Turbulence in the PARC

Xerox Palo Alto Research Center 1970 - 1975

by
Alan G. Labouseur
alan@Labouseur.com

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Our Plan

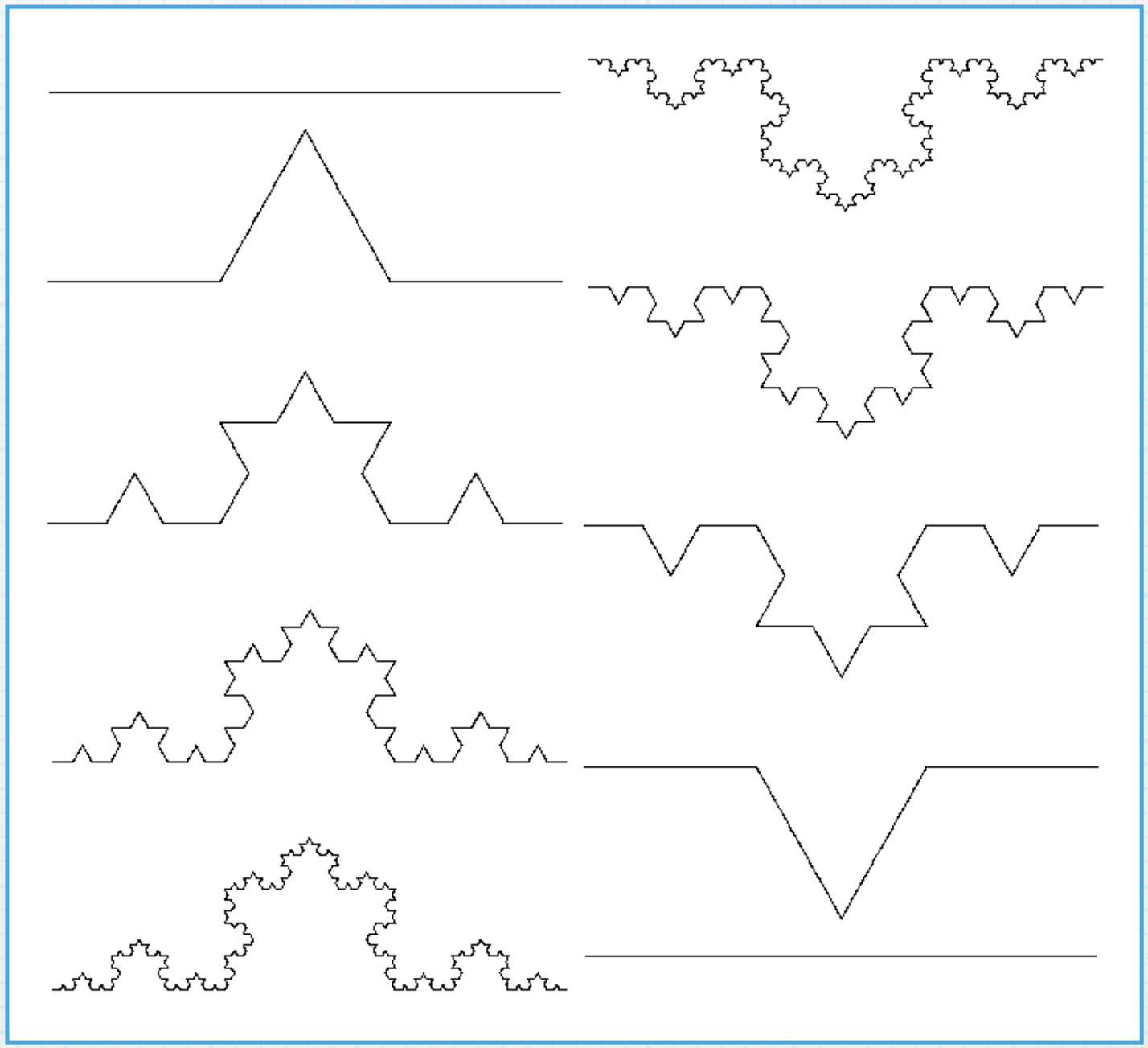
1. Background
2. Early History
3. Innovation or Invention?
4. What Happened?
5. Today and Tomorrow
6. References

