Fostering Practical Innovation at Microsoft Research

Jack Breese
Director, MS Research Redmond
http://research.microsoft.com

Microsoft Research 2004

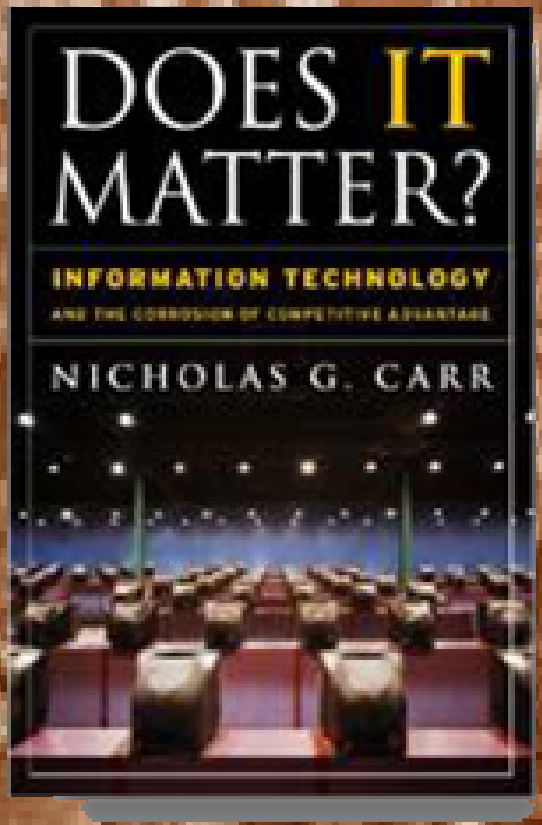
- Goal: pursue strategic technologies for MS
- Founded in 1991
- Staff of approx 700 WW in over 50 areas
- Internationally recognized research teams
- Small % of $7.9 Billion R&D spend at MS
- Research locations :
  - Redmond, Washington
  - San Francisco, California
  - Mountain View, California
  - Cambridge, United Kingdom
  - Beijing, People's Republic of China

Microsoft Research Mission

- Research Excellence
  - Participation in global research community
  - Keep apprised of trends/breakthroughs
  - Identify and recruit top talent
- Provide Technology to Microsoft
  - Compelling functionality and features for existing products
  - Drive entry into new businesses
  - Collaboration: Consultations, algorithms, components, strategic direction

MRS In the 21st Century:

- *Human-Computer Interaction*
  - Natural language, Speech, Vision
  - Sensors, Devices
- *Information analysis, management and retrieval*
  - Databases, Data mining, Scalable computing, Internet Search, Document Understanding
- *Collaboration*
  - Distributed meetings, Social Computing, Communities
- *Mobility*
  - Adaptive systems, Wireless computing
- *Rich Media*
  - 3D-Models, Interactive Images, Signal processing
- *Software Development*
  - Specifications, Programming languages
  - Compilers
  - Trustworthy Computing
- *Systems*
  - Systems Management
  - Security, Privacy
  - Distributed Computing



The End of Computing Science?

EDSGER W. DIJKSTRA

In academia, in industry, and in the commercial world, there is a widespread belief that computing science as such has been all but completed and that, consequently, computing has matured from a theoretical topic for the scientists to a practical issue for the engineers, the managers, and the entrepreneurs. That is, mostly people who can accept the application of science for the obvious benefits, but feel rather uncomfortable with its creation because they don't understand what the doing of research, with its intangible goals and its uncertain rewards, entails. This widespread belief, however, is only correct if we identify the goals of computing science with what has been accomplished and forget those goals that we

Insight › Comment › Peter Judge Tuesday 21st October 2003

Have we reached the end of IT history?

Peter Judge, Tech Update UK
ZDNet UK
October 08, 2002, 10:22 BST

TALK BACK!
Tell us your opinion!

Peter Judge: The leaders of the flagships of the UK's IT industry admit that technology just isn't magic any more.

Hardware Innovation

PC Software Ecosystem

Power

- Riding Moore's Law
- Scale up and out
- 64-bit, 64-way
- Next Generation Secure Computing Base

Convenience

- Wireless networking
- Always on
- Always with you

Personal Computer in 2006

- CPU: 4-6 GHz; multi-processor
- Memory: 2+ GB
- Disk: 1+ TB
- GPU: 3x today
- Net: 1Gb, 54Mb wireless

Continuing Software Innovation

Bigger

- Global scale enterprise software systems
- Global scale federated databases

Richer Experiences

- Multimedia: Video, Audio, Images
- Richer communications: VOIP, IM, Blogs
- Richer connectivity: Broadband, Wireless
- New communication paradigms

