

The MIT Center for  
Digital Business

MIT Sloan  
MANAGEMENT

Digitization, Productivity and Jobs

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MIT Center for Digital Business

United Nations ECOSOC  
ANNUAL MINISTERIAL REVIEW  
GLOBAL PREPARATORY MEETING  
April 3, 2012



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MANAGEMENT

Bill Gates's Paradox:

*Innovation is faster than ever before...*

*... yet Americans are more pessimistic about the future.*

- New York Times, March 4, 2012

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## The Bounty and the Spread

Trillions of wealth created in past decade,  
yet tens of millions without work.

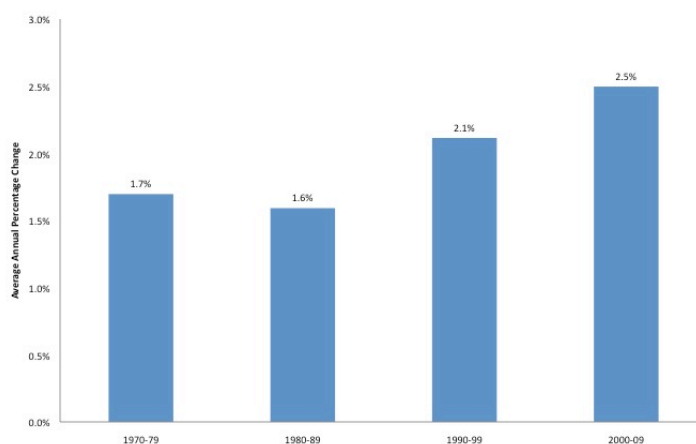
Not just recession, but longer term trends  
are at work

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## U.S. Productivity Growth is Accelerating

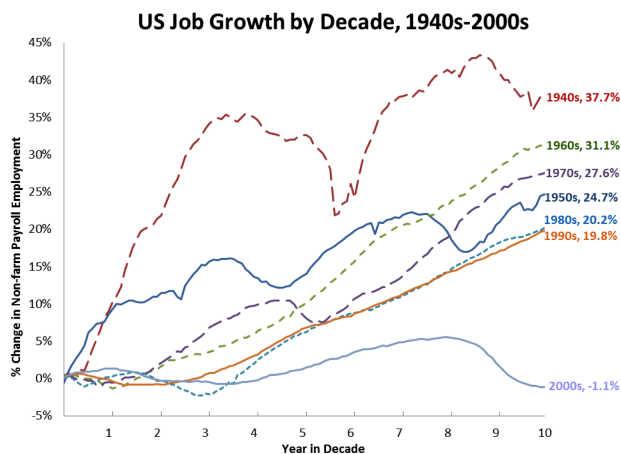
Annual Productivity Change in the Non-farm Business Sector by Decade



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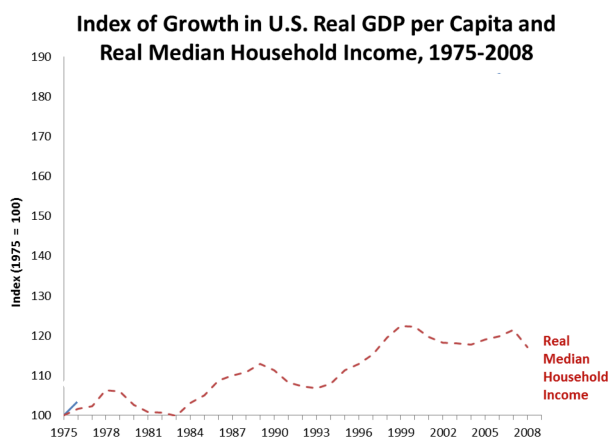
## U.S. Job Creation



