Software Quality and the Internet Appliance

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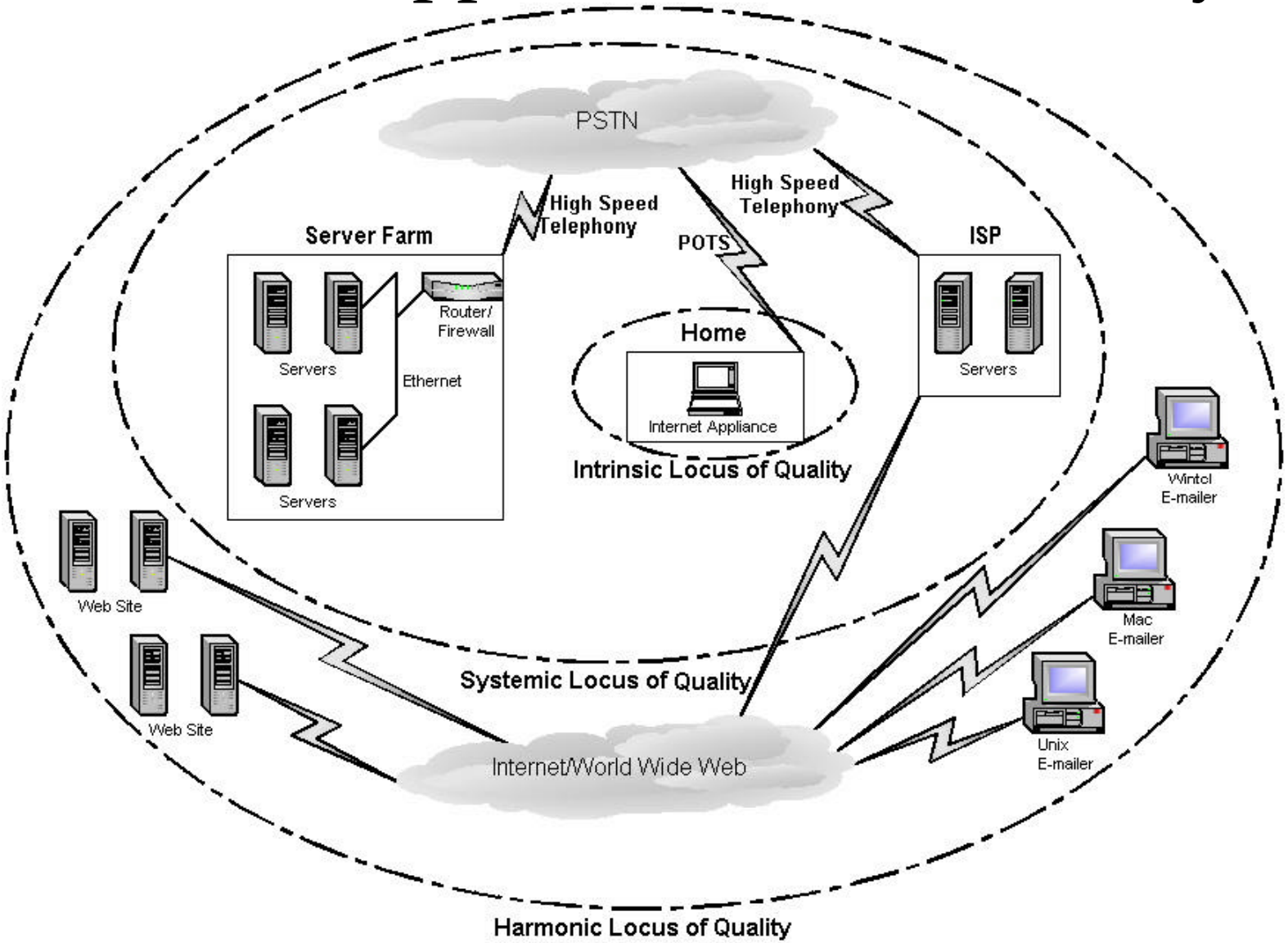
What is an Information Appliance?