Background

Turbulence

[5]

- Volatility
- Rapid Changes
- Uncertainty
- Complexity
- Hyper Competition
- New Technology
- Inflection Points



Background

Xerox in the late 1960s [1,2]

- Chester Carlson invented the xerographic process in 1938
  - Greek: *xeros* = dry; *graphia* = writing
- Cornered the market on copy machines by the 1960s
  - "Would you Xerox this for me?"
- Virtual monopoly = $$$$
  - Pavur's Law

If things are going very well, be afraid... be very afraid.

- Xerox executives got afraid.

Xerox 914 - 1959

Background

Xerox in the late 1960s [1,2]

- Marketing and selling copiers to virtually all businesses
- Xerox copiers sitting next to IBM mainframes and minis
- Why not take on IBM by offering computers too?
  - "Office of the Future" vision. What could go wrong?

- Xerox purchased Scientific Data Systems (SDS)
  - Paid $960M, 96 times earnings
  - Many top SDSers retired on crazy new stock profits.

SDS 940 - 1966

Background

Turbulent Environment of the late 1960s [1]

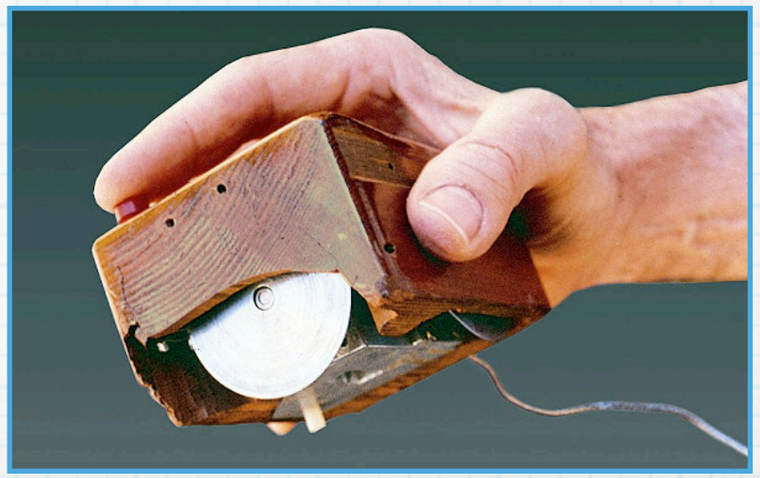
- Volatility ✓ Vietnam war, riots, assassins
- Rapid Changes ✓ Social unrest, Woodstock
- Uncertainty ✓ Economic recession, protests
- Complexity ✓ Mainframes, Minis, Micro?
- Hyper Competition ✓ IBM, HP, DEC, NCR, EDP, CDC, . . .
- New Technology ✓ NASA, USSR, Boeing, IBM, . . .
- Inflection Points ✓ Semiconductors, all of the above

[1] See more at http://www.nytimes.com/packages/html/arts/20090717-1969-feature

Early History: 1968 - 1970

In the beginning . . .

[1,2]