PC Software Ecosystem

Smaller

- Intermittent connectivity
- Windows Mobile
- Tiny CLR and Compact framework

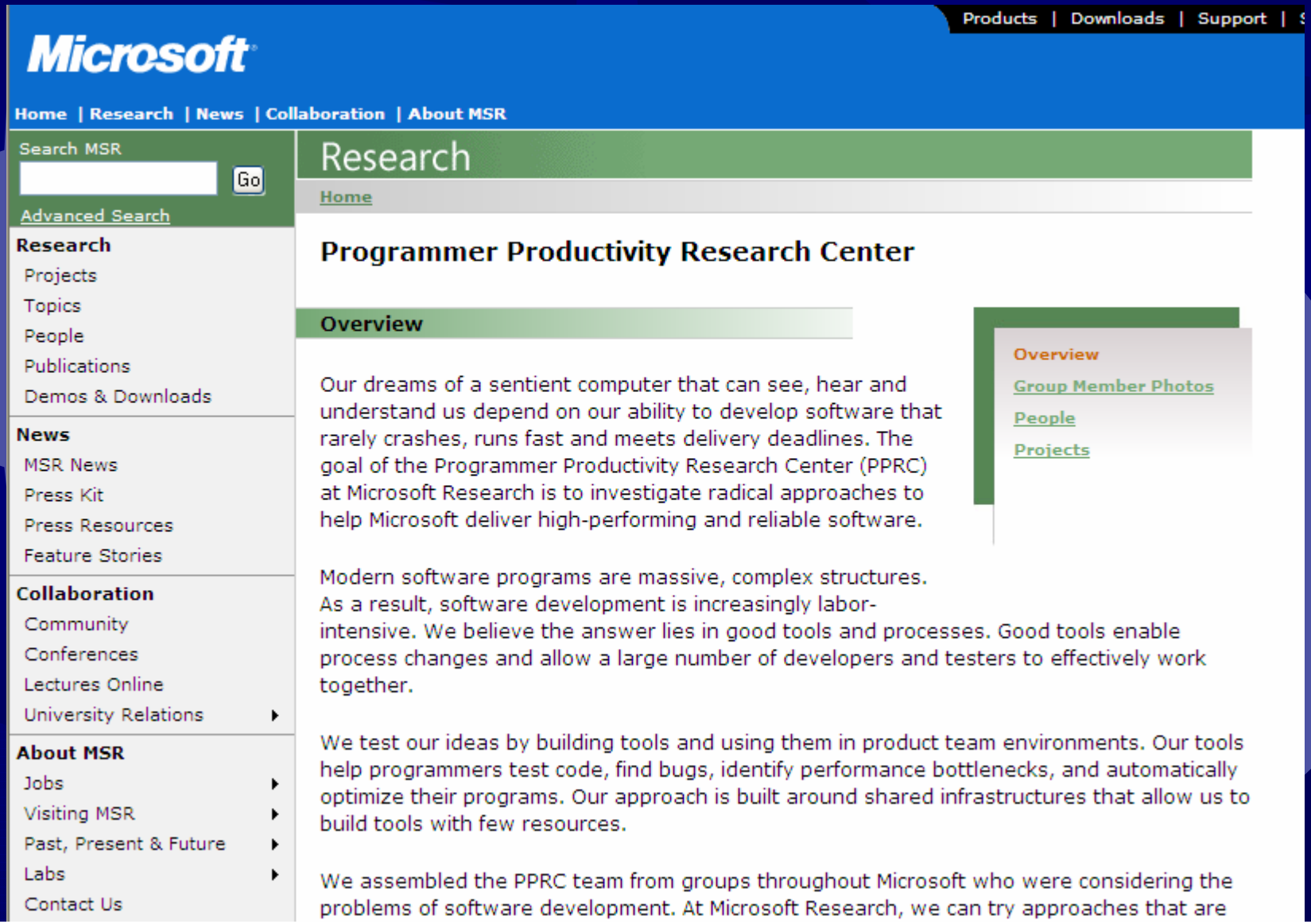
A New Future

- The industry and Microsoft are facing significant new challenges and opportunities
- Technical, social, and organizational issues are driving changes in innovation management
- Where are we going, and what type of university/industry partnerships are important?

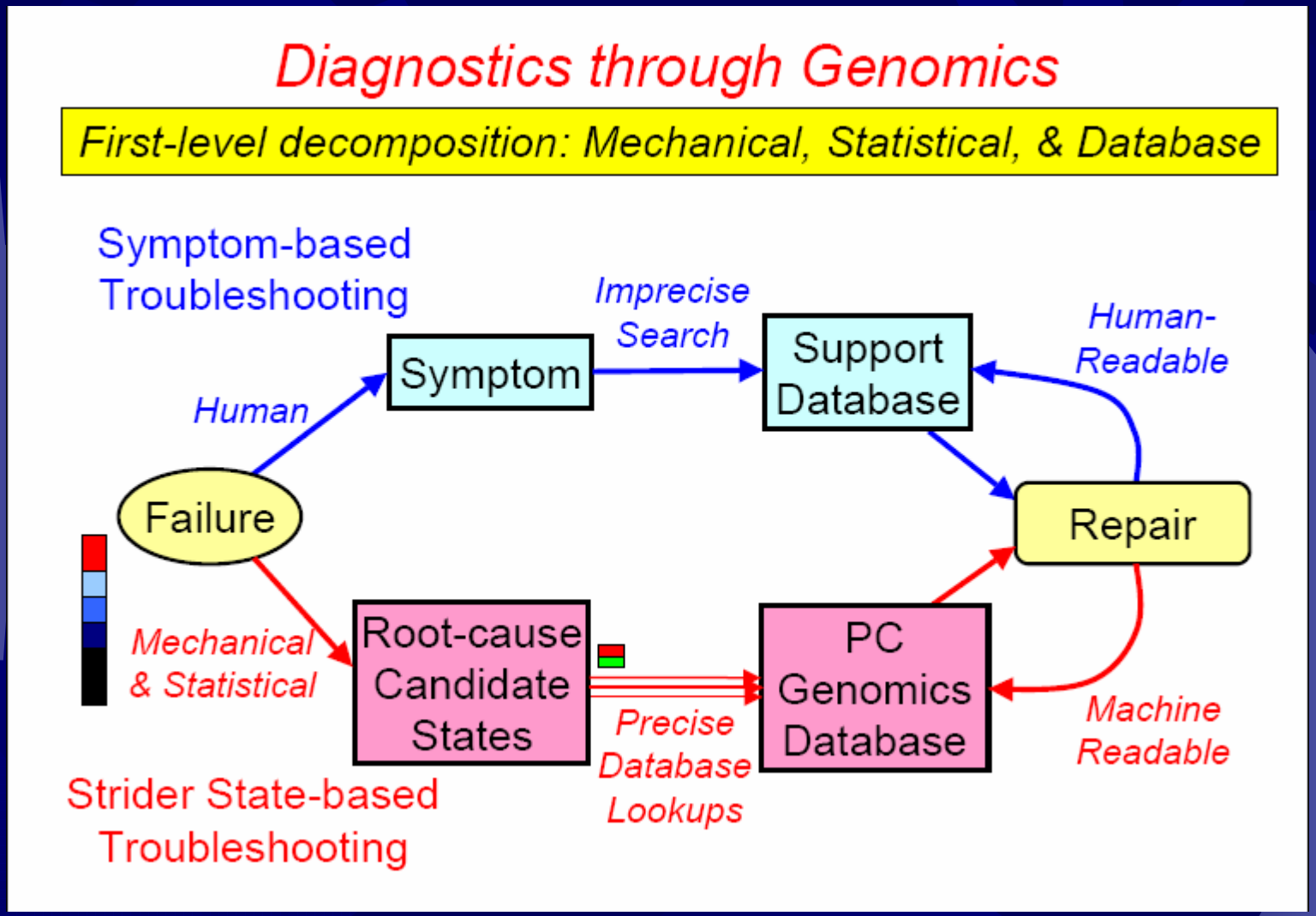
Top Technical Challenges/Opportunities

- Security/Software Productivity
- Systems Management
- Social Computing
- Information Management
- Data Intensive Computing