- A computer system that performs simple tasks in a trivially obvious and foolproof fashion, usually via a non-traditional access device (i.e., not a PC)
- Evolution
  - Access devices themselves evolving from common items like PCs, phones, and computer games
  - Back-end servers evolving from Unix data centers
- Revolution
  - Brings computer technology to those who can't/don't/won't deal with underlying complexity
- Internet Appliance: Access e-mail and the WWW

Loci of Quality for Internet Appliances

- Quality indicators fit in 3 sets of behavioral points that determine the customer's experience of quality
  - Intrinsic: Inherent in the access device hardware, the firmware, and the locally hosted software itself
  - Systemic: Arising from supporting functions of the appliance, including the servers, the communications network, and the human aspects of the process
  - Harmonic. Involving how well the otherwise-correct intrinsic and systemic functions interact with the Internet
- Moving outward, the vendor has less control and must ultimately adapt to Internet realities

Internet Appliance Loci of Quality



Quality Risks for Internet Appliances

- Usability
- Functionality
- Reliability
- Performance
- Security
- Operations
- Error and disaster handling and recovery
- Capacity and volume
- Data flows and data quality
- States and state transitions
- Untested code
- Date and time handling
- Localization
- Configuration options
- Documentation, tutorials, and help screens

We defined 75 types of failure modes within these quality risks

We developed cases covering about 1,000 test conditions

Two Challenging Test Areas

Client Updates

- Servers “push/pull” mail, content, applications, and OS to client devices on login
- A failed update can lose data, render device unusable
- We tested > 10,000 update events under both normal and error conditions
- End-to-end testing (direct to customer) important

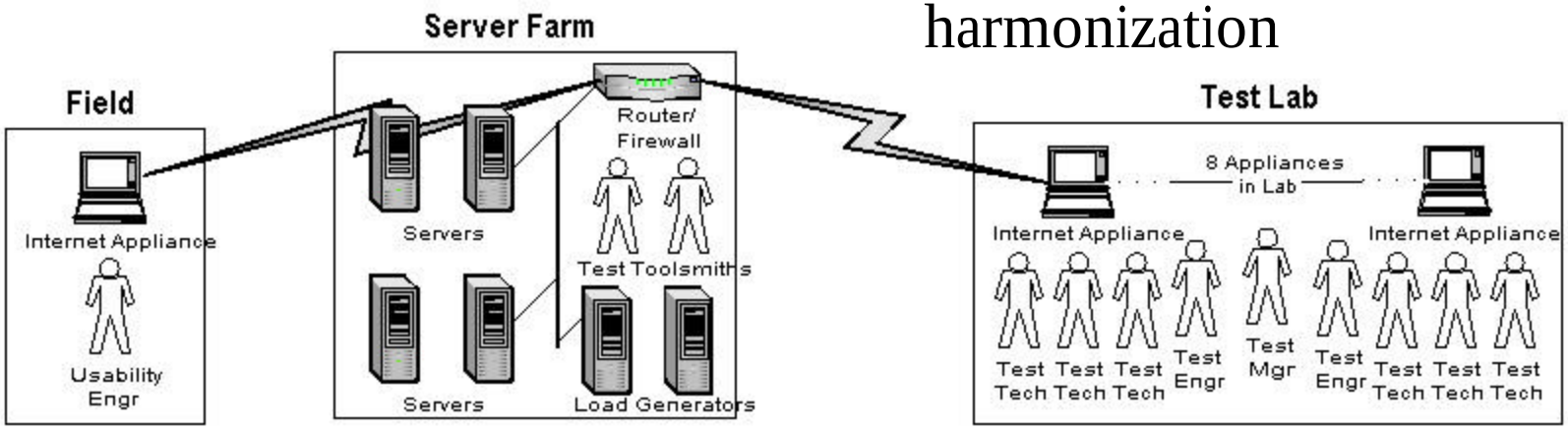
Usability

- Standard Mac and Win UIs too complex for customers
- Usability design from day one
- Prototypes tested in malls, airports, etc.
- Large, early (>100) Beta
- Active tester bias towards reporting bugs
  - K If observed behavior could mislead, bewilder, intimidate, or anger customers, report as bug

