Building tools from the outside in
(or how to bring UCD to embedded Linux)

Belen Barros Pena

Embedded Linux Conference
San Jose - 23 Apr 2014
15. Usability Evaluation
by Gilbert Cockton. How to cite in your report.

Put simply, usability evaluation assesses the extent to which an interactive system is easy and pleasant to use. Things aren’t this simple at all though, but let’s start by considering the following propositions about usability evaluation:

1. Usability is an inherent measurable property of all interactive digital technologies
2. Human-Computer Interaction researchers and Interaction Design professionals have developed evaluation methods that determine whether or not an interactive system or device is usable.
3. Where a system or device is usable, usability evaluation methods also determine the extent of its usability, through the use of robust, objective and reliable metrics
4. Evaluation methods and metrics are thoroughly documented in the Human-Computer Interaction research and practitioner literature. People wishing to develop expertise in usability measurement and evaluation can read about
BOBING
Welcome to hell
“Like industrial design, the discipline would start from the needs and desires of the people who use a product or service”

Bill Moggridge, Designing Interactions (2007)
Back in 2011 ...

“I saw a demo of Suse Studio when I was in Vancouver (...) It did have a really nice, smooth sort of feel to it and a lot of thought had been put into how the user interface interacted with people.

I was with a couple of other people from the Yocto Project, and we looked at it (...) We dream of having a user interface that looks a bit like that.”
The nail

“Because there are so many permutations and so many ways for things to go wrong it seems like, at any point in time, if I try to config my conf files in Yocto and run a build, I have about 40% or 50% chance of it failing. That has been really the frustration.”
Defensive design

“Even better than good error messages is a careful design which prevents a problem from occurring in the first place (...) eliminate error-prone conditions.”

http://www.nngroup.com/articles/ten-usability-heuristics/
“In my development environment I actually have machines in other rooms that I do most of my builds on, because they are noisy and I don’t want them near me. Sharing some kind of web server that I just connected in from my desktop or my laptop or something, I’d be more than happy with that.”
Yocto community survey results

The vast majority of respondents uses Linux as their main OS. Ubuntu, the most popular distribution, is used by 41% of respondents.

Which operating system do you use to get your job done?
World’s Biggest Data Breaches
Selected losses greater than 30,000 records

- Adobe
- Evernote
- Living Social
- Blizzard
- Massive American business hack

Filter by:
- ORGANISATION
  - all
  - academic
  - energy
  - financial
  - gaming
  - government
  - healthcare
  - media
  - military
  - retail
  - tech
  - telecoms
  - web

- METHOD OF LEAK
  - all
  - accidentally published
  - hacked
  - inside job
  - lost / stolen computer
  - lost / stolen media
  - poor security

