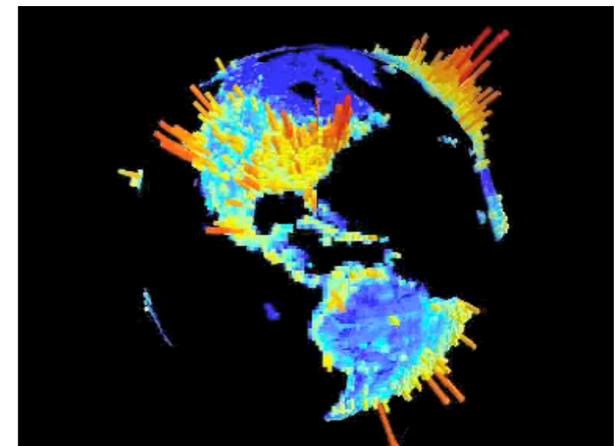


Why Future Medicines Will Need to be Discovered in the Cloud

Dr. Steven Muskal

Chief Executive Officer
Eidogen-Sertanty, Inc
smuskal@eidogen-sertanty.com

7 Billion people depend on fewer
than **300,000** people to discover
and develop new medicines...



Drug Industry Layoffs: 300,000 in the last decade!

A Decade In Drug Industry Layoffs

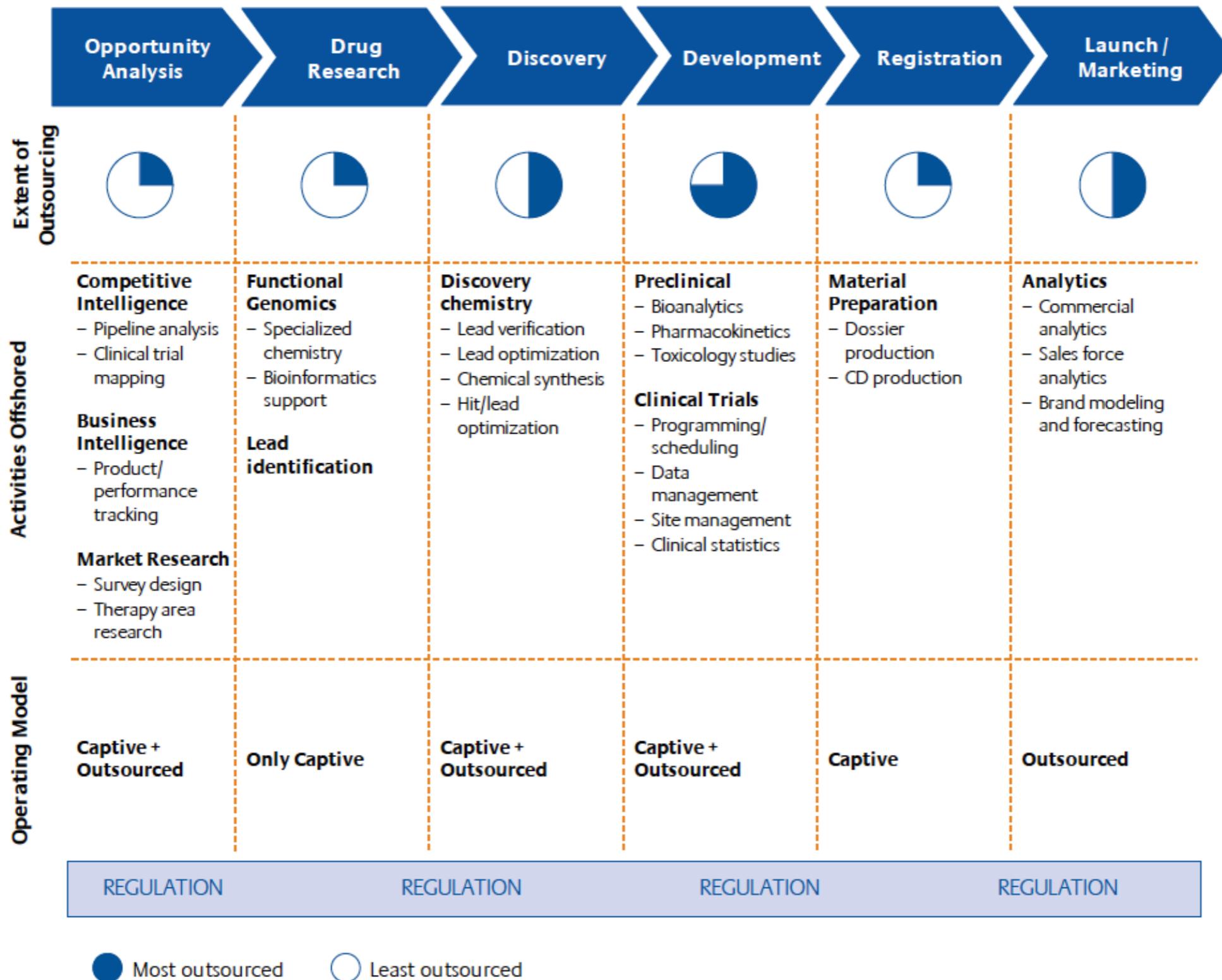
Year	Number of jobs cut
2000	2,453
2001	4,736
2002	11,488
2003	28,519
2004	15,640
2005	26,300
2006	15,638
2007	31,732
2008	43,014
2009	61,109
2010	53,636
2011 (First three months)	3,385
TOTAL	297,650

Source: Challenger,
Gray & Christmas,
Inc. ©

Outsourcing Trends

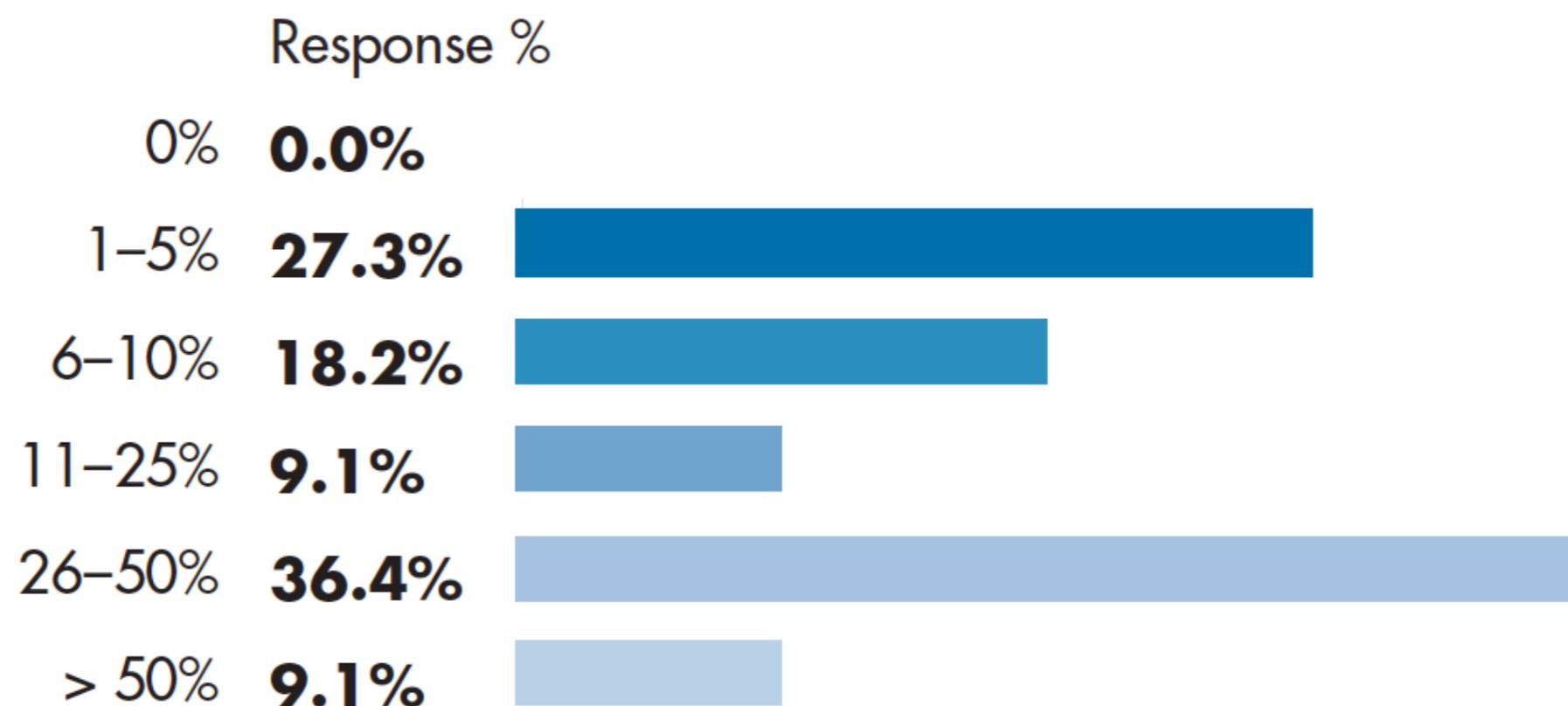
Source: KPMG Outsourcing in the pharmaceutical industry: 2011 and beyond

