Usable Verification for Usable Systems

Lenore Zuck
University of Illinois at Chicago

SPUR (Patterson, CACM 2005)

SPUR (Patterson, CACM 2005)

Focus of computing in 21st century should be on:

SPUR (Patterson, CACM 2005)

Focus of computing in 21st century should be on:

- Ensuring security (against criminals, terrorists, etc.)

SPUR (Patterson, CACM 2005)

Focus of computing in 21st century should be on:

- Ensuring security (against criminals, terrorists, etc.)
- Protecting privacy (against "big brother(s)" effect)

SPUR (Patterson, CACM 2005)

Focus of computing in 21st century should be on:

- Ensuring security (against criminals, terrorists, etc.)
- Protecting privacy (against "big brother(s)" effect)
- Increasing usability (radio)

SPUR (Patterson, CACM 2005)

Focus of computing in 21st century should be on:

- Ensuring security (against criminals, terrorists, etc.)
- Protecting privacy (against "big brother(s)" effect)
- Increasing usability (radio)
- Increasing reliability (telephone)

Towards Social SPURious Systems

Towards Social SPURious Systems

- Large strides towards faster, better, and cheaper systems

Towards Social SPURious Systems

- Large strides towards faster, better, and cheaper systems
- Yet, systems frequently fail

Towards Social SPURious Systems

- Large strides towards faster, better, and cheaper systems
- Yet, systems frequently fail
- We need more interaction between humans (users and professionals) to guarantee Usability, Acceptability, Predictability, Modularity for both developers and users

Towards Social SPURious Systems

- Large strides towards faster, better, and cheaper systems
- Yet, systems frequently fail
- We need more interaction between humans (users and professionals) to guarantee Usability, Acceptability, Predictability, Modularity for both developers and users
- User involvement and complete reqs & specs are the two most important factors for success (Standish Group Chaos report, 1995)

What's Wrong Now?

What's Wrong Now?

- Focus on reliability wrt specification (building the system right)

What's Wrong Now?