Software Development/Security



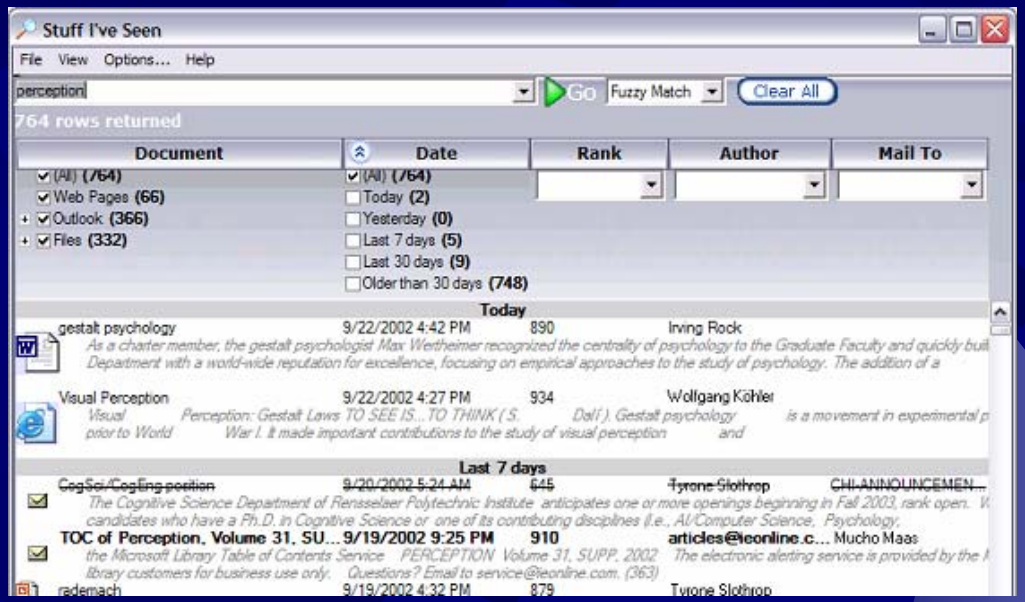
Systems Management: Strider

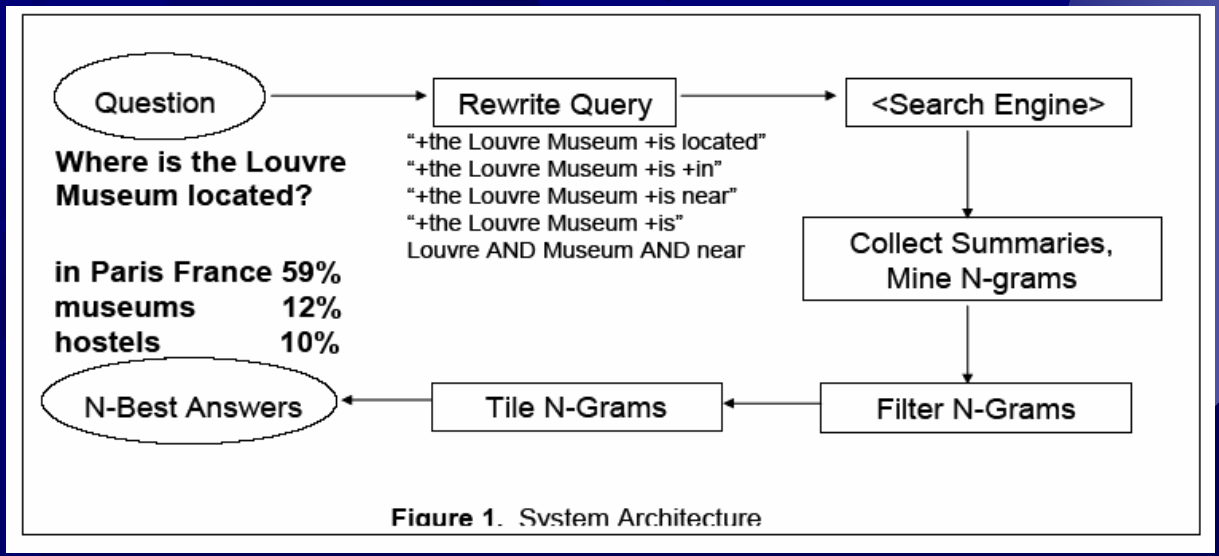


Yi-min Wang et al. "**STRIDER: A Black-box, State-based Approach to Change and Configuration Management and Support**," in *Proc. Usenix LISA* Oct. 2003.