Pharma R&D outsourcing



Outsourcing Trends

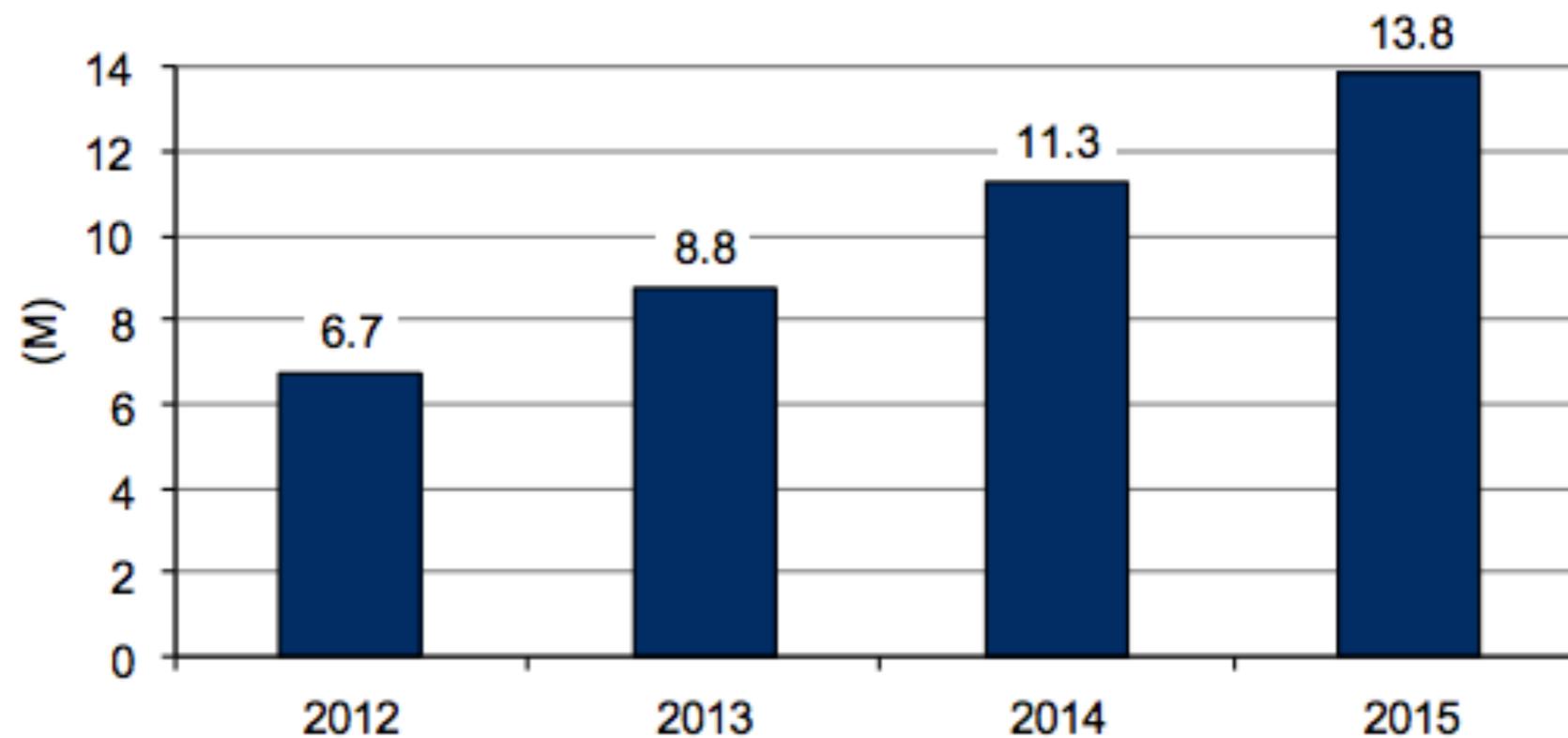
Proportion of Life Sciences R&D Informatics Budget Devoted to Cloud Computing in Three Years, Commercial Sector



Source: Insight Pharma Reports

Jobs Generated by Cloud Computing

Cloud Computing Impact on Jobs: Total Cumulative Jobs Generated by Cloud Computing Worldwide at Year-End, 2012–2015