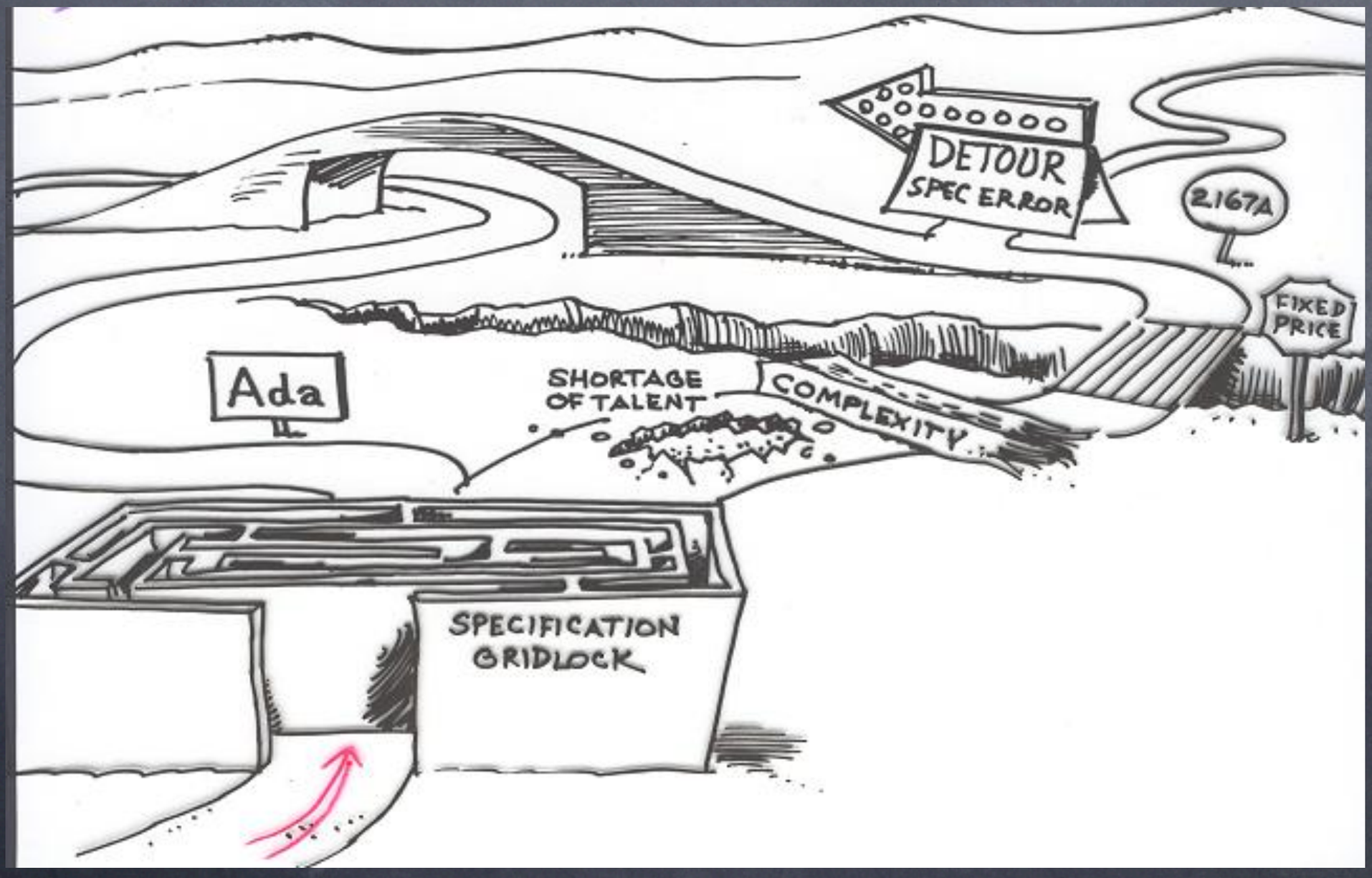
- Focus on reliability wrt specification (building the system right)
- Insufficient focus on acceptability and usability (building the right system)

What's Wrong Now?