Interesting story

Dun & Bradstreet
Central Hudson Gas & Electric
NortonCom & YourWeb

X
17

Yocto Project | The Linux Foundation
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Feature</th>
<th>Grouping</th>
<th>In order to...</th>
<th>As...</th>
<th>I want to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a collaborative error database to parse all crashes and error codes (e.g. bitbog)</td>
<td>Collaborative error database</td>
<td>Community</td>
<td>improve community-sourced error data</td>
<td>Web Hob</td>
<td>create a collaborative error database to parse error logs and codes (see GNOME bugzilla)</td>
</tr>
<tr>
<td>Enable search of recipes</td>
<td>Recipe search (and browse)</td>
<td>Browse &amp; Search</td>
<td>benefit from the Yocto community</td>
<td>a user</td>
<td>use a tool to search and browse recipes</td>
</tr>
<tr>
<td>Enable user to investigate build errors by viewing community-sourced information about them</td>
<td>View community-sourced build error database</td>
<td>Community</td>
<td>benefit from the Yocto community</td>
<td>a user</td>
<td>browse and view a community-sourced build error database</td>
</tr>
<tr>
<td>Phone home with build &amp; error logs into shared location which could be analysed and used as a resource</td>
<td>Send build and error log data to resource database ('phone home')</td>
<td>Community</td>
<td>improve community-sourced error data</td>
<td>a user</td>
<td>have Web Hob phone home with my build and error log data to improve the resource database</td>
</tr>
<tr>
<td>Enable secure sharing of source code and builds within a team (duplicate, may not exist)</td>
<td>Source code and build sharing (within team)</td>
<td>Browse &amp; Search</td>
<td>find and use known good source code and builds</td>
<td>a user</td>
<td>use a tool to share and use shared source code and builds (on a team or global basis)</td>
</tr>
<tr>
<td>Enable sharing of built toolchains</td>
<td>Sharing of built toolchains</td>
<td>Browse &amp; Search</td>
<td>find and use previous known good built toolchains</td>
<td>a user</td>
<td>use a tool to share and use shared built toolchains</td>
</tr>
<tr>
<td>Enable sharing of intermediate build sets</td>
<td>Sharing of intermediate build sets</td>
<td>Browse &amp; Search</td>
<td>find and use previous known good intermediate build sets</td>
<td>a user</td>
<td>use a tool to share and use shared intermediate build sets</td>
</tr>
<tr>
<td>Enough user account support to allow for different permissions/access to different functionality</td>
<td>User account management</td>
<td>User management</td>
<td>control access to different functionality</td>
<td>an administrator</td>
<td>use a tool to set permissions and manage individual user accounts</td>
</tr>
<tr>
<td>Individuals in teams can specify builds locally or on servers (scheduled)</td>
<td>Build management tools (scheduled)</td>
<td>Build management</td>
<td>schedule builds for specific times and machines</td>
<td>a user</td>
<td>use a tool to manage build jobs</td>
</tr>
<tr>
<td>Manage resource usage and availability on shared build servers</td>
<td>Build server management (resource usage and availability)</td>
<td>Build management</td>
<td>manage shared build servers</td>
<td>an administrator</td>
<td>use a tool to manage resource usage and availability on shared build servers</td>
</tr>
<tr>
<td>Reusability of previous builds-- to leverage CPU time as well as allow users to find previous known good builds</td>
<td>Reusability of previous builds</td>
<td>Browse &amp; Search</td>
<td>find and use previous known good builds</td>
<td>a user</td>
<td>be able to search and reuse known good builds</td>
</tr>
<tr>
<td>Support multi-user teams (multi-user accounts, permissions, team tools, etc)</td>
<td>Multi-user team management</td>
<td>User management</td>
<td>support multi-user teams</td>
<td>an administrator</td>
<td>use a tool to manage multi-user/team account and their permissions</td>
</tr>
<tr>
<td>Teams must be able to do work separately on local machines and then submit changes to the team server, to allow for coordinated builds</td>
<td>Team workflow management</td>
<td>Team support</td>
<td>support team workflows</td>
<td>Web Hob</td>
<td>allow individuals in a team to do work separately, then submit them for coordinated builds</td>
</tr>
<tr>
<td>To use web interface to launch build jobs on remote machines</td>
<td>Build management tools (basic)</td>
<td>Networked WH</td>
<td>use remote machines for build jobs</td>
<td>a user</td>
<td>use a tool to launch build jobs on remote machines</td>
</tr>
<tr>
<td>Enable to work offline for demonstration or local work purposes</td>
<td>Has offline mode</td>
<td>Security</td>
<td>use Web Hob offline</td>
<td>a user</td>
<td>be able to use Web Hob in an ‘offline mode’ for use locally or in locations without an internet connection (e.g. demonstrations)</td>
</tr>
<tr>
<td>Allow greater control over individual config options</td>
<td>Advanced configuration tools</td>
<td>Advanced</td>
<td>have more control in Web Hob</td>
<td>a user</td>
<td>be able to use advanced configuration tools from within Web Hob</td>
</tr>
<tr>
<td>Prioritise view of diagnostic and forensic data from colleagues</td>
<td>Set level of comparison of diagnostic and forensic data</td>
<td>Forensics &amp; diagnostics</td>
<td>get more relevant help</td>
<td>a user</td>