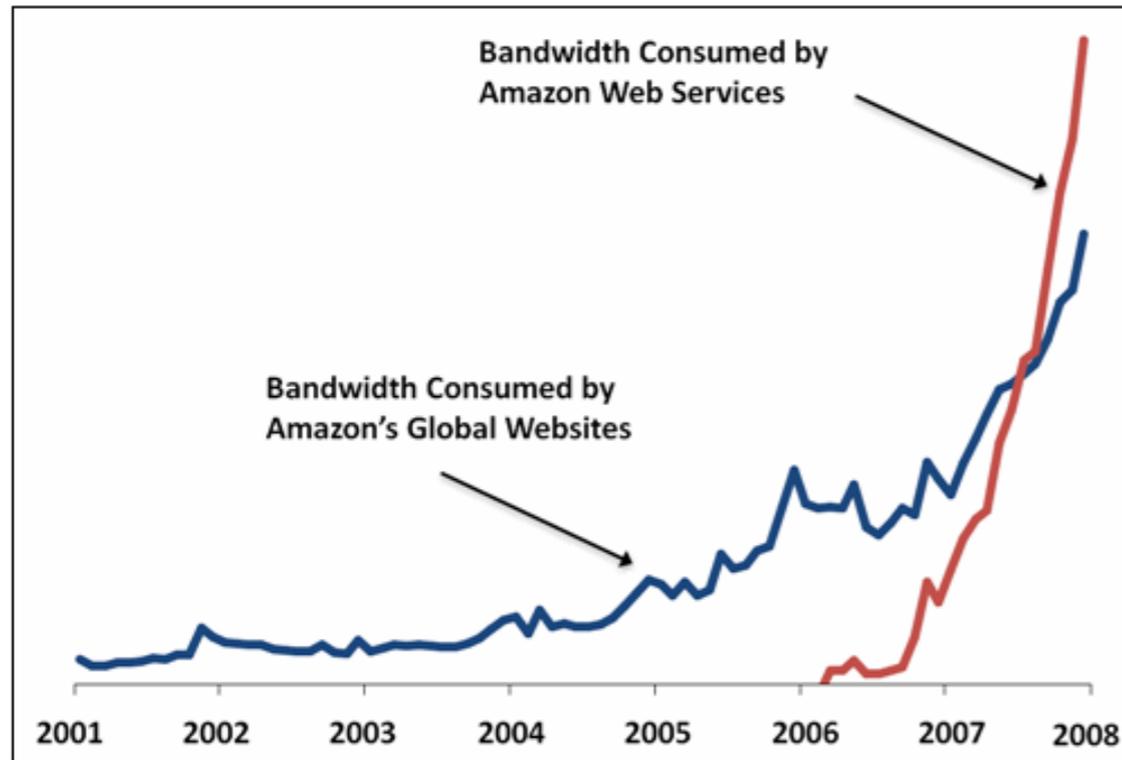
Source: IDC, 2012

U.S. number of unemployed persons (12.8 million) - i.e. unemployment rate (8.3 percent)

Aug 3, 2012: <http://www.bls.gov/news.release/pdf/empsit.pdf>

The Cloud: Amazon AWS Growth

In January 2008, Amazon announced that the Amazon Web Services consume more bandwidth than its entire global network of Amazon.com retail sites



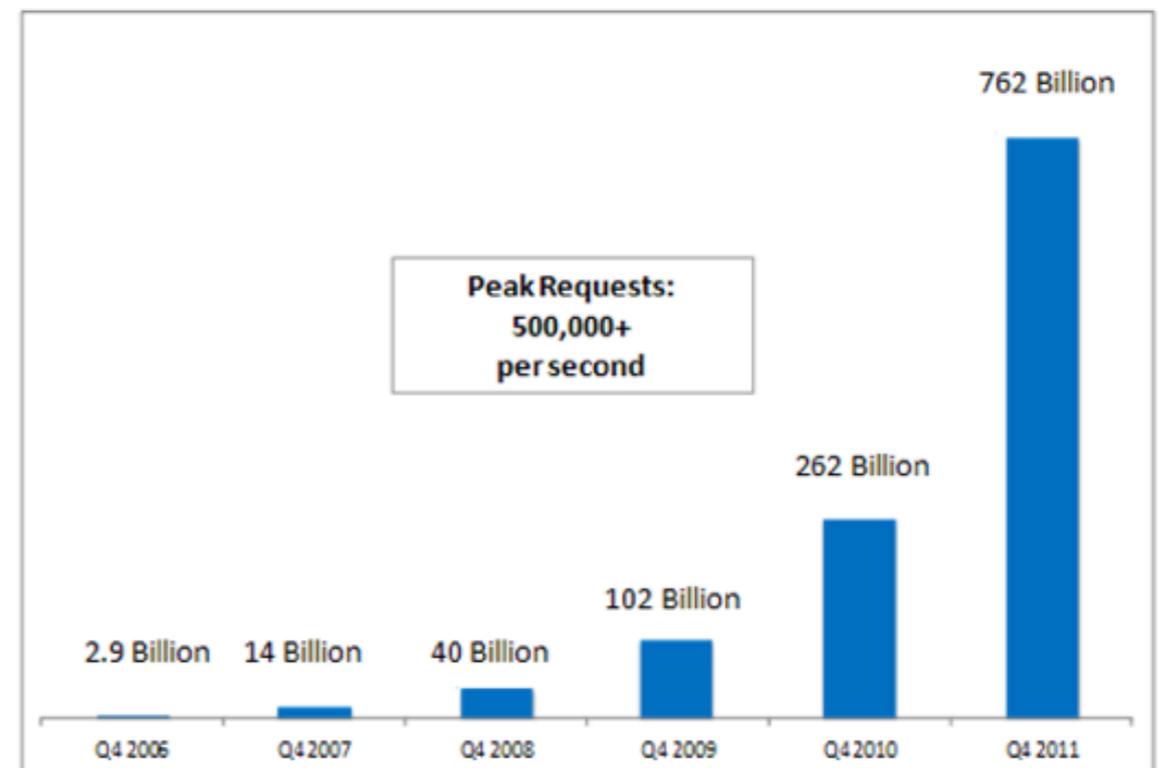
<http://aws.typepad.com/aws/2008/05/lots-of-bits.html>