Source: BLS



## *The Problem:* Median Income is Stagnating

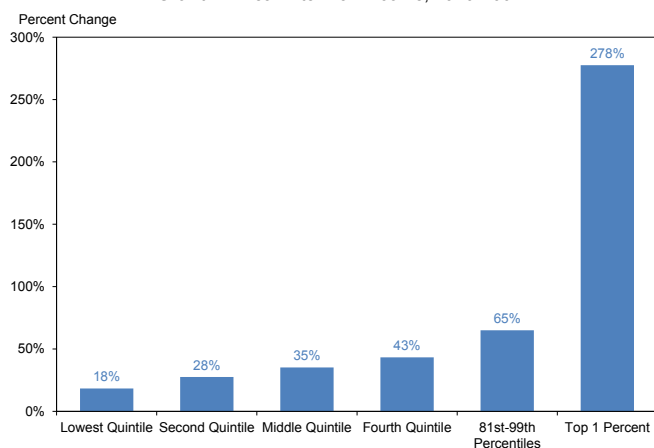


Source: BLS

## The Spread: Individuals



Growth in Real After-Tax Income, 1979-2007



Source: Congressional Budget Office

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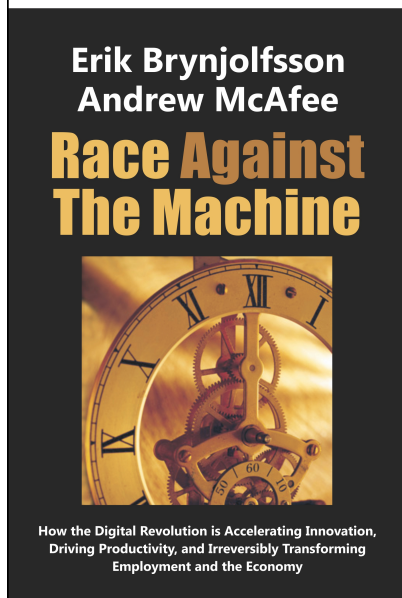
What's Going On?







## Our View



“Digital technologies change rapidly, but organizations and skills aren’t keeping pace.

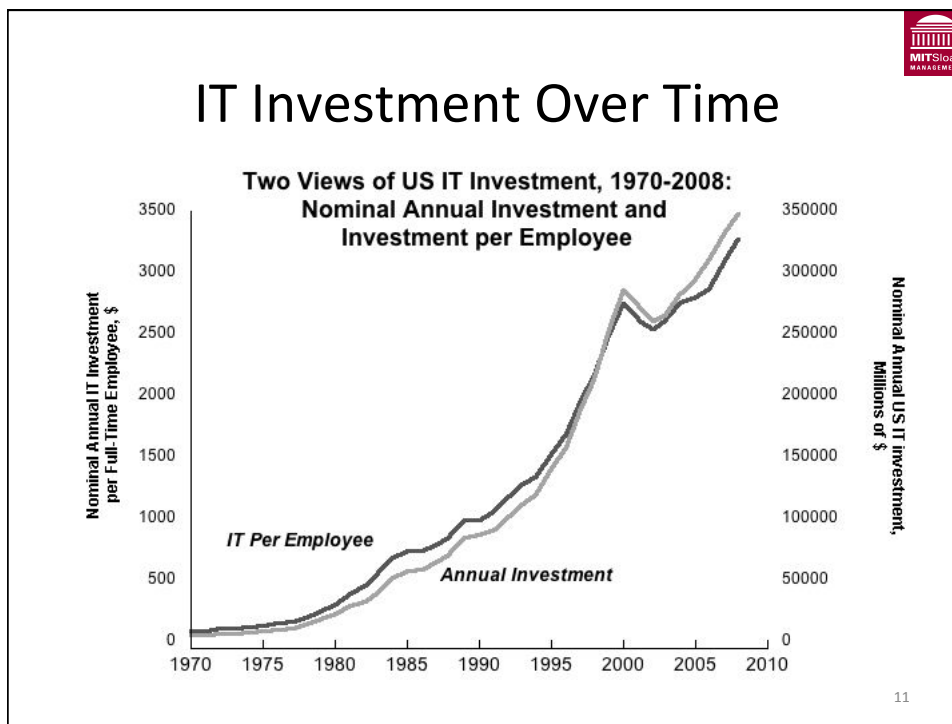
As a result, millions of people are being left behind. Their incomes and jobs are being destroyed, leaving them worse off ... than before the digital revolution..”