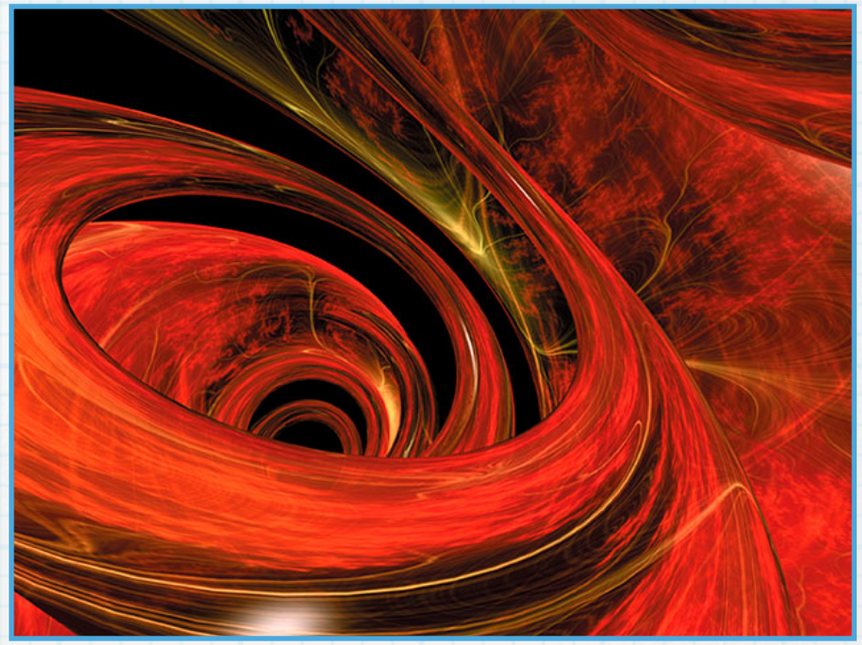


- 1968 - Doug Engelbart invents the mouse at Stanford Research Institute (SRI). His team soon goes to PARC.
- 1969 - Xerox buys SDS, renamed XDS.
- XDS cannot compete with IBM. (Not even close.)
- Xerox founds a new research center to develop new products and new computing technology.
  - Proposed name: "Advanced Scientific and Systems Lab".
  - Director George Pake liked another suggestion, PARC, because it sounded bucolic and made for a better acronym.

Early History: 1968 - 1970

Turbulence can be good

[1,2]



- It was a “buyers market” for top research talent.
  - Turbulence brought on by the expense and politics of the Vietnam war caused reductions in government research spending.
  - The turbulence brought on by a national recession caused reductions in corporate research spending.
- Xerox was one of the few places that could bid for top research talent.

Early History: 1968 - 1970

Top Talent [1,2]

- Robert Taylor - “The Impresario” from ARPA.
- Gary Starkweather - Laser printer
- Alan Kay - Object-oriented programming, GUI. Also coined the term “Personal Computer”.
- Robert Metcalfe - Ethernet
- Butler Lampson - Laser Printer, Ethernet, Alto, GUI
- Dick Shoup and Alvy Ray Smith - Superpaint, lead to Pixar
- Charles Simonyi - GUI, word processing as we know it

Early History: 1968 - 1970

Robert Taylor [1,2]

- ARPA Information Processing Techniques manager
- PARC's early Computer Science Lab manager

I was never interested in the computer as a mathematical device, but as a communications device.

- No Ph.D. - This caused conflicts, but was also beneficial.
- Gifted talent manager and motivator
- Eventually kicked out of PARC, founded DEC's Systems Research Center

Innovation or Invention? 1971

Laser Printing [1,2]

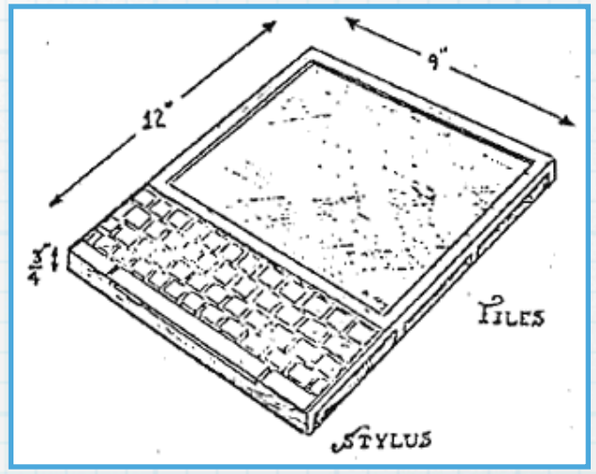
- Gary Starkweather wondered if lasers could be used to "paint" an image on a xerographic drum instead of using lenses and light.
- He was almost fired for not focusing on lenses and light.
- Instead, he was exiled to PARC . . .
- ... where he invented the "Scanning Laser Output Printer"
- The patent earned Xerox $Billions
- Commercialized in 1977
  - The Xerox 9700
  - 300 dpi / 120 ppm