<td>be able to specify ‘colleagues only’ or ‘everyone’ (or other levels of inclusion) when searching error database</td>
</tr>
<tr>
<td>Share diagnosis and forensic information (duplicate?)</td>
<td>Share diagnosis and forensic information</td>
<td>Community</td>
<td>help others diagnose and fix errors</td>
<td>a user</td>
<td>share my diagnosis and forensic data with other users</td>
</tr>
<tr>
<td>Requirement</td>
<td>Functionality</td>
<td>Module</td>
<td>User/Effort</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>---------------</td>
<td>--------</td>
<td>-------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Support the migration of projects from a Web Hob instance to local environment</td>
<td>Quick start build tools</td>
<td>Getting started</td>
<td>a user</td>
<td>have quick start build tools ready to use</td>
<td></td>
</tr>
<tr>
<td>Allow ‘normal’ programmers to easily create images</td>
<td>Easy installation process</td>
<td>Getting started</td>
<td>a user</td>
<td>do an easy install of Web Hob and automatic launch when ready</td>
<td></td>
</tr>
<tr>
<td>Enable easy install of Web Hob and automatic launch when ready</td>
<td>Save and restore config settings</td>
<td>n/a</td>
<td>a user</td>
<td>use a tool to save and restore my configuration settings</td>
<td></td>
</tr>
<tr>
<td>Enable the ability to save and restore configuration settings</td>
<td>Find a use known good packages and pre-built packages</td>
<td>n/a</td>
<td>a user</td>
<td>use a tool to share and use shared packages and pre-built packages</td>
<td></td>
</tr>
<tr>
<td>Enable users to select packages or pre-built packages through a GUI</td>
<td>User management</td>
<td>Use Web Hob in the most relevant way</td>
<td>a user</td>
<td>be able to customise Web Hob based on the most relevant usage type (individual, group, enterprise)</td>
<td></td>
</tr>
<tr>
<td>Allow the system to be customisable depending on if an individual, group, enterprise user...</td>
<td>Build error diagnostic tools</td>
<td>Forensics &amp; diagnostics</td>
<td>a user</td>
<td>use diagnostic tools in Web Hob when build errors occur</td>
<td></td>
</tr>
<tr>
<td>Provide diagnostic abilities where build errors occur</td>
<td>Provide specifications for build machines</td>
<td>Getting started</td>
<td>a user</td>
<td>be able to access a specification of build machine requirements</td>
<td></td>
</tr>
<tr>
<td>Provide specification of build machine requirements</td>
<td>Tools for managing host OS and proxy issues (and support with these)</td>
<td>Forensics &amp; diagnostics</td>
<td>a user</td>
<td>use a tool for managing host and proxy issues</td>
<td></td>
</tr>
<tr>
<td>Provide tools which isolate the user from host OS and proxy issues (and support with these)</td>
<td>File viewing/editing tools</td>
<td>Security</td>
<td>a user</td>
<td>be able to change files more quickly</td>
<td></td>
</tr>
<tr>
<td>Allow teams to open and modify files on server quickly</td>
<td>Package search by name/text (e.g. non-browse)</td>
<td>Security</td>
<td>an expert user</td>
<td>be able to find packages by name/text when I know them</td>
<td></td>
</tr>
<tr>
<td>Optimise GUI for expert users to find, edit, etc pacakages by name</td>
<td>Sandbox for test builds</td>
<td>test builds safely or without making extensive local configuration changes</td>
<td>a user</td>
<td>be able to use Web Hob in a sandbox mode</td>
<td></td>
</tr>
<tr>
<td>Provide a sandbox for creating test builds</td>
<td>Sandbox for new users</td>
<td>have lower barriers to learn and try out Web Hob safely</td>
<td>a new user</td>
<td>be able to use Web Hob in a sandbox mode/environment, with priority on my user experience</td>
<td></td>
</tr>
<tr>
<td>Provide a sandbox for new users to try out WH</td>
<td>Sharing of config and setup processes</td>
<td>Community</td>
<td>a new user</td>
<td>use tools to share my configs and setup processes with others</td>
<td></td>
</tr>
<tr>
<td>Enable sharing/duplication of configuration and setup process with others</td>
<td>Provide more support in-application, or through wikis, mailing lists, etc</td>
<td>Community</td>
<td>a user</td>
<td>use tools to share my configs and setup processes with others</td>
<td></td>
</tr>
<tr>
<td>Lower overall volume of support requests by improving community tools</td>
<td>Display graphical visualisations of build contents, metrics, and forensics</td>
<td>Forensics &amp; diagnostics</td>
<td>a user</td>
<td>get, compare, and save graphical visualisations of build contents, metrics and forensics</td>
<td></td>
</tr>
<tr>
<td>Show data and graphical visualisations of build contents, metrics, and forensics</td>
<td>Package browse and selection in a GUI</td>
<td>Browse &amp; Search</td>
<td>a user</td>
<td>graphically browse and select packages in a GUI</td>
<td></td>
</tr>
<tr>
<td>Enable graphical browsing of available packages, by type and compatibility</td>
<td>Networking and firewall management</td>
<td>Security</td>
<td>a user</td>
<td>use a tool to manage firewall issues (without manual config)</td>
<td></td>
</tr>
<tr>
<td>Enable set up on networks with strict firewall rules without manual config customisation</td>
<td>Support for source control</td>
<td>Support for source control</td>
<td>Web Hob</td>
<td>make changes in accordance with source control, without showing unnecessary complexity to the user</td>
<td></td>
</tr>
</tbody>
</table>
builds & metrics
Active Projects