AWS Free Usage Tier now includes Amazon MS-Windows Server EC2 instances

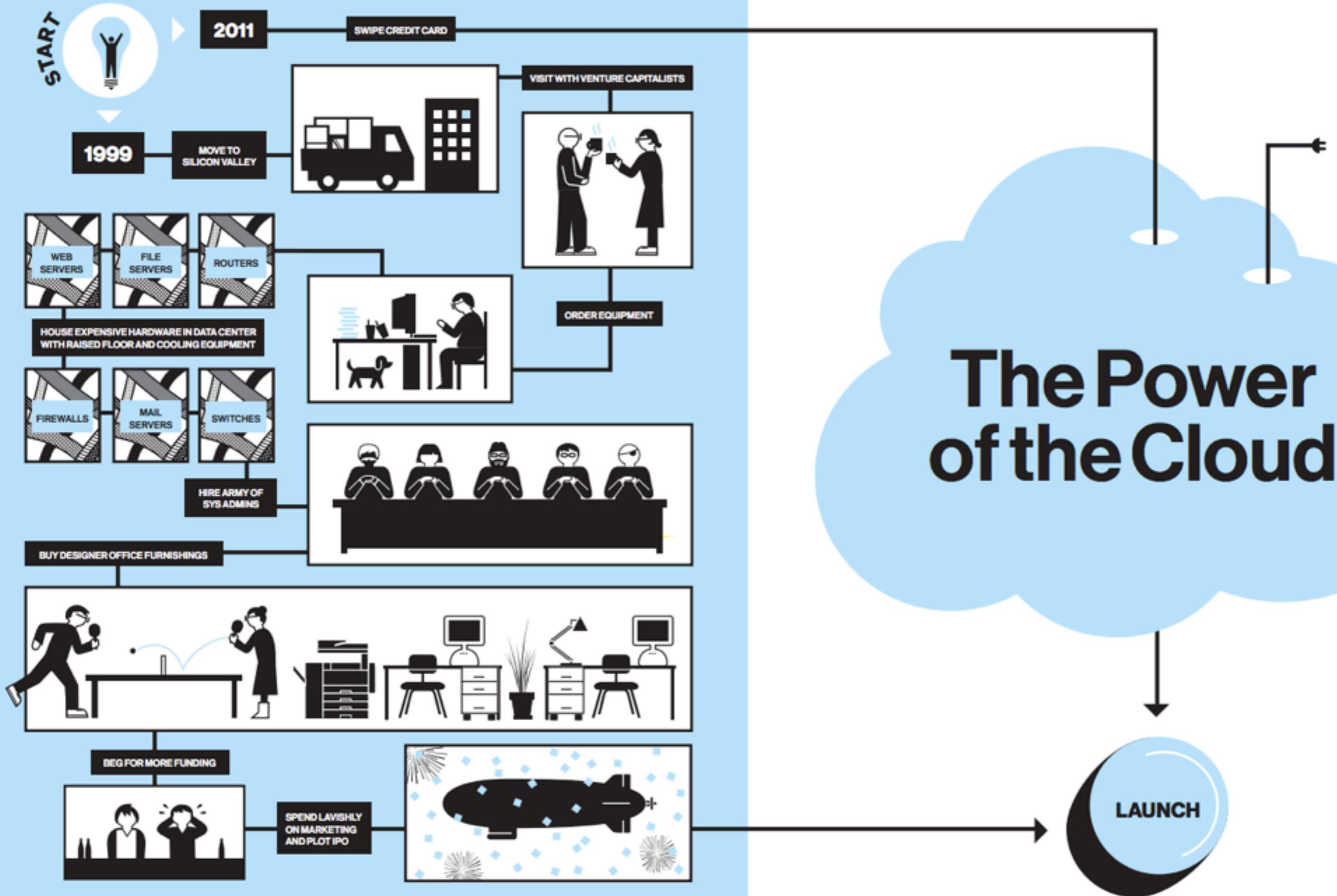
February 23, 2012

Amazon S3 grew 192% year-over-year

Total Number of Objects Stored in Amazon S3



<http://venturebeat.com/2012/01/31/amazon-aws-s3-growth-cloud/>



Cloud Computing - In Practice

AWS Management Console > Amazon EC2 Steven Muskal | Help

Navigation: Elastic Beanstalk, S3, **EC2**, VPC, CloudWatch, Elastic MapReduce, CloudFront, CloudFormation, RDS, ElastiCache, SQS, IAM, SNS, SES, Route 53, DynamoDB, Storage Gateway, SWF

Amazon EC2 Console Dashboard

Getting Started

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

[Launch Instance](#)

Note: Your instances will launch in the US East (Virginia) region.

Service Health

Current Status	Details
✔ Amazon EC2 (US East - N. Virginia)	EBS API errors View complete service health details

Availability Zone Status

Current Status	Details
✔ us-east-1a	Availability zone is operating normally
✔ us-east-1b	Availability zone is operating normally
✔ us-east-1c	Availability zone is operating normally
✔ us-east-1d	Availability zone is operating normally
✔ us-east-1e	Availability zone is operating normally

My Resources

You are using the following Amazon EC2 resources in the US East (Virginia) region: [Refresh](#)

- 5 Running Instances
- 5 Elastic IPs
- 8 EBS Volumes
- 5 EBS Snapshots
- 5 Key Pairs
- 0 Load Balancers
- 0 Placement Groups
- 3 Security Groups

Events

✔ US East (Virginia): No events [Refresh](#)

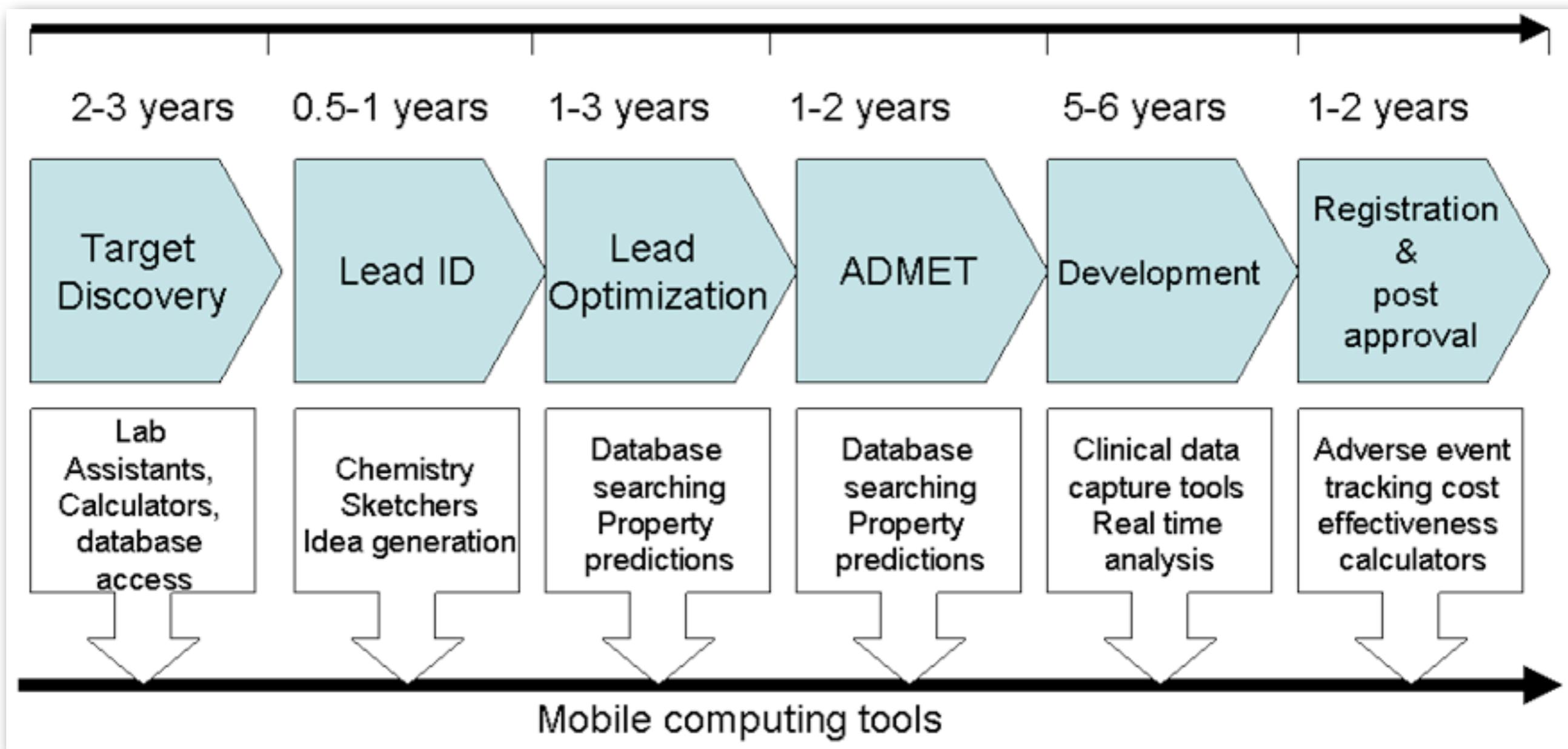
Related Links

- Getting Started Guide
- Documentation
- All EC2 Resources
- Forums
- Feedback
- Report an Issue

Performance Metrics (3/23 03:00 - 03:30)

- Avg CPU Utilization (Percent):** Fluctuates between 50% and 80%.
- Avg Disk Reads (Bytes):** Shows a sharp spike to approximately 28,000 bytes at 03:30.
- Avg Disk Writes (Bytes):** Shows a sharp spike to approximately 3,000,000 bytes at 03:30.
- Max Network In (Bytes):** Peaks at approximately 200,000,000 bytes around 03:00.
- Max Network Out (Bytes):** Peaks at approximately 28,000,000 bytes around 03:00.