Xerox 9700 - 1977

Invention: 1972

Object-oriented Programming [1,2,6]

- Alan Kay - Stanford AI Lab, then ARPA, then PARC
  - DynaBook - what we'd call a notebook
  - Thought about computer programming in biological terms: cells communicating by passing messages.

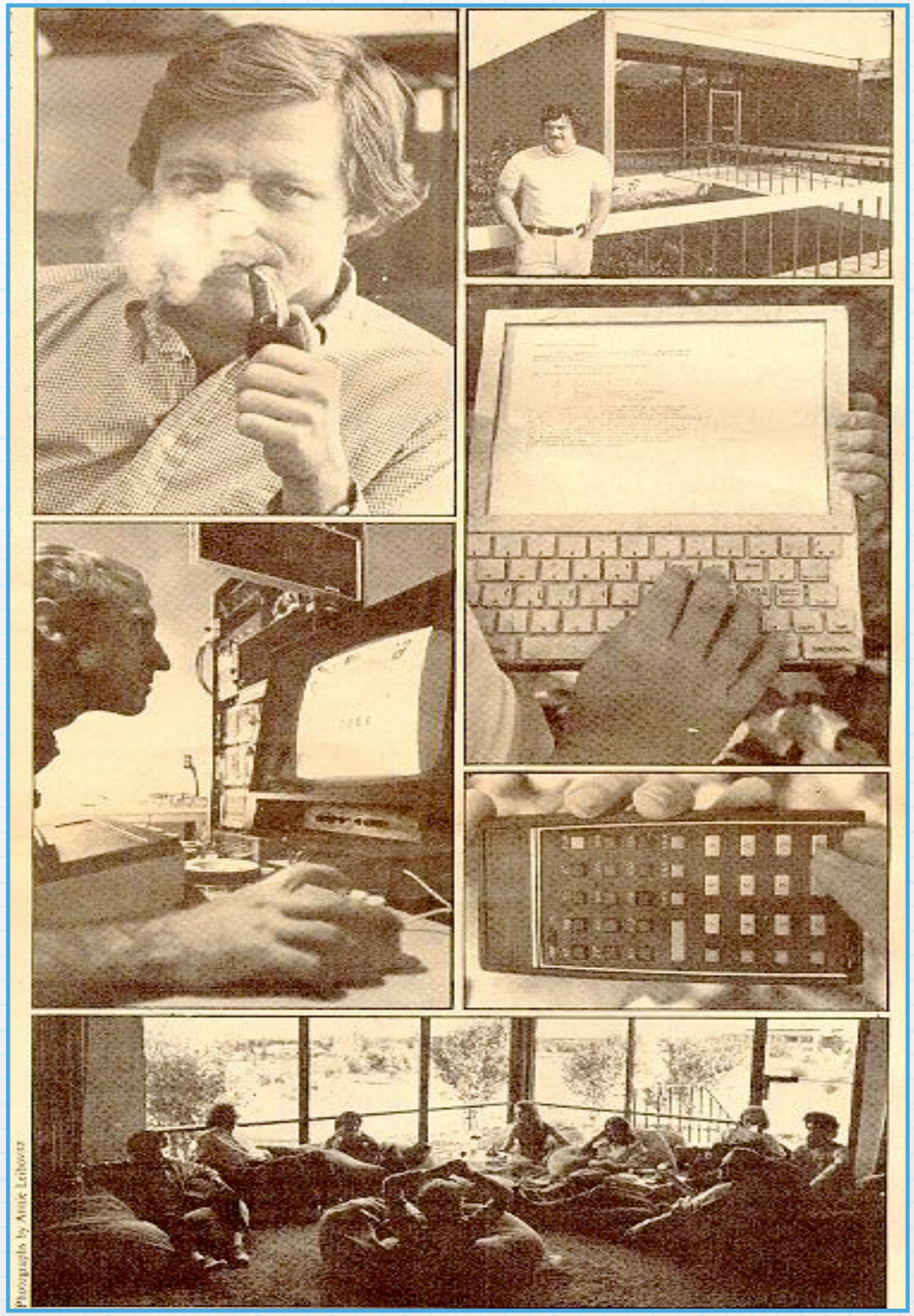


- SmallTalk - an entirely new way to program computers
  - First *Object-oriented programming* environment
  - Objects have traits (data) and behaviors (methods).
  - Objects can inherit from each other for differentiation.
- Today: C++, Java, C#, Objective-C, many others

Fame: 1972

Rolling Stone [9]

- SPACEWAR: Fanatic Life and Symbolic Death Among the Computer Bums.
- Article by Stewart Brand
- December, 1972
- “Ready or not, computers are coming to the people.”



Immediately [below] left, chief marble collector Bob Taylor; and right, quiz kid emeritus, Alan Kay. Below him, the Dynabook; the pocket calculator; the Bean-Bag Room. Center left, the author draws with the computer.