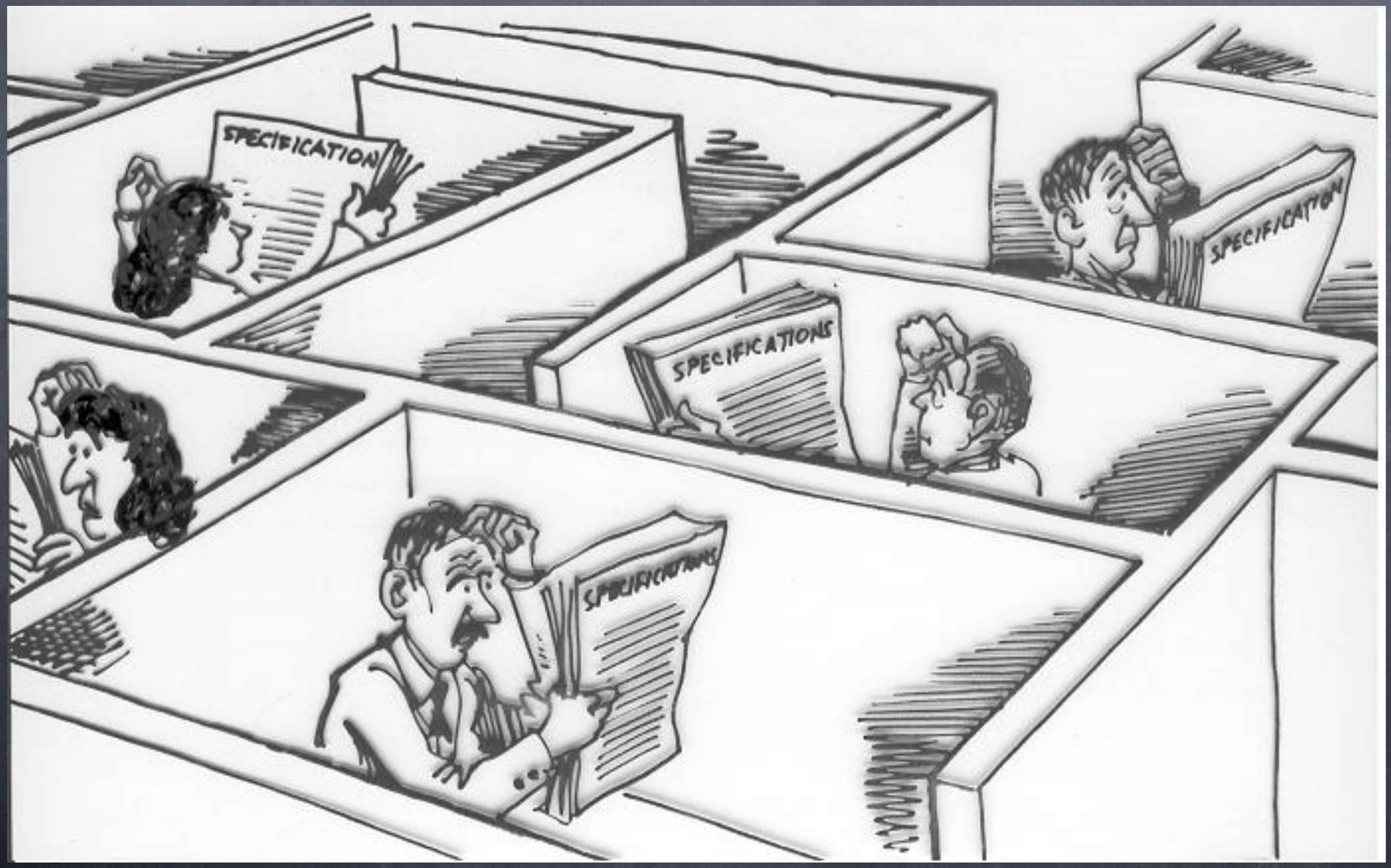
- Focus on reliability wrt specification (building the system right)
- Insufficient focus on acceptability and usability (building the right system)
- Without which a system doesn't serve its purpose!

Speedway to Success

The Actual Development Process



The Specification Gridlock



Specification Gridlock

Taken from Real Spec!!

Section 2.7.6: Security (~ page 10)

"If the system sends a signal hot then send a message to the operator."

Section 9.3.4: Temperatures (~ page 150)

"If the system sends a signal hot and T>60^0, then send a message to the operator."

Summary of critical aspects (~ page 650)

"When the temperature is maximum, the system should display a message on the screen unless no operator is on the site except when T<60^0."

What's Wrong (cont)

What's Wrong (cont)

- Specification capture led by development doesn't necessarily lead to acceptable systems