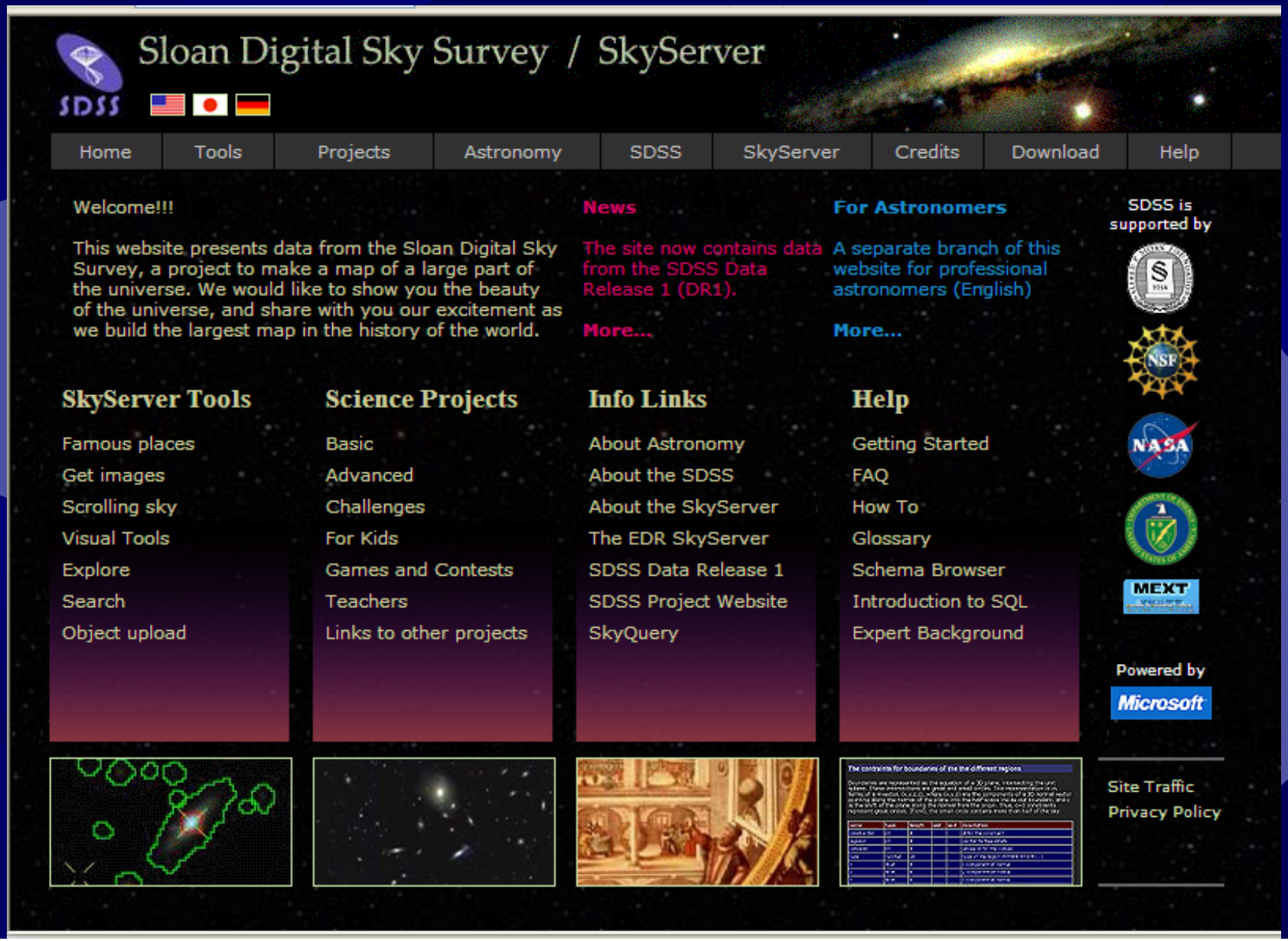
Information Management

- Stuff I've Seen (Dumais)
- ASKMSR (Brill)



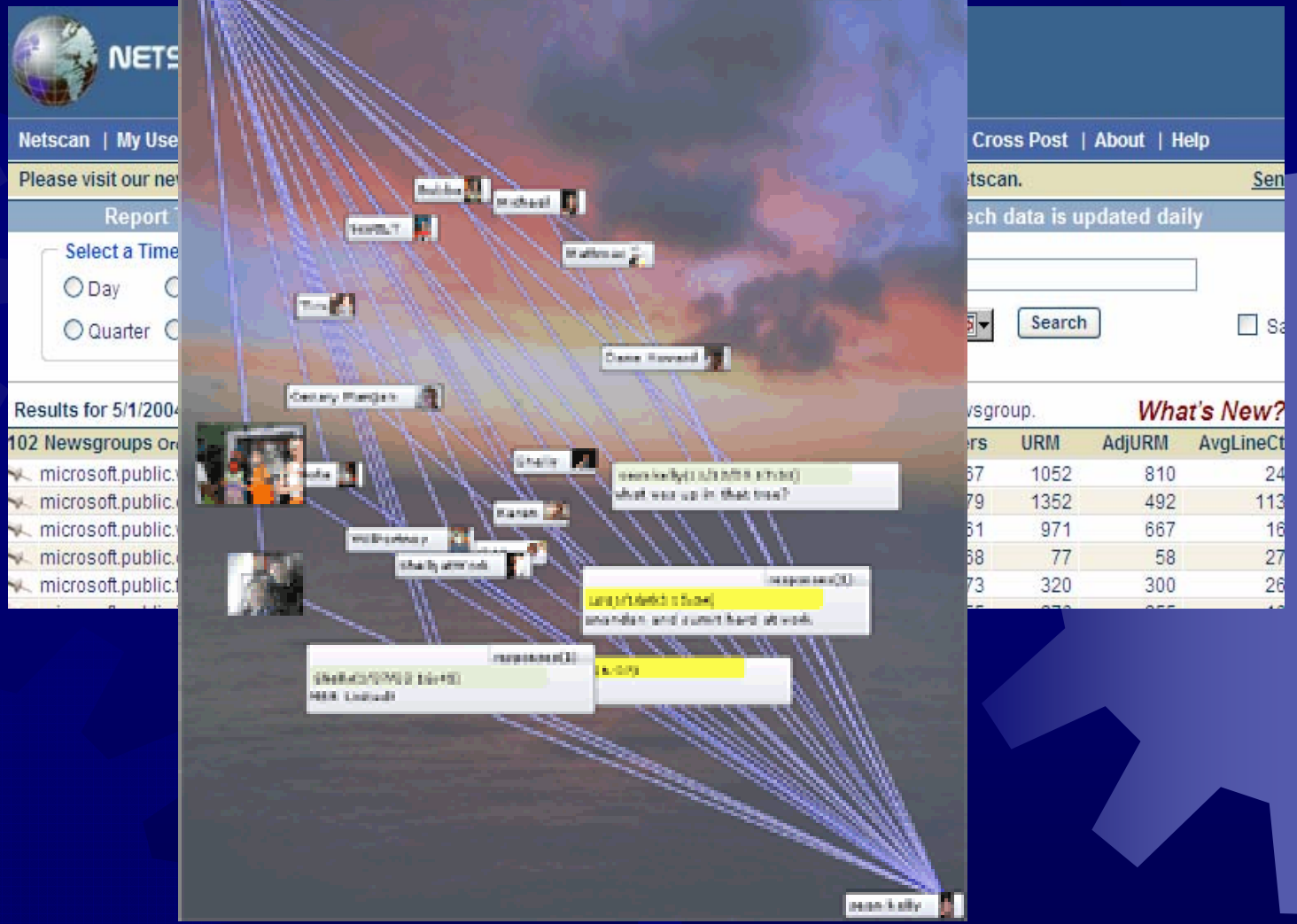


Data Intensive computing (Gray)



Social Computing

- Netscan (Smith)
- Wallop (Cheng)