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## The Digitization of the Economy

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What are the Economic  
Consequences of this Rapid  
Digitization of the Economy?



## Three Sets of Winners and Losers

### 1. High Skilled vs. Low Skilled workers

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## Three Sets of Winners and Losers

### 1. High Skilled vs. Low Skilled workers

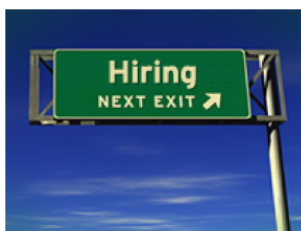
#### German Giant Says US Workers Lack Skills

FINANCIAL TIMES

Text Size - +

Published: Monday, 20 Jun 2011 | 2:07 AM ET

By: Ed Crooks

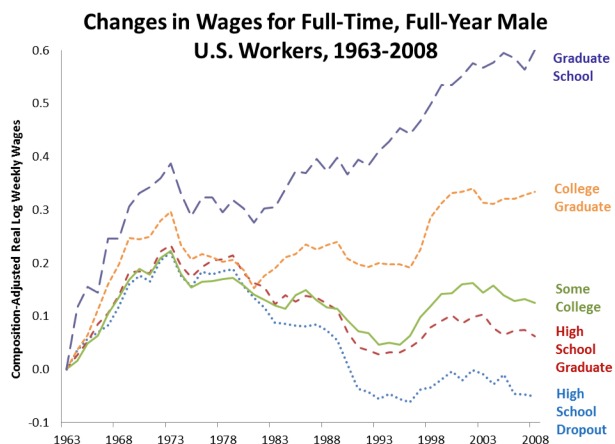


rate of 9.1 percent

Eric Spiegel, chief executive in the US for **Siemens** [SI 102.20 ▼ -3.17 (-3.01%)], the German engineering group, said the problem **exposed weaknesses in education and training in the US**. Siemens had been forced to use more than 30 recruiters and hire staff from other companies to find the workers it needed for its expansion plans, even amid an unemployment

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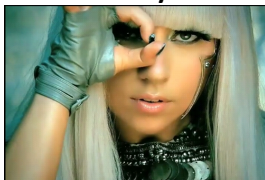
## Skill Disparities



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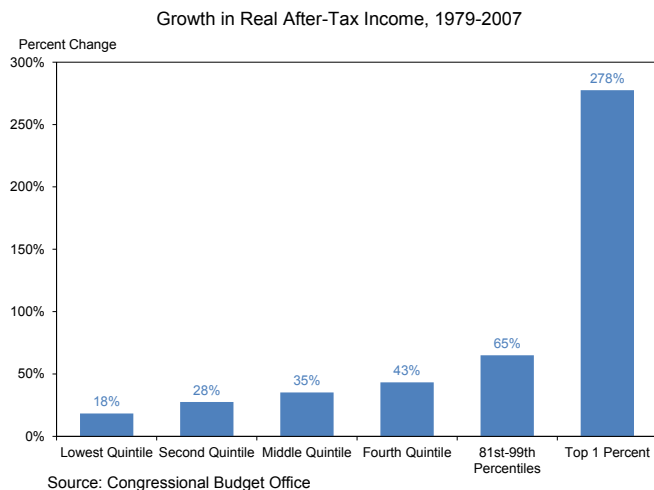
## Three Sets of Winners and Losers