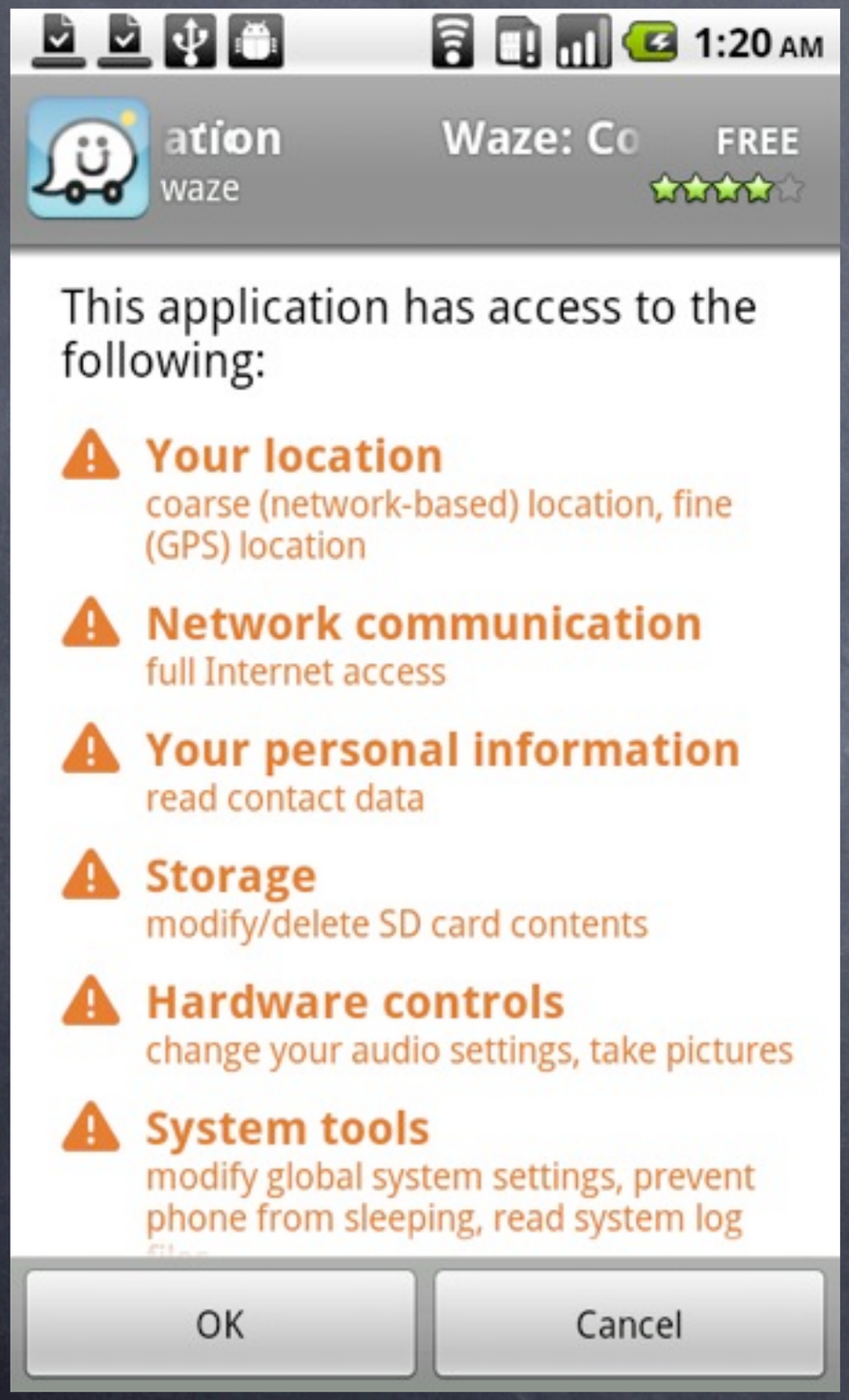
What's Wrong (cont)

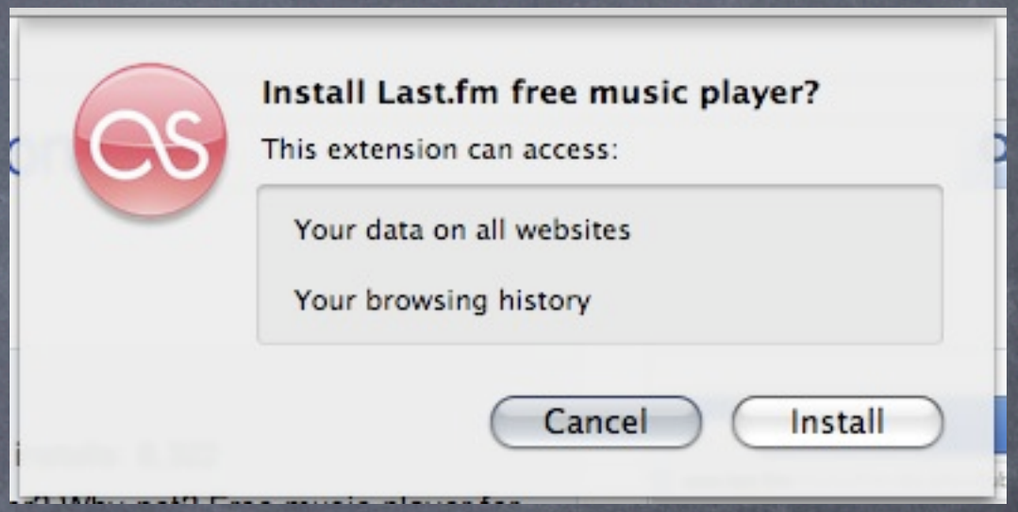
- Specification capture led by development doesn't necessarily lead to acceptable systems
- Insufficient focus on determining that spec indeed covers user's intent