Mobile Computing throughout (Bio)Pharma R&D

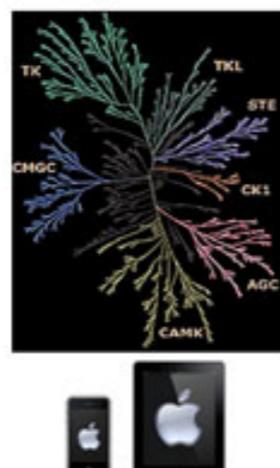


Eidogen's iPhone, iPad, and Android Apps

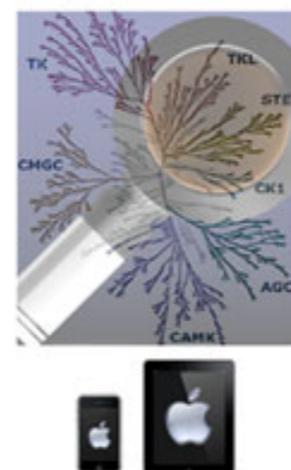
iProtein



iKinase



iKinasePro



iOncology



Mobile Reagents



Reaction101



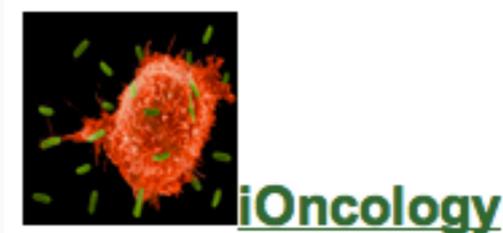
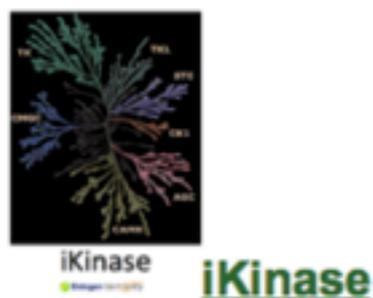
Yield101



SPRESImobile



MobileApps: Worldwide Marketing Vehicles!

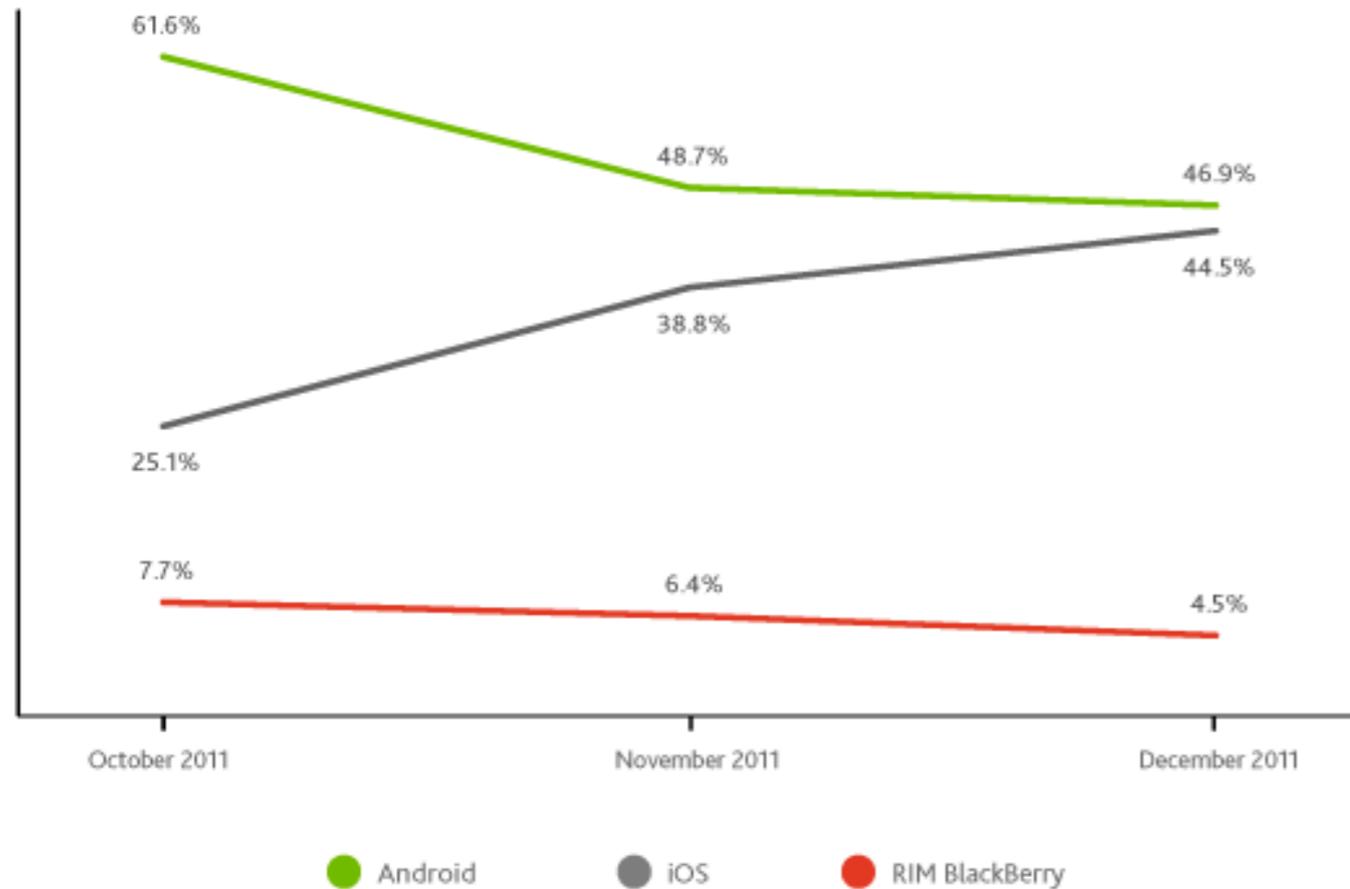


~ 30,000 People Use Eidogen Mobile Apps

iOS v. Android - The Numbers Vary

Smartphone Operating System Share – Recent Smartphone Acquirers

Oct - Dec 2011, Nielsen Mobile Insights



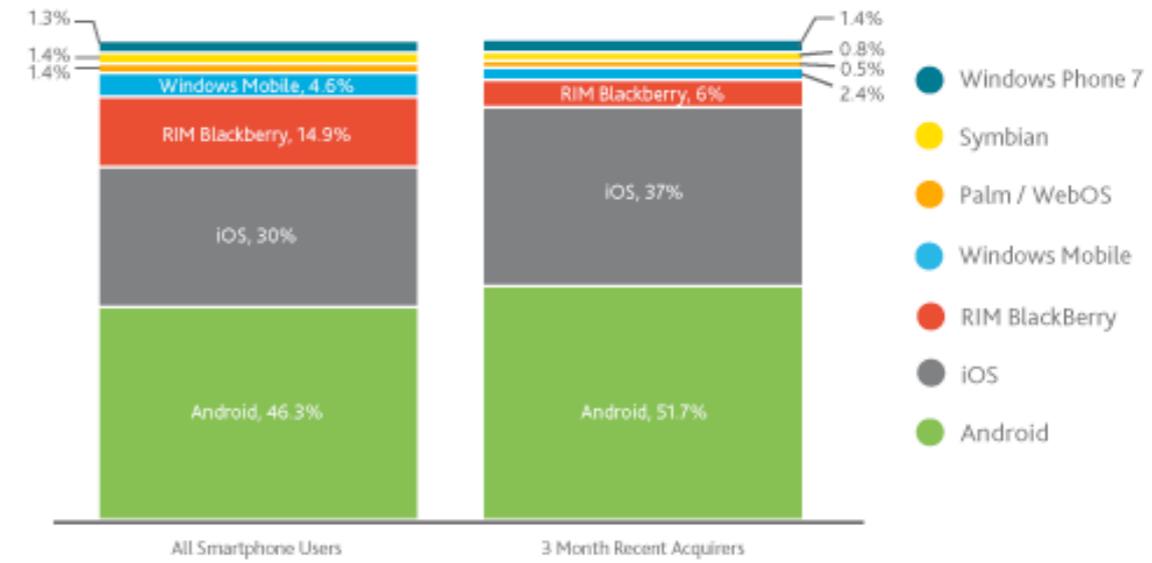
Source: Nielsen

nielsen



Operating System Share – All Smartphone Consumers vs. Recent Smartphone Acquirers (3Mo)