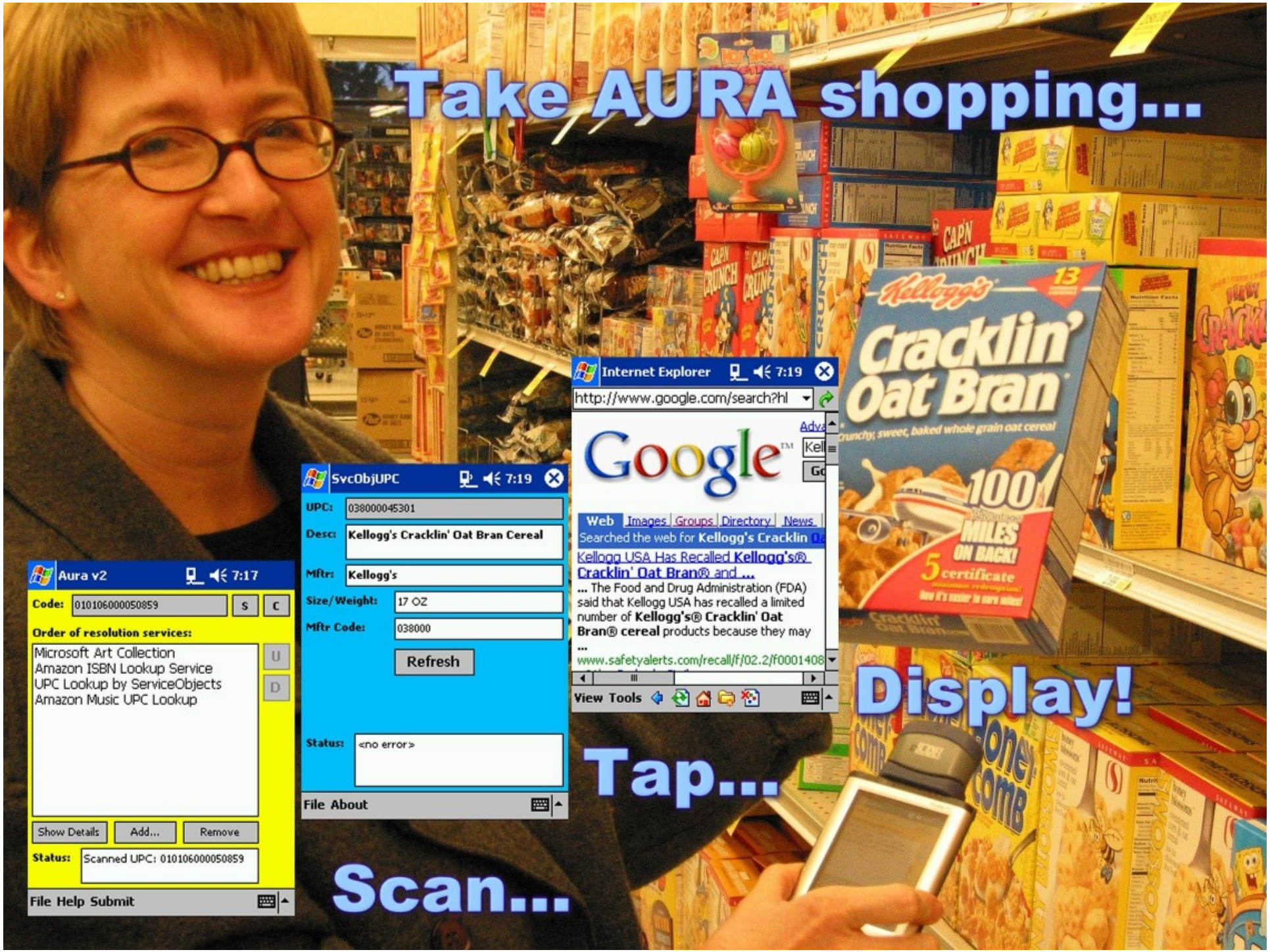


Follow the Data

- We are taking a data driven approach in all of these areas
  - Collect
  - Label
  - Learn
  - Apply
- Driven by
  - Availability of Data
  - Substantial progress in scalable data mining and machine learning algorithms

Never bet against the Hardware

- Aura: Marc Smith, Community Technologies Group, Redmond
- Magic Pen, Jian Wang, MSR Asia
- Many others
  - Large Displays
  - Sensecam (Williams, MSR Cambridge)
  - Sensor enhanced Mobile devices (Hinckley)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Microsoft Art Collection
Amazon ISBN Lookup Service
UPC Lookup by ServiceObjects
Amazon Music UPC Lookup
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UPC: 038000045301
Desc: Kellogg's Cracklin' Oat Bran Cereal
Mftr: Kellogg's
Size/Weight: 17 OZ
Mftr Code: 038000
Refresh
Status: <no error>
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Internet Explorer 7:19
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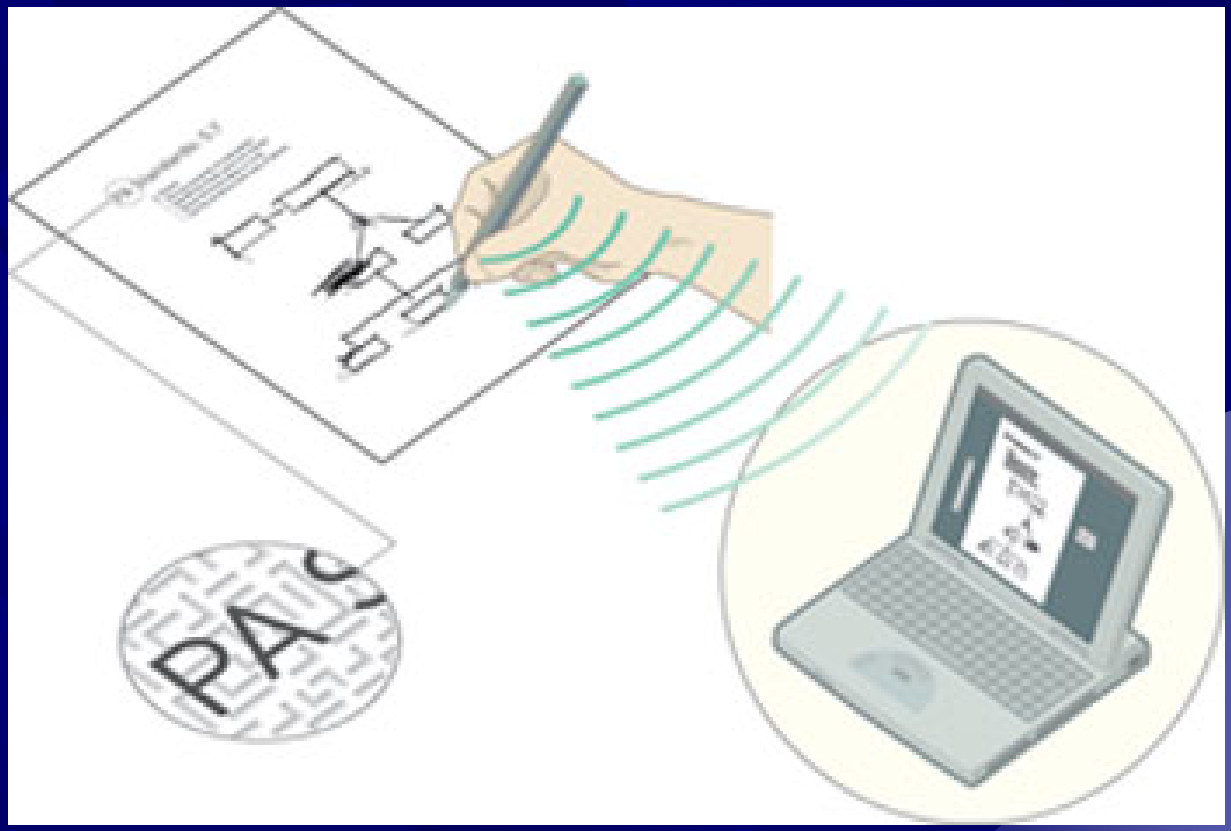
Searched the web for Kellogg's Cracklin
Kellogg USA Has Recalled Kellogg's® Cracklin' Oat Bran® and ...
... The Food and Drug Administration (FDA) said that Kellogg USA has recalled a limited number of Kellogg's® Cracklin' Oat Bran® cereal products because they may ...
www.safetyalerts.com/recall/f/02.2/f0001408
View Tools
Kellogg's
Cracklin' Oat Bran
crunchy, sweet, baked whole grain oat cereal
100
MILES ON BACK!
5 certificate
Tap...
Display!
Scan...

