Valley is coming. We are going to work hard to make our services as seamless and competitive as theirs”
Jamie Dimon
JP Morgan CEO

“We are putting 70% of our applications on the cloud to improve flexibility. And, we are launching game-changing applications to improve our efficiency”
Jeffrey Immelt
GE CEO

“Walmart is redefining the next generation of retail growth and is the best-positioned retailer to win at the convergence of digital and physical retail”
Doug McMillon
Walmart CEO

“It’s about looking ahead to the changes coming to the global auto business, particularly from potential “disruptors” in Silicon Valley—and preparing Ford to thrive through those changes”
Mark Fields
Ford Motor Company CEO
Ok, software is important.

So what?
Let’s do some engineering
Law of accelerating returns*

40 years from now

* Ray Kurzweil
Where will we be in 40 years?

**Today**
- Planetary scale cloud infrastructure
- 2.5 billion cell phone users
- 6 connected devices/user in 2020
- Smart homes
- Smart power grids
- Smart chemical processing plants

**Trends**
- Information/education delivery
- Control over the physical world
- Biological control systems
- Attention management
- Surveillance
- Professional cybercrime
- Nation state cyber attacks
Where will we be in 40 years?

**Today**
- Planetary scale cloud infrastructure
- 2.5 billion cell phone users
- 6 connected devices/user in 2020
- Smart homes
- Smart power grids
- Smart chemical processing plants

**Trends**
- Information/education delivery!!!
- Control over the physical world!!!
- Biological control systems!!!
- Attention management!!!
- Surveillance!!!
- Professional cybercrime!!!
- Nation state cyber attacks!!!
If software eats the world, where did this software come from?

Engineers!

What could possibly go wrong with that?
If you and I are building our future world....

We need to ask ourselves:

**What kind of world do we want to build?**
“But I just code what I’m told to”

- You are responsible for the moral actions of yourself and your code
- Being a member of a team does not diminish that responsibility
- You have a voice in how your labor is applied to solve problems

- Most of us have way more power than we appreciate:
  We have a choice of projects and employers
- Decide whether a company’s business model aligns with your values BEFORE you accept a job
The future presents both opportunities and challenges
The path of human progress

First industrial revolution
Steam, water, mechanical production

Second industrial revolution
Division of labor, electricity, mass production

Third industrial revolution
Electronics, IT, automated production

Fourth industrial revolution
Data analytics, mobile devices, artificial intelligence, machine learning, robotics, genomics
Technology is disrupting everything
Opportunities

Technologies like AI can increase productivity

Challenges

But is displacing jobs

Value creation to GDP growth from AI

Percent/probability of automation
Opportunities

Millions lifted out of poverty

Challenges

But income inequality is on the rise
Opportunities

The internet has expanded access to information

Challenges

But it has fueled cyberattacks and cybercrime

Global internet users and penetration rate

Year | Internet Users (Millions) | World Population Penetration |
--- | --- | ---
1993 | 0.30 | 61.3
1994 | 0.74 | 62.3
1995 | 1.11 | 64.2
1996 | 1.50 | 67.6
1997 | 1.93 | 70.3
1998 | 2.42 | 75.2
1999 | 3.01 | 80.1
2000 | 3.60 | 86.2
2001 | 4.20 | 92.3
2002 | 4.80 | 98.4
2003 | 5.40 | 104.3
2004 | 6.00 | 111.0
2005 | 6.60 | 118.1
2006 | 7.20 | 125.6
2007 | 7.80 | 133.1
2008 | 8.40 | 140.6
2009 | 9.00 | 148.3
2010 | 9.60 | 156.0
2011 | 10.20 | 163.7
2012 | 10.80 | 171.4
2013 | 11.40 | 179.1
2014 | 12.00 | 186.8
2015 | 12.60 | 194.4
2016 | 13.20 | 202.1

Amount of monetary damage caused by reported cybercrime to the IC3 from 2001 to 2016

Year | Total Damage in Million U.S. dollars |
--- | ---
2001 | 17.8 |
2002 | 54 |
2003 | 126.1 |
2004 | 68.1 |
2005 | 183.1 |
2006 | 198.4 |
2007 | 239.1 |
2008 | 264.6 |
2009 | 559.7 |
2010 | 485.23 |
2011 | 581.44 |
2012 | 761.84 |
2013 | 800.46 |
2014 | 1070.71 |
2015 | 1336.0 |
2016 | 1336.0 |
Technology does not just transform business... it transforms society and reveals new challenges.
Technology is not just transforming business... it is transforming society and raising new questions.
Building great software means playing the long game

For the sake of technology

- Am I using the right tool for the job?
- Is this something new or are we reinventing the wheel?
- Am I incurring undue technical debt?

For the sake of society

- Does this improve people's lives?
- Could this be misused for harm?
- What users have been excluded?
  - Is this ethical?
  - Is this legal?

For the sake of business

- What is the business strategy?
- Does it reduce our flexibility to pivot our strategy?
Are you building for all of society?