Q4 2011, Nielsen Mobile Insights

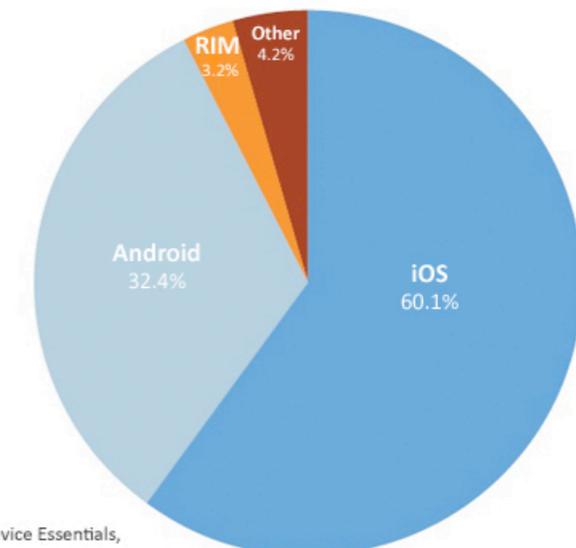


Source: Nielsen

nielsen

Silicon Alley Insider Chart of the Day

U.S. Connected Device Digital Traffic Market Share By OS



Source: comScore Device Essentials, Dec 2011; U.S.

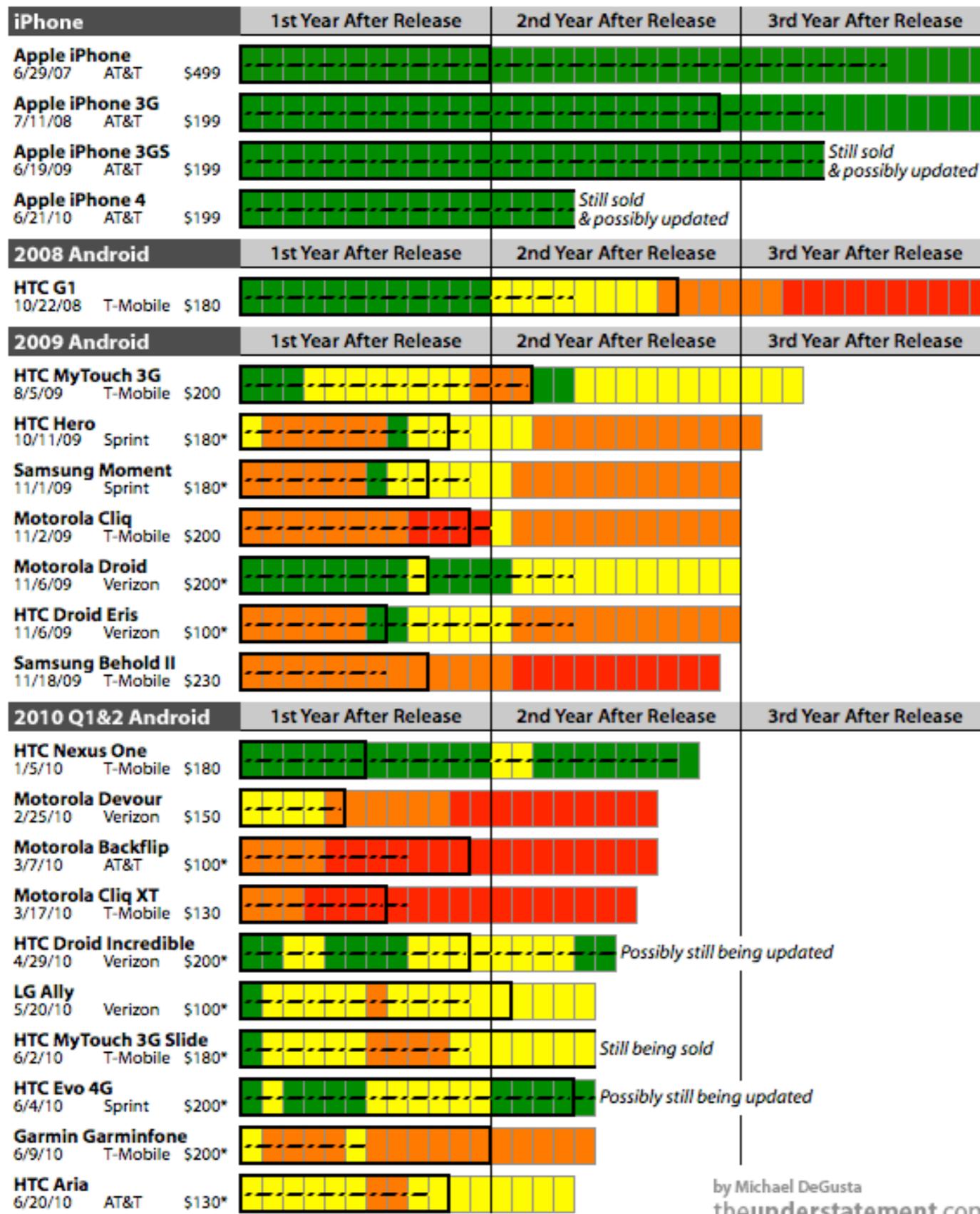
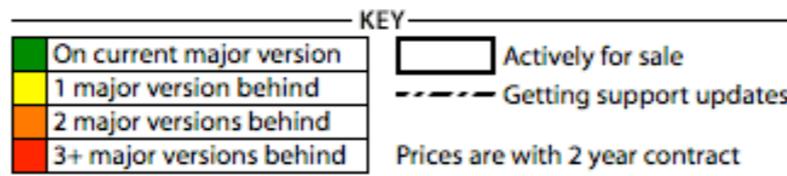
<http://blog.nielsen.com/nielsenwire/consumer/more-us-consumers-choosing-smartphones-as-apple-closes-the-gap-on-android/>

http://articles.businessinsider.com/2012-03-13/tech/31158768_1_ios-android-ipad

ANDROID & IPHONE UPDATE HISTORY

Includes every iPhone & Android model released in the US before July 2010.

Data as of the end of October 2011.