Invention: 1973

Ethernet

[1,2,7]

- Robert Metcalfe
  - Harvard rejected his doctoral thesis on packet transfer in networks.
  - Robert Taylor didn't care and hired him at PARC.

Robert Metcalfe in 1973

- Fired electrical pulses down copper cable into an oscilloscope
  - Invented Ethernet
  - Used it to connect Alto workstations
- Left PARC in 1979 to found 3COM
  - Sold his stake for $100M+

Invention: 1973

The Alto Personal Workstation [1,2]

- IBM was making mainframes and electric typewriters.
- Bill Gates was a freshman at Harvard.
- Steve Jobs was wandering around India seeking Zen.
- Butler Lampson - “Why Alto?”
- This 1973 Alto prototype (which fit under a desk) did almost as much as the production Macintosh in 1984.

Invention: 1973

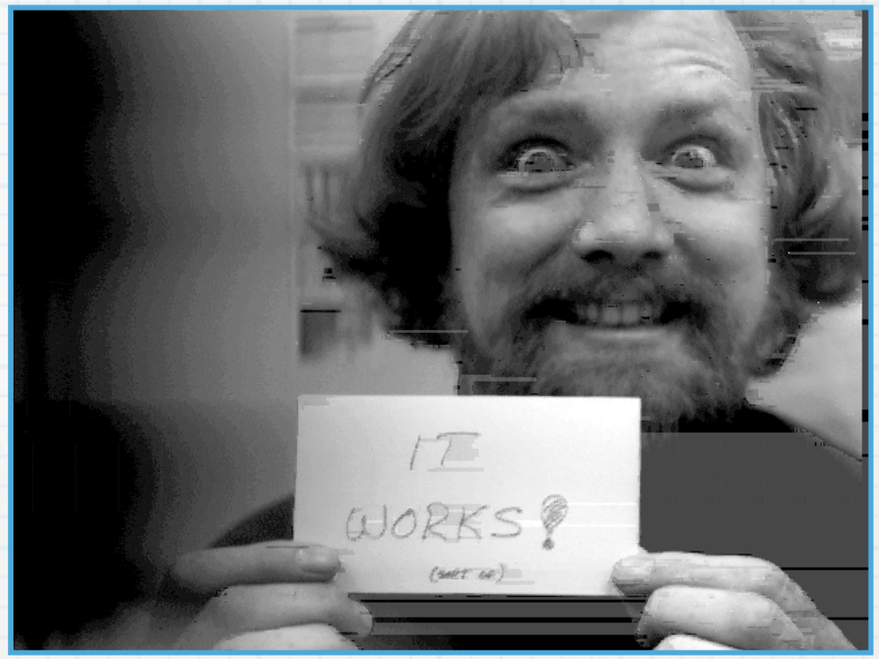
The Alto Personal Workstation [1,2]