MSRA Magic Pen



Jian Wang, MSR Asia

Globalization of Research

The World's Hottest Computer Lab

Microsoft's six-year-old Beijing lab has already paid dividends in speech recognition, graphics, wireless multimedia—and the training of future executives.

By Gregory T. Huang
June 2004

Face to face: Keman Yu demos handheld video phones. (Photographs by Kevin Lee)

Half a world away from the calm beauty of Seattle and Puget Sound, there's a lab where software dreams come true. At Microsoft Research Asia, the drive to succeed is as intense as the traffic that roars by the front door in unbridled, chaotic fury. If Microsoft's other facilities around the globe seem idyllic, this one, in Beijing, China, is pure street. Nearby high-rises compete with smokestacks for skyline supremacy. Run-down buildings sit next to bustling consumer electronics markets and the Beijing Satellite Manufacturing Factory, where China conducts its spaceflight research. Microsoft's mantra: work hard to get in the door; work harder to survive; then work even harder because the real work—that of an information technology world leader—is just beginning.

Integrated R&D Center

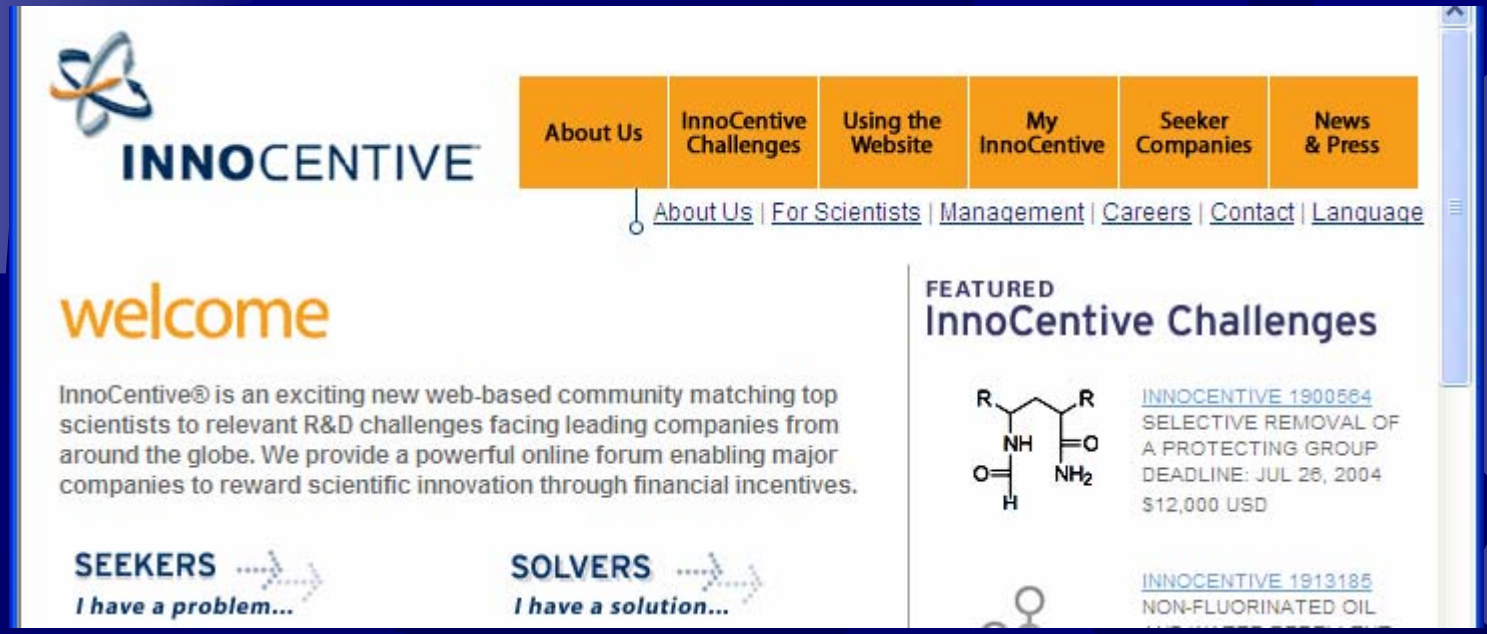
70 out of 120,000

What is Changing

- Excellent university preparation in mathematics and science
- Global access to technical information
- Local technical ecosystem: labs, university, large and small companies
- Access to capital
- Local intellectual property rights??

Result

- Global market for intellectual property creation
- New models and economics



Oxygen for the Research Engine: University engagement

- Funding:
  - Strategic Initiatives ($ and software)
  - Relation based
  - Industrial Affiliates
- Internships/Fellowships
- Faculty Summit

University Licensing

- Ideas an
- Not typic
- Often no
- Negotiat

Preferred Scenarios

- Non-exclusive, non-transferable, worldwide, royalty-free license*
- Option for an exclusive license
- Not one size fit's all:
  - Consider impact
  - Level of investment involved

*Computing Research Association (CRA) "Best Practices Memo: University-Industry Sponsored Research Agreements" Moore, Snyder, Bernstein

Innovation Dilemma at MSR

- Many more ideas than we can fully fund and explore with product groups

University

- Basic Research
- Training

Entrepreneur

Startup

- Adv Development
- Initial productization
- Rapid deployment and rework

Acquire

MSFT

- Industrial Dev
- Global distribution
- Integration & Standardization

- New outbound licensing

Some MSR Contributions. . .