Disability is mismatched human interactions
Disability is universal and dynamic
Sometimes disability is temporary
Sometimes disability is situational

As more of our interactions with the world become digitized, inclusive design becomes critical

TOUCH
- one arm
- arm injury
- new parent

HEAR
- deaf
- ear infection
- bartender

SEE
- blind
- cataracts
- distracted driver

SPEAK
- mute
- laryngitis
- heavy accent

Microsoft inclusive design toolkit: https://www.microsoft.com/en-us/design/inclusive
Software is too important to forget about ethics

When in doubt, focus on solutions that amplify human dignity
AI Optimism

Innovation,
SELF-DRIVING UBER CRASH
DASH CAM VIDEO
RELEASED ...
'Disturbing, Heartbreaking'

And
AI will not solve all our challenges

AI will solve Facebook’s most vexing problems, Mark Zuckerberg says. Just don’t ask when or how.

By Drew Harwell  April 11  Email the author

Artificial intelligence (AI)

AI programs exhibit racial and gender biases, research reveals

Machine learning algorithms are picking up deeply ingrained race and gender prejudices concealed within the patterns of language use, scientists say

HASTA LA VISTA, BABY —

Microsoft terminates its Tay AI chatbot after she turns into a Nazi

Setting her neural net processor to read-write was a terrible mistake.

PETER BRIGHT - 3/24/2016, 7:28 AM

Forget Killer Robots—Bias Is the Real AI Danger

John Giannandrea, who leads AI at Google, is worried about intelligent systems learning human prejudices.

by Will Knight  October 3, 2017
Are you building inclusive AI?

Microsoft design blog—how to recognize exclusion in AI https://medium.com/microsoft-design/how-to-recognize-exclusion-in-ai-ec2d6d89f850
AI will cause harm

- Glitches as we advance the technology
- Amoral applications
- Machine learning makes fault attribution difficult/impossible
- Backlash & large liability losses will cause more harm
- How do we move forward?
- Underwriters Labs (UL) & Vaccine Court provide models
What We Do

UL helps companies demonstrate safety, confirm compliance, enhance sustainability, manage transparency, deliver quality and performance, strengthen security, protect brand reputation, build workplace excellence, and advance societal wellbeing. Some of the services offered by UL include: inspection, advisory services, education and training, testing, auditing and analytics, certification software solutions, and marketing claim verification.
National childhood vaccine injury act

• 1980s: most vaccine makers stopped production due to court losses
• Concern over the loss of herd immunity lead the creation of the “Vaccine Court”
• No-fault system for litigating vaccine injury claims with a different burden of proof
• People cannot sue vaccine manufacturers
• Costs covered by a vaccine tax
How do we move forward?

**Acknowledge**
- We have an evolving dilemma
- We are responsible for the moral acts of ourselves and our products
- Shift focus from shareholder to stakeholder

**Lean in**
- Educate yourself on the issues
- Participate in the industry, social, and political discussions

**Engineer**
- Incrementally improve yourself, your team, and your product
- Build systems which will find and address problems
“...at that very moment, one or more people in each of my colleagues’ departments were doing something that was illegal or improper... The key was to have mechanisms to find such people before they did too much harm.”

—Robert Gates Duty: Memoirs of a Secretary at War
DevOps & the law of thirds
Devops & the law of thirds
Process engineering 101

- Define repeatable steps and measure outcomes
- Make steps smaller and do them faster
- Automate steps
- Modify steps to optimize outcomes
- Problems $\rightarrow$ new measurements $\rightarrow$ new/modified steps
- Support and encourage “guilds”
- Continuous patent reviews $\rightarrow$
  - Continuous security, accessibility, ethical, privacy, & social justice reviews
Industry Example: EthicalOS.org
## How do I move forward?

<table>
<thead>
<tr>
<th>When</th>
<th>Then</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting up CI/CD pipelines</td>
<td>Add ethical checkpoints</td>
</tr>
<tr>
<td>Designing software</td>
<td>Ensure inclusion and diversity considerations</td>
</tr>
<tr>
<td>Buying products</td>
<td>Pick vendors committed to cybersecurity</td>
</tr>
<tr>
<td>Hanging with coworkers</td>
<td>Raise awareness of these issues</td>
</tr>
<tr>
<td>Looking for a job</td>
<td>Pick a company aligned with your morals</td>
</tr>
<tr>
<td>When</td>
<td>Then</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Dying</td>
<td>Leave the world a better place</td>
</tr>
</tbody>
</table>
Thank You
Responsible AI to augment human ingenuity

Three questions we must always ask

1. **System Purpose**: Will the technology be used to augment the abilities of individuals and result in a positive impact on people and society? If no, seek guidance.

2. **Technology Capability**: Are the AI technology and people capable of performing the tasks that the AI system should do? If no, seek guidance.

3. **Quality & Reliability**: Will the technology be effectively designed, operated and maintained by a responsible party? If no, seek guidance.

Sensitive categories of AI systems

At Microsoft, we recognize that there are sensitive categories of Artificial Intelligent systems which are involved in making automated decisions and recommendations that may have a broad impact on people and society in the following ways:

- Denial of Consequential Services
- Risk of Harm
- Personal Freedom
Guidance

Learn, share, follow AI principles with your teams and customers, to design, develop, and use AI systems responsibly.

Ask yourself the 3 questions, using the decision framework to consider the societal and individual impact of AI.

Develop and support organizational safety nets thoughtfully governing AI use and seek guidance early in the development process.