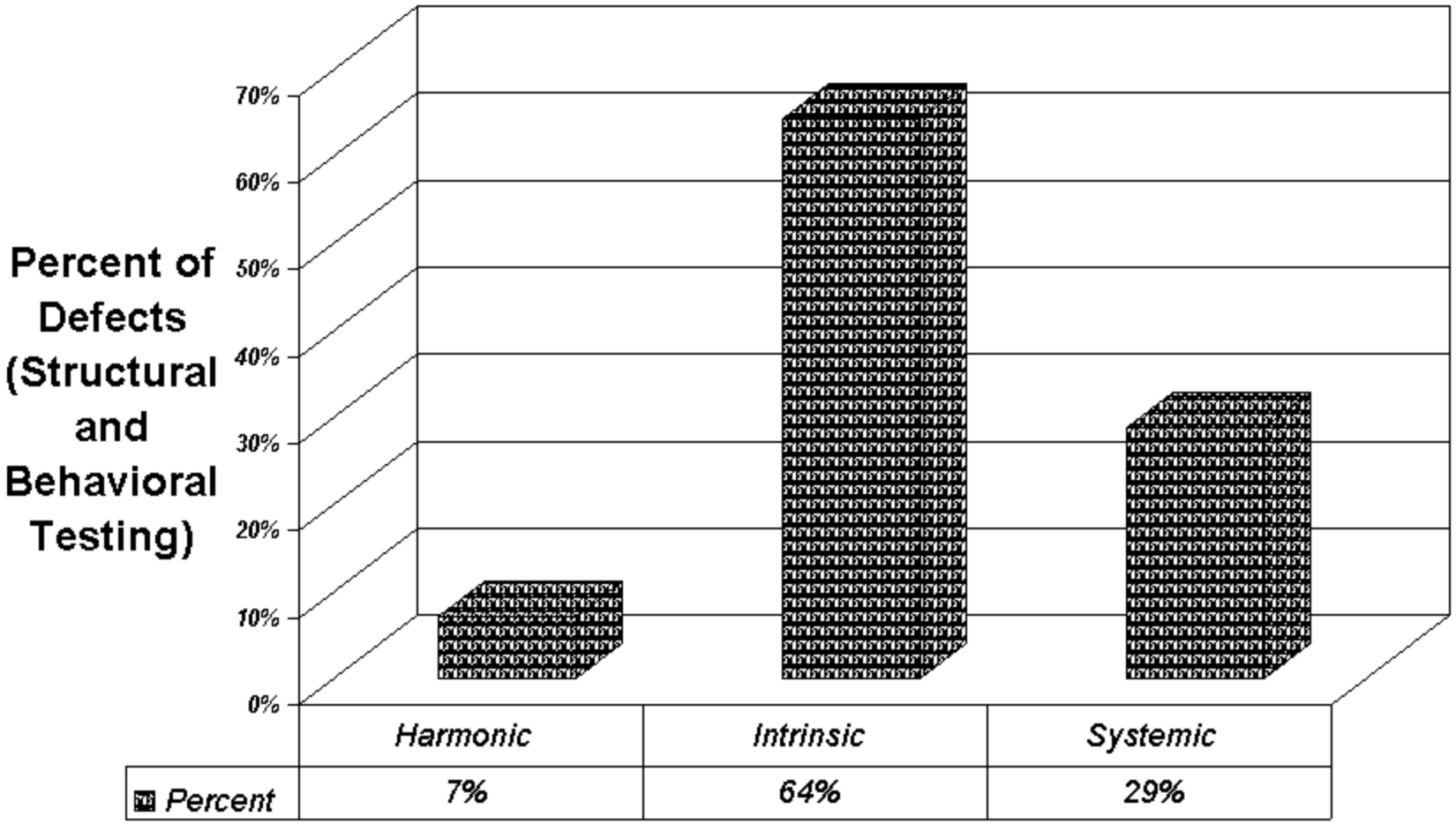
Test Approach

- Manual and automated
- Test team did behavioral testing
- Developers did structural testing
- Bugs: 30% found by testers, 70% by developers