1. High Skilled vs. Low Skilled workers
2. Superstars vs. Everyone Else



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## Superstars

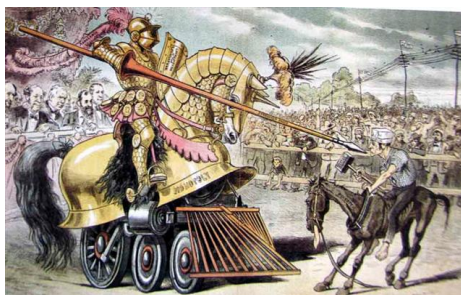


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## Three Sets of Winners and Losers



1. High Skilled vs. Low Skilled workers
2. Superstars vs. Everyone Else
3. Capital vs. Labor

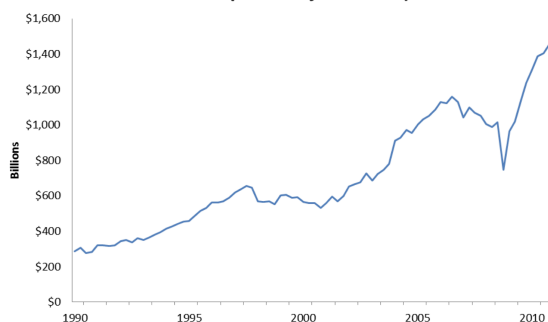


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## Capital

**U.S. Real Corporate Profits After Tax, 1990-2010**  
(with Inventory Valuation and Capital Consumption Adjustments)

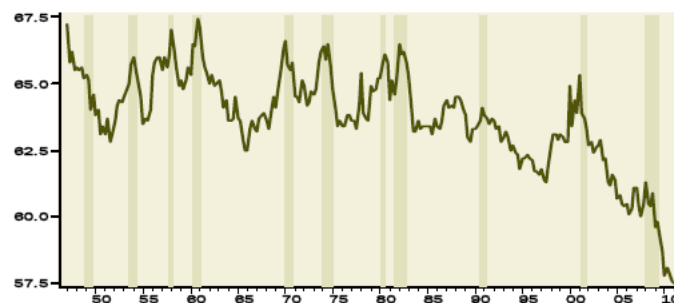


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## ... vs. Labor

**United States: Nonfarm Business: Labour Share**  
(percent)



Shaded areas represent periods of U.S. recession. Source: Haver Analytics, Gluskin Sheff

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## We Ain't Seen Nothing Yet...

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## Our View

Erik Brynjolfsson  
Andrew McAfee  
**Race Against  
The Machine**



How the Digital Revolution is Accelerating Innovation,  
Driving Productivity, and Irreversibly Transforming  
Employment and the Economy

**“Computers are now doing many things that used to be the domain of people only.**

The pace and scale of this encroachment into human skills is relatively recent and has profound economic implications. Perhaps the most important of these is that while digital progress grows the overall economic pie, it can do so while leaving some people, or even a lot of them, worse off.”

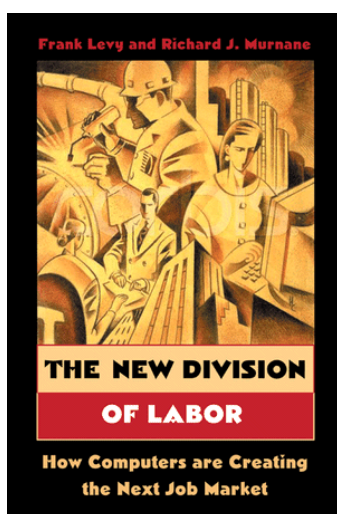
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## Technical Change is Accelerating



## State of Understanding, 2004



### Human Abilities

- Pattern Matching
- Complex Communication



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## State of Understanding, 2004

The bakery truck driver is processing a constant stream of [visual, aural, and tactile] information from his environment... to program this behavior we could begin with a video camera and other sensors to capture the sensory input. But executing a left turn against oncoming traffic involves so many factors that **it is hard to imagine discovering the set of rules that can replicate a driver's behavior.**

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## State of Understanding, 2010

The New York Times

October 10, 2010

### Autonomous Driving

Google's modified Toyota Prius uses an array of sensors to navigate public roads without a human driver. Other components, not shown, include a GPS receiver and an inertial motion sensor.