* After \$100 mail-in rebate (\$50 on MyTouch 3G Slide & Garminfone)

by Michael DeGusta
theunderstatement.com
Copyright © 2011

Advantages iOS

- Minimal fragmentation
- Nice development environment
- Better tablet support
- Apple is a powerhouse

“Apple App Store Generates Twice As Much Revenue As Android Market In 2011” Distimo

Advantages Android

- Java-based
- Several development environments available
- Many powerful devices
- Many ways to distribute

Web Apps v. Native Apps

Web Advantages	Web Disadvantages
Central Management	InterApp Communication Difficult
Device Agnostic	Can't Maximize Device Features (e.g. Gestures & Motion)
No App Store Approval	URL exposed
HTML5 is very powerful	No App Store promotion

Hybrid → Native Apps with WebViews

Examples of Mobile IAC (InterApplicationCommunication)

iPad 3:36 PM 99%

mobileReagents Email

more
MOBILE REAGENTS

Hit(s): 1 of 8

MOREid: 55848
FMLA: C8H9NO2
MWT: 151.1626

Open In...

- MMDS
- SPRESI
- iProtein
- PyMOL

Name: a

★★★★☆

< 50 Ratings

Search Inc

★★★★☆ Apin Chemicals

★★★★☆ Sigma-Aldrich

< 50 Ratings Tocris Bioscience

iPad 3:33 PM 100%

Home Reaction Reactions

1 of 100

Open In...

- Reaction101
- Yield101
- MMDS
- MolSync

Calculated Properties

Conditions: Stage 1: Chlorobenzene, Dichloromethane, Sodium-ammonia, hydrogen carbonate I Stage 2: 24 h, 82 °C, HKO Potassium hydroxide

Journal Articles

Raja Mathiyazhagan Ulaganatha, Ramesh Rengan, Ahn Kyo Han, "Rhodium(III) NCN pincer complexes catalyzed transfer hydrogenation of ketones", Tetrahedron Lett., vol. 50, pp. 7014-7017 (2009)
<http://dx.doi.org/10.1016/j.tetlet.2009.09.152>