- Graphical User Interface
- Keyboard and mouse
- Removable data storage.
- WYSIWYG display and laser printing
- Networking and e-mail
- $12,000 to build - never sold

Invention: 1973

The Superpaint Machine

[1,4,8]



- Dick Shoup and Alvy Ray Smith
  - Built the first video frame buffer
- The Superpaint Machine took up two cabinets and cost more than $100,000
  - Could grab frames off television, digitally mark them up (in color!) and alter them, and store the result to disk. They demonstrated on Star Trek episodes.
- Xerox not interested, focused on Alto and “documents”.
  - Shoup and Smith left.
  - Smith to ILM and eventually cofounded Pixar.

Invention: 1974

WYSIWYG editing

[1,2]

- Butler Lampson started designing an editor for the Alto.
- Charles Simonyi (with Larry Tesler and Tim Mott) implemented it.
- Bravo - the first user-friendly text editing system
  - multi-font, bitmapped displays, used the mouse for marking and selecting text
  - basis for Gypsy, first GUI word processor
- Left in 1981 for Microsoft to develop Word and Excel
- Now flies to space with the Russians.

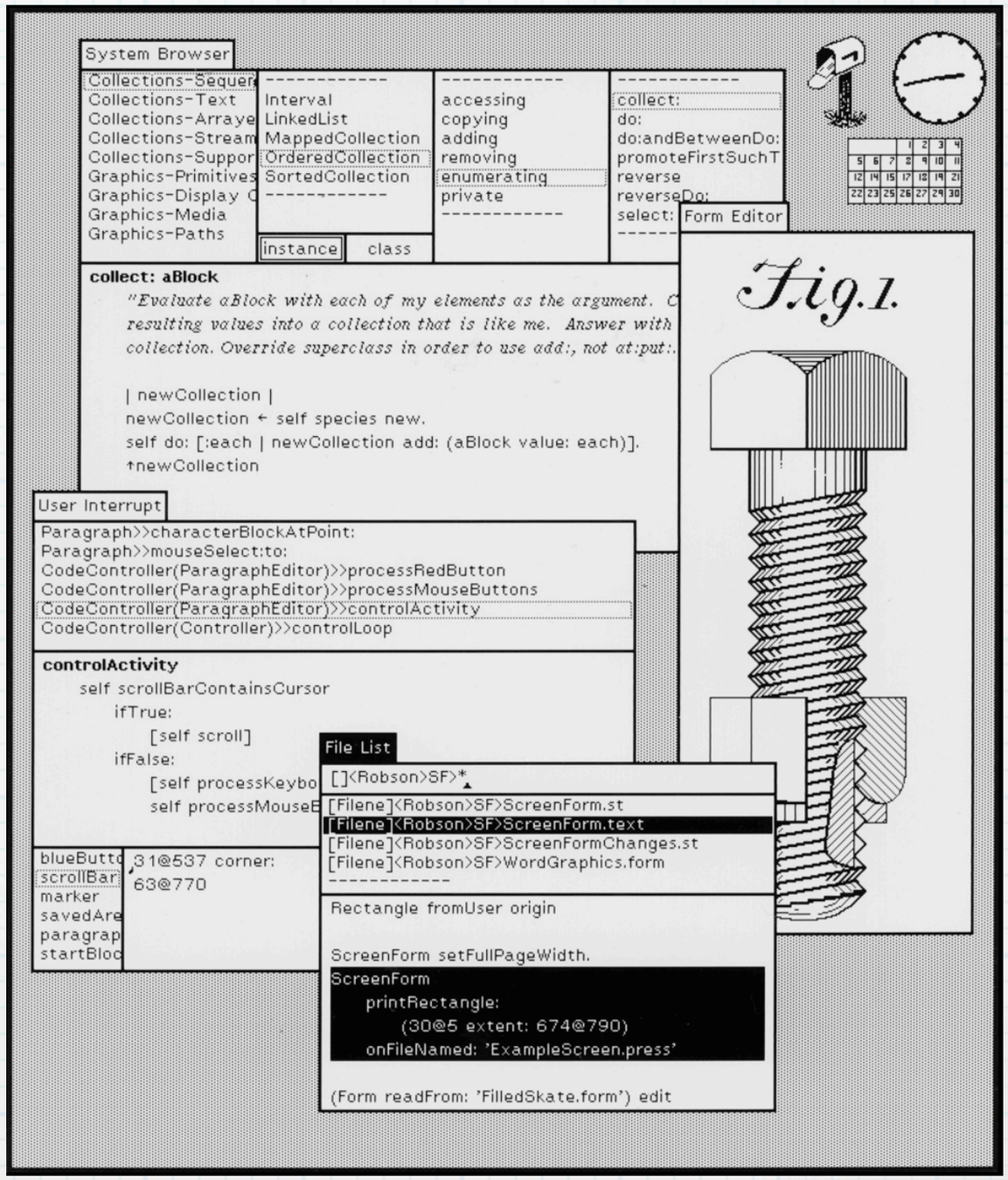
Charles Simonyi

Invention: 1975

The Graphical User Interface

[1,2]

- Alto Software Interfaces:
  - Alan Kay's SmallTalk
  - Butler Lampson's text editor
  - Charles Simonyi's word processor . . .
- Graphical User Interface
  - The GIU
  - Steve Jobs saw this in 1979. The Macintosh debuted five years later.



Smalltalk GUI

What Happened?

Did Xerox fumble the future?

- Strong vision: “Office of the Future”
- Had money
- Heavily invested in research

What went wrong?

What Happened?

Did Xerox fumble the future?

- Strong vision: “Office of the Future”
- Had money
- Heavily invested in research

What went wrong?

- No interest in nor support for commercialization

  - All “R” and no “D”; ignored the rest of the life cycle
  - No portfolio strategy
  - Unable to manage change, enter the consumer market, or execute their “Office of the Future” vision.