Windows 95 and Office 95
- Performance optimization
- Answer Wizard (Office)

Office 97
- English grammar checker
- Japanese stemmer and segmenter

Windows 98
- Chinese Input Method Editor (IME)
- Intelligent Troubleshooters
- Windows Media™ Player audio and video codecs

Windows NT®
- Alpha channel compositing algorithms
- Cryptography libraries

Windows XP
- ClearType® display technology
- Windows Media™ Player
- IPv6
- Source code analysis tool
- Performance optimization tool

Some MSR Contributions. . .

Office XP

- Smart tags technology
- Grammar checker improvements, more languages.
- Outlook® mobile manager (notification system, IntelliShrink™)
- Antipiracy technologies
- Development tools
- SharePoint™ information retrieval technologies
- Speech recognition engines
- Mandarin Chinese data entry

Office 2000

- Improved answer wizard
- New grammar checker languages

Office 2003

- Junk mail filter
- Multi-monitor and large screen enhancements
- Security enhancements

Some MSR Contributions. . .

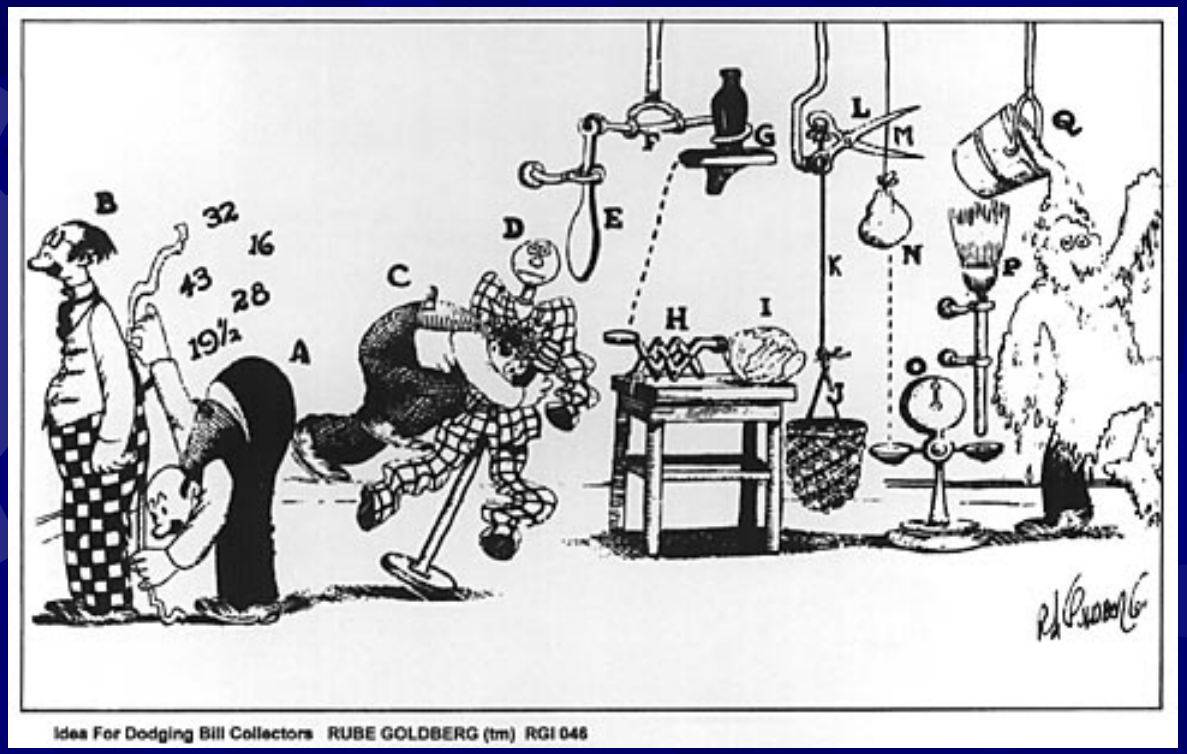
Microsoft SQL Server

- Test tools (e.g. complex query generation)
- Auto admin tools
- Key range locking
- Multilevel recovery
- Multiple storage organizations
- New OLE DB extensions for data-mining components
- New data-mining techniques

Tablet PC

- Concepts and people from MSR
- Digital Ink technology
- Handwriting and sketch recognition
- Asian character recognition
- Compression techniques for annotation

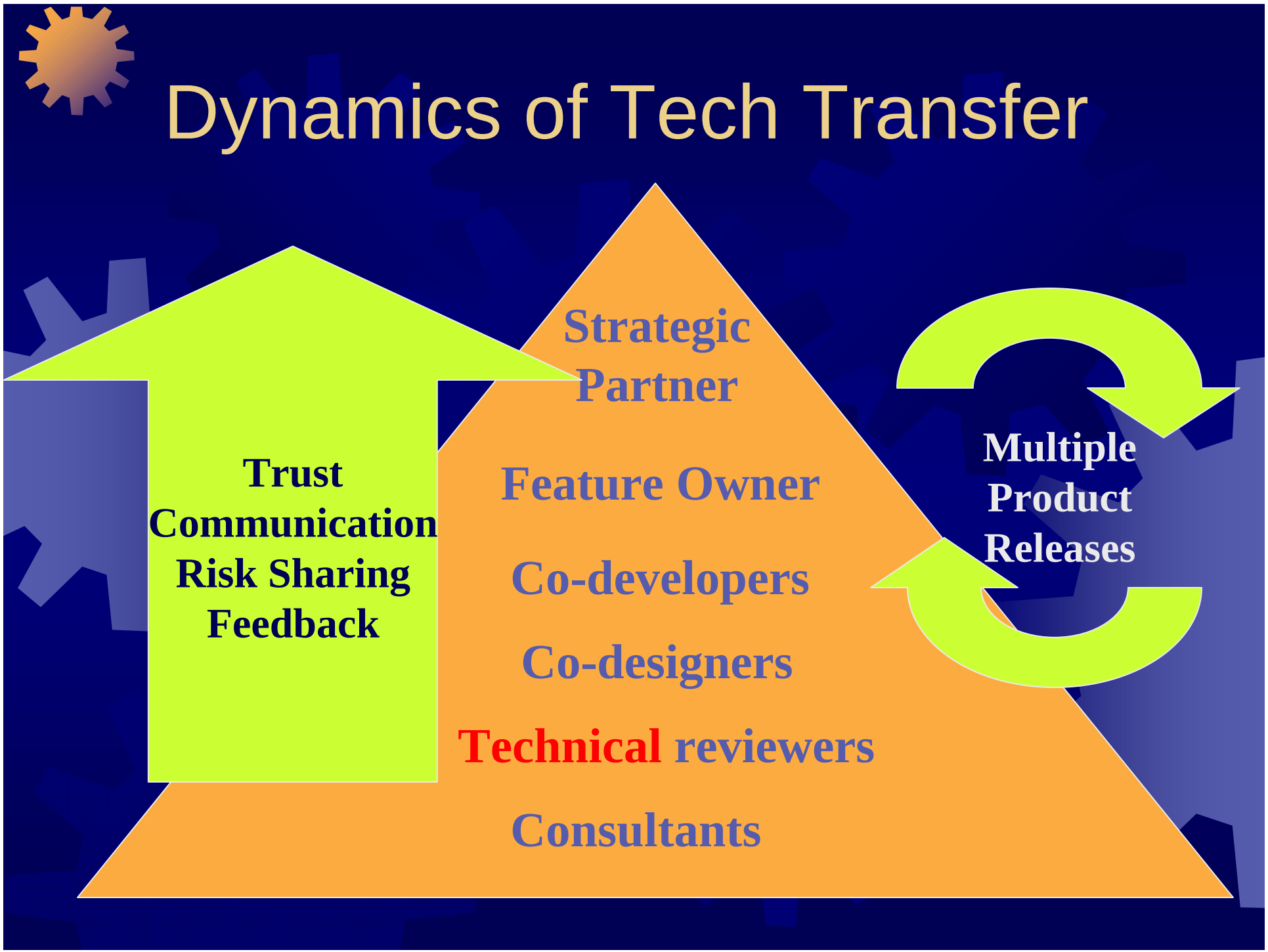
Tech Transfer is not...