Reactant 1

MW: 182.218
MF: C₁₃H₁₀O

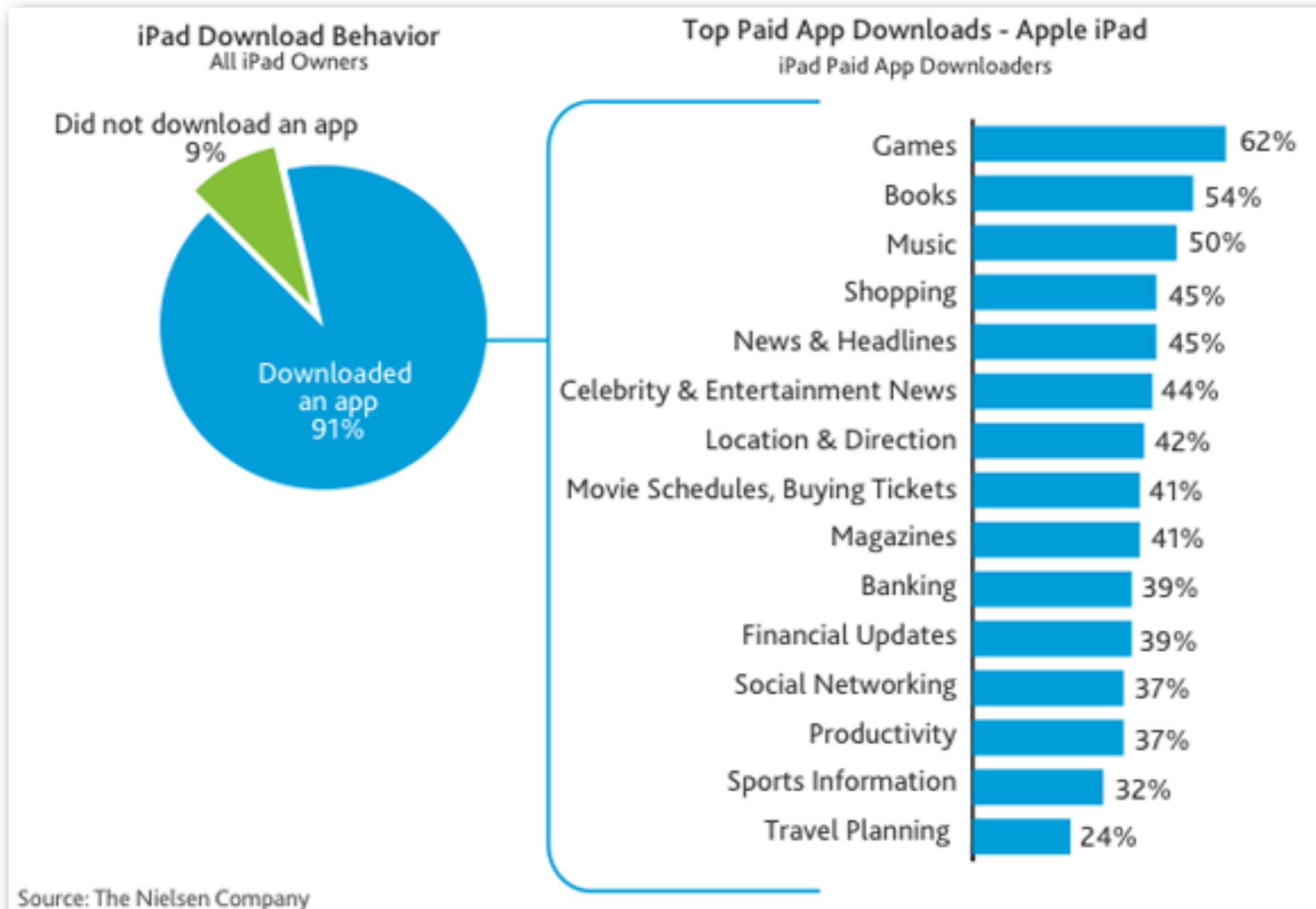
Product 1

MW: 184.234
MF: C₁₃H₁₂O

1

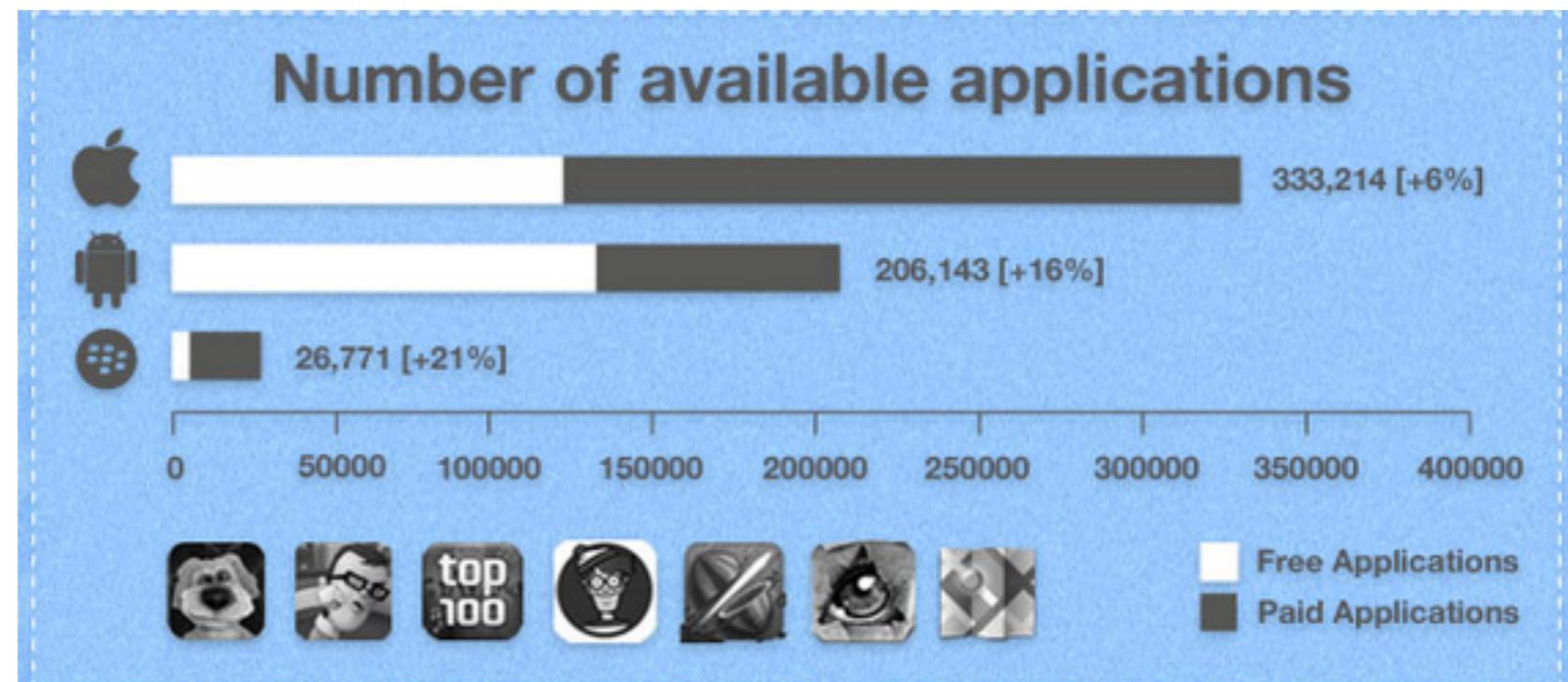
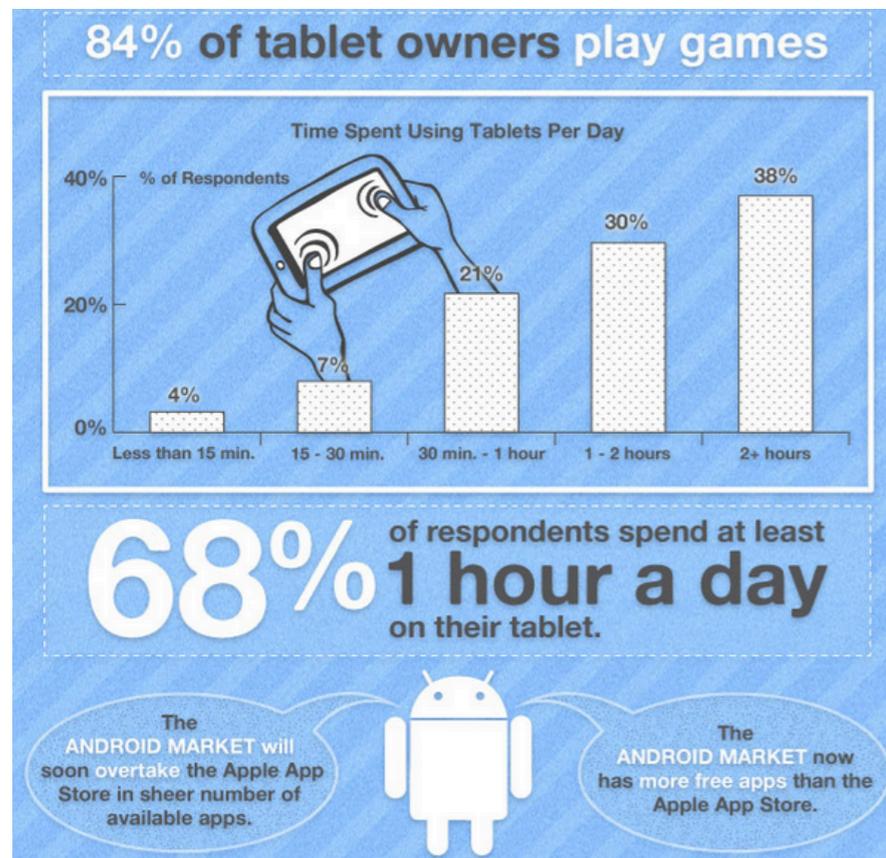
100

Almost All Tablet Owners Download Apps



Mobile/Gaming...

- The mobile gaming industry is predicted to reach **\$54 Billion by 2015**
- **84%** of tablet owners play games
- **70 – 80%** of all mobile downloads are games
- **Android** is soon to overtake **Apple** in number of total **available apps**
- In-game purchases should overtake pay-per-downloads by **2013**
- Developers made **\$87 million** in ad revenue in 2010 and will **grow 10 fold by 2015**



How About Mobile/Gaming + Drug Discovery...

Serious Dilemma - **7 Billion** people depend on fewer than **300,000** people worldwide to discover and develop new medicines...

Consider this,

- Hundreds of Millions of Gamers Worldwide
- Hundreds of Millions of Smartphones+Tablets
- “Foldit Gamers Solve Riddle of HIV Enzyme within 3 Weeks”

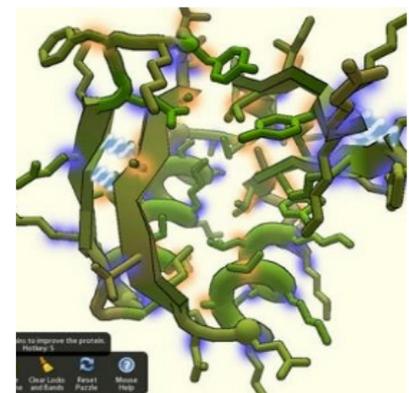


**Gamers Unlock Protein Mystery That Baffled
AIDS Researchers For Years**



By Leslie Horn

September 19, 2011 10:42am EST



Syrum - Boehringer Ingelheim GmbH



Summary

- Pharma R&D has been trending down for a decade
 - ➔ Opportunity: Startups - i.e. sell-side of outsourcing
- Cloud computing is the place to be
 - ➔ Opportunity: Retool within your current employer
- Mobile and cloud computing pair well
 - ➔ Opportunity: Supercharge Apps within the cloud
- Worldwide connectivity+mobile+cloud+gaming
 - ➔ Opportunity: The stage is set

Acknowledgements

- Dr. Rajan Sharma and Prof. Stephan Schurer



- Dr. Maurizio Bronzetti



- Dr. Alex Clark



- Dr. Tony Yuan



- Dr. Peter Löw, Dr. Josef Eiblmaier, et al.



12 Jobs on the Brink: Will They Evolve or Go Extinct?

By [Heather Dugan](#), Salary.com contributing writer.

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Stayed employed: Join the evolution

A stubborn ignorance of the technical didn't do in the dinosaur, but keeping pace with an evolving work environment is certainly *your* best bet against job extinction.

Watch big picture trends, update your skills and direction as necessary, and get personal. Specialized service may become the new luxury item as society does its cyclical swing (but learning VCR repair should *not* be on your bucket list).

An overload of "DIY" and *virtual* everything may lead consumers to value skilled laborers as the new "big thing." Just remember that quality work is always in style and *value* will never be obsolete.