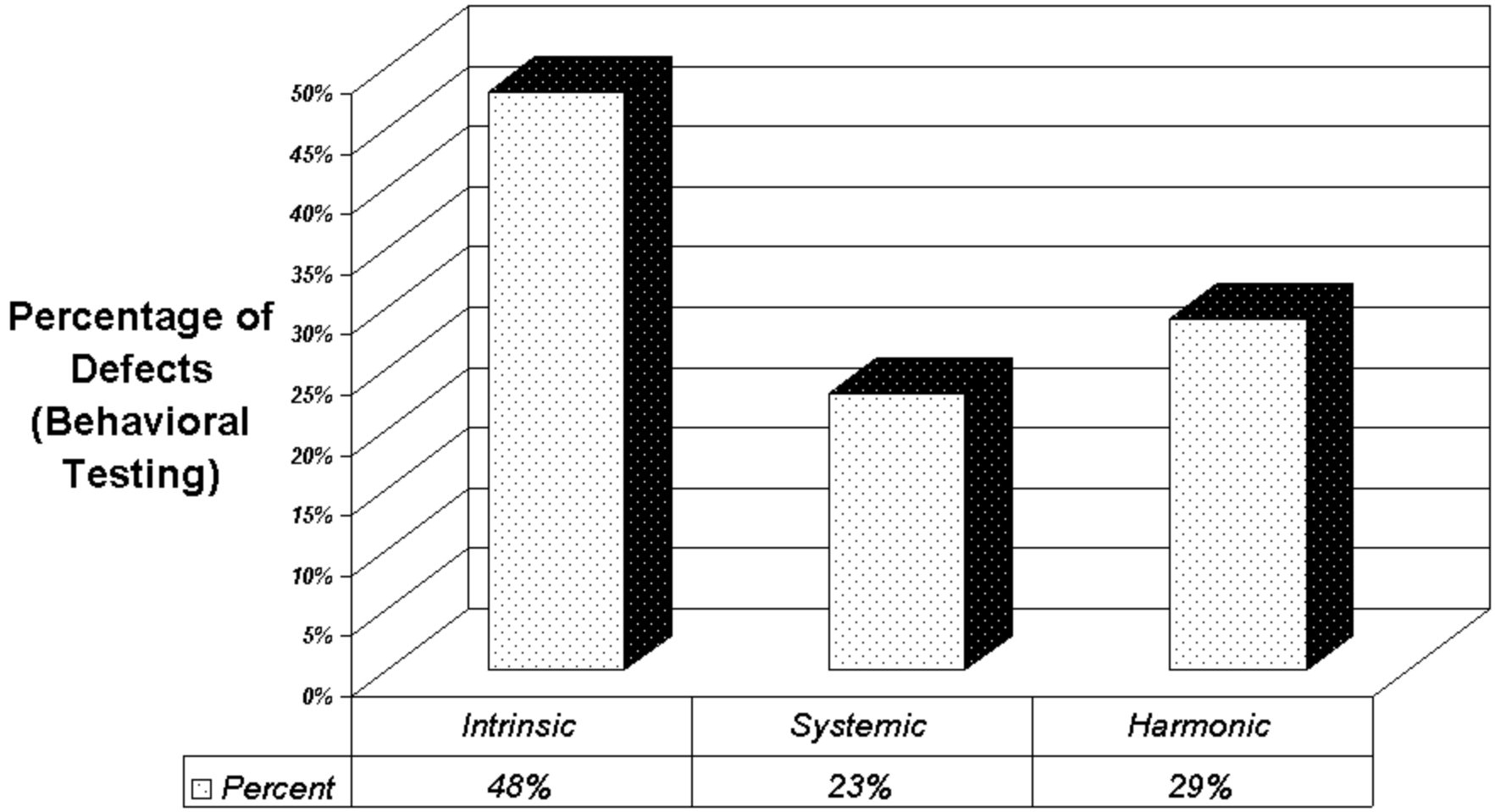
- Test engineers wrote manual and automated tests
- Technicians ran manual tests
- Test toolsmiths developed and ran automated tools
- Usability tester checked human factors and Internet harmonization



Defect Root Cause by Locus of Quality



Behavioral Defect Locus of Quality Affected



Internet Appliance Quality Lessons Learned

- There is such a thing as "enough" memory, CPU, local storage
- There is no such thing as too much bandwidth
- Getting the UI right is hard
- Reliability and stability don't happen by accident
- Server capacity is critical: Test and model carefully
- Localization is strategic and not just a matter of standards and certification
- The Web waits for no one: Pick the right platforms
- E-mail attachment trade-offs are myriad and hard
- Filtering software isn't quite safe--yet
- E-commerce is still flaky

Beyond the Case Study

Are Internet phones the next challenge (79.4MM by 2003)? How will Internet appliances evolve (bandwidth, apps, etc.)?

Conclusions

- Benefits of information appliances
  - Allow easy access to information
  - Extend computer technology to those unwilling to endure typical computer quality problems
- Software quality professionals must understand how the key quality risks differ from traditional PCs, phones, and games (from which they are evolving)
- Testers can use traditional techniques, but must look for these different quality risks
- Harmonization with the Internet, reliability, and ease-of-use are the ultimate goals