What Happened?

Why was there no development? [1]

- Commercializing technology is difficult.
- Innovator's Dilemma - focused on cash cow copiers
- Huge company challenges
  - bureaucracy, delay, short-term thinking
  - couldn't bet the company on one product (like Apple did)
- Management focused on strategy, disregarded research
  - drove brilliant minds to other commercial ventures, all of them successful (Microsoft, 3COM, Apple, Pixar, more).

Turbulence Happened

Why was there no development?

- Commercializing technology is difficult.
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Complexity

Uncertainty

Rapid Changes

Hyper Competition

Volatility

New Technology

Inflection Points

Today: Recent History

More Inventions and Innovations since 1975 [1,2]

- Solid-state lasers
- Computer worms - killed the Alto Ethernet in 1978
- Natural Language Processing
- Magneto-optical storage
- Fiber-optic LANs
- Multi-beam lasers
- Blue lasers

Today: PARC, a Xerox company

The Business of Breakthroughs®

[2]

- 2002 - incorporated as a subsidiary of Xerox
- Provides R&D services and technology consulting to Fortune 500 and Global 1000 companies

  - technology risk management, accelerating time to market, customizing technology
- Holds about 2500 patents, adding about 150 per year

Tomorrow

Xerox PARC: The Next 40 Years [3]

- Incubator for new startups
  - Already spun off PowerCloud Systems
- Working on a new Internet
  - “Content-centric Networking”
  - NDN: the “Named Data Network”
- Social Intelligence Systems
  - Modeling behavior in social networks to enhance the value of these systems.

Tomorrow

Xerox PARC: The Next 40 Years [3]

- Intelligent Power Management Systems
  - PowerAssure - power distribution in data centers
- E-mail organization
  - Enriching e-mail systems with contextual data from LinkedIn, Twitter, etc.
- Organic Semiconductors
- Flexible electronics

Thank you

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