What's Wrong (cont)

- Specification capture led by development doesn't necessarily lead to acceptable systems
- Insufficient focus on determining that spec indeed covers user's intent
- Insufficient focus on whether system is usable

Examples


1:20 AM
ation
Waze: Co
FREE
waze
This application has access to the following:
Your location
coarse (network-based) location, fine (GPS) location
Network communication
full Internet access
Your personal information
read contact data
Storage
modify/delete SD card contents
Hardware controls
change your audio settings, take pictures
System tools
modify global system settings, prevent phone from sleeping, read system log
OK
Cancel


Install Last.fm free music player?
This extension can access:
Your data on all websites
Your browsing history
Cancel
Install

More Examples

I purchased a new version of an antivirus program from [redacted] and was told by them that I first would have to delete the old version first, which I did. Then I paid $39.95 for the new version of "[redacted]" which was a good product. I tried then after opening the software to load it and could not, because it required parts of the old version to be present.

unusable.software.informer.com

Disadvantages

- Contain adware toolbar.
- Freezes occasionally.
- Cannot make copies of other dvds.

Why Does this Happen? (conjectures)

- Users not involved in prototyping and implementation
- Lack of verification for usability
- Impact of architectural decisions and environmental situations are not taken into account
- Users' needs are not sufficiently considered

Can we Remedy this?

- Extreme Programming (too extreme?)
- Rapid prototyping + program transformation (performance?)
- Waterfall (usability?)
- Have user participate in every stage of development
- Develop "mock up" scenarios

Perhaps, we can't (EWD627)

The term "software reliability" does not occur in my active vocabulary... it is in my opinion not a very fruitful notion. I call a tool "reliable" when it is safe to use by virtue of the fact that, when used, it acts as intended...it covers two completely different questions: the formalised question whether a program is correct, i.e whether it meets its specifications, and the unformalised question whether a tool meeting those specifications is in such-and-such unformalised and ill-understood environment a pleasant tool to use. Correctness is a scientific issue, pleasantness is a non-scientific one, and it's therefore confusing to try to deal with both of them in a single sweep. And that is why the term "software reliability" has been banned from my active vocabulary.... As far as the non-scientific issue is concerned, there is little reason to assume that the scientist is much better equipped to contribute than others. As furthermore no scientific fruits are to be expected from dealing with fundamentally non-scientific issues, the scientist is justified in experiencing dealing with the non-scientific issue not only as a neglect of duty, but even as a waste of time.

For Users

- Make software usable, predictable, and reliable
- Make software easier to use
- Bridge gap between formal specs and users' needs
- Verification is only good if it addresses users' needs
- (Make security/privacy part of specs)

For IT Developers

- Bridge gap between programmers and FM community

Design for verification

- Develop reusable, scalable, replaceable, easily updatable software
- Develop better tools for cost estimation

And... Acceptability

- Specification needs be captured and maintained
- Avoid having implementation become its own specification
  - Dependence on undocumented features
  - Which user may be unaware of

Acceptability
(Specefication vs Implementation)

- Guarantee access by implementation only through documented interface
- Continuous (and automatic) update of specification

Specification is a living (currently, undocumented) organism should maintained as such

The Last Slide

- Usable systems require interaction between IT-developers and social needs
- Usable Verification is only useful if applied toward attaining Usable Systems
- To guarantee usability, the user must be involved in all stages of development
- We (may) need tools to specify and measure usability