#### LIDAR

A rotating sensor on the roof scans more than 200 feet in all directions to generate a precise three-dimensional map of the car's surroundings.

#### POSITION ESTIMATOR

A sensor mounted on the left rear wheel measures small movements made by the car and helps to accurately locate its position on the map.

#### VIDEO CAMERA

A camera mounted near the rear-view mirror detects traffic lights and helps the car's onboard computers recognize moving obstacles like pedestrians and bicyclists.



#### RADAR

Four standard automotive radar sensors, three in front and one in the rear, help determine the positions of distant objects.



Source: Google

THE NEW YORK TIMES, PHOTOGRAPHS BY RAMIN RAHMANN FOR THE NEW YORK TIMES

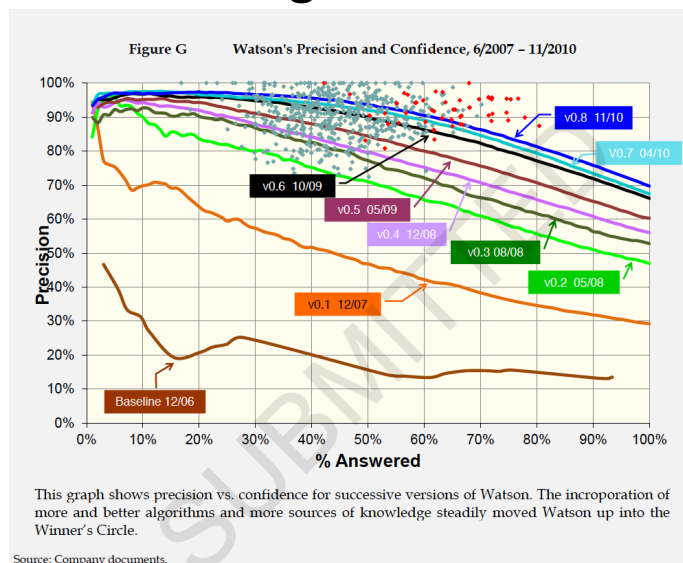
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# The Digital Frontier



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# The Digital Frontier



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## What Is To Be Done?

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## The Opportunity

- Digital technologies will continue to accelerate.
- Our skills, organizations and institutions are lagging.
- Working as usual won't solve this problem.
- We need to think big. We need to be creative.

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## Education and Entrepreneurship

Work on *both* aspects of skill/work mismatch

### 1) Education

- Fundamentally transform education and skill development
- K-12, University, Vocational, on-the-job
- Use technology: MITx, Kahn Academy, Udacity
- Invest more: higher teacher salaries, a win-win
- More accountability: separate teaching from evaluation and certification

### 2) Entrepreneurship

- Not because everyone can or should be an entrepreneur (although more could be)
- Entrepreneurs lead creative destruction
- 90% on Farms ->2%; But Ford, Edison, Gates and others created new work
- Lower barriers to business formation
- Create templates like eBay and app economy

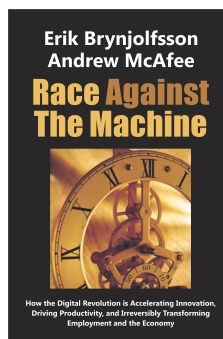
Example: Draw Something was launched in February, 2012 and within 6 weeks was 31 app in 79 countries, had 20 million downloads, generated over \$100,000 per day in revenue and had over 12 million users each day.

It took AOL 9 years to get to 1 million users; Facebook -9 months; Draw something- 9 days. This is possible by building on an existing platform.

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To learn more about related research,  
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<http://digital.mit.edu/erik>



Both books are available at Amazon.com