Idea For Dodging Bill Collectors RUBE GOLDBERG (tm) RGI 046

It is a *fundamentally social process* for managing key technology assets

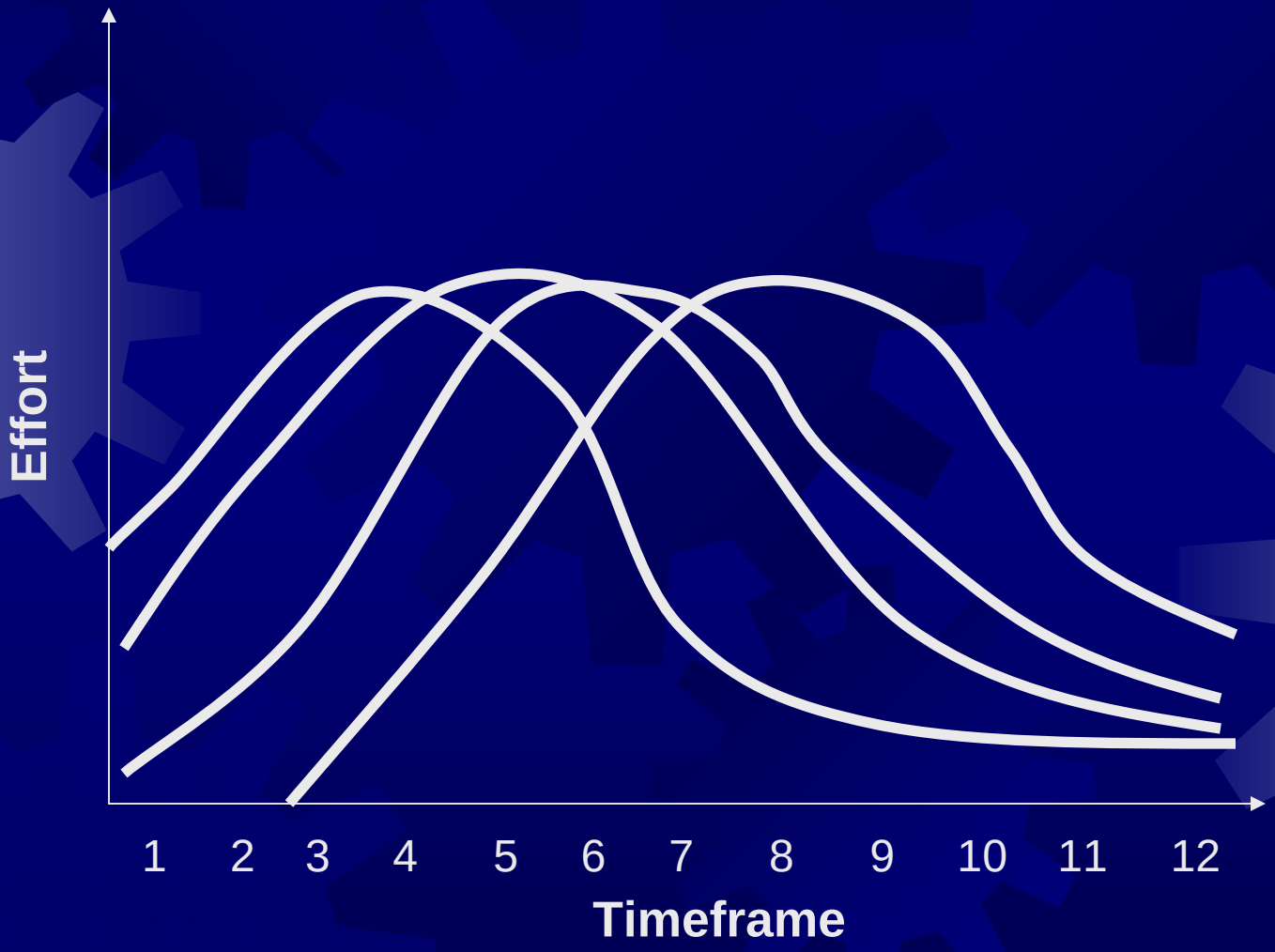
Dynamics of Tech Transfer



Tactics

- Recruiting: Hire the best people who also want to have an impact
- Cost sharing: management attention is a critical resource
- Recognize contributions: compensation, promotions, “ship-its”
- Team building: Theorists and software development engineers are critical team members.

Manage the portfolio



IT does matter!

- Challenges and opportunities are substantial
- Research – industry, government and university- is a global enterprise
- We need a rich ecosystem of innovation involving licensing, startups, acquisitions, and human capital.

Microsoft Research

- Investigating a wide range of topics in computer science
  - Software
  - Hardware
  - Algorithms
- Continuing to invest globally
- Focus on innovation for Microsoft products
- More information: http://research.microsoft.com