An Arbitrary Project Name

Latest Build:
<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

A Different Project Name

Latest Build:
<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

A Different Project Name

Latest Build:
<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

A Different Project Name

Latest Build:
<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

A Different Project Name

Latest Build:
<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

Recent Builds

<build-architecture> core-image-base, qemux86, 6.4 MB

An Arbitrary Project Name

<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

<build-architecture> core-image-base, qemux86, 6.4 MB

An Arbitrary Project Name

<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images

<build-architecture> core-image-base, qemux86, 6.4 MB

An Arbitrary Project Name

<datetime>, core-image-base, qemux86, 6.4 MB

Download All Images
### Recent activity

<table>
<thead>
<tr>
<th>Recipe/Project</th>
<th>Status</th>
<th>Errors</th>
<th>Warnings</th>
<th>Elapsed time</th>
</tr>
</thead>
<tbody>
<tr>
<td>core-image-sato (FRI2 for Fosdem 2013)</td>
<td>failed</td>
<td>2</td>
<td>12</td>
<td>00:05:11</td>
</tr>
<tr>
<td>$RECIPE_NAME $TASK_NAME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This is the error message provided by BitBake. They might be sort of lengthy, so we might want to fix a limit to the amount of characters we display to keep recent activity compact.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log: path/to/some/log/file.log</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$RECIPE_NAME $TASK_NAME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This is the error message provided by BitBake. They might be sort of lengthy, so we might want to fix a limit to the amount of characters we display to keep recent activity compact.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log: path/to/some/log/file.log</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>core-image-minimal (Web Kiosk)</td>
<td>complete</td>
<td>1</td>
<td>12</td>
<td>01:34:22</td>
</tr>
<tr>
<td>core-image-minimal (FRI2 Fosdem)</td>
<td>complete</td>
<td>1</td>
<td>5</td>
<td>00:45:19</td>
</tr>
<tr>
<td>$BITBAKE_TARGET ($PROJECT_NAME)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### All projects

<table>
<thead>
<tr>
<th>Project name</th>
<th>Last build</th>
<th>Build status</th>
<th>Base image</th>
<th>Target architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Kiosk</td>
<td>27/01/13 at 04:12:45</td>
<td>complete</td>
<td>core-image-web-kiosk</td>
<td>qemux86</td>
</tr>
</tbody>
</table>
builds & metrics
“Personally I don’t like the idea to give so much control, because I think it’s going to be a nightmare for someone supporting users. If you are going to provide this kind of feature I would expect to be able to disable it. Otherwise it’s going to be a nightmare”
builds & metrics
“I wouldn’t use it probably (...) It certainly doesn’t fit in my workflow (...) The package information was kind of interesting (...). Dependencies: ok, well, that’s useful. And if a particular task got an error and you can get this kind of thing really easily that would be nice. I can see that.
class Build_File(models.Model):
    bpackage = models.ForeignKey(Build_Package, related_name='filelist_bpackage')
    path = models.FilePathField(max_length=255, blank=True)
    size = models.IntegerField()

class Target_File(models.Model):
    tpackage = models.ForeignKey(Target_Package, related_name='filelist_tpackage')
    path = models.FilePathField(max_length=255, blank=True)
    size = models.IntegerField()

class Recipe(models.Model):
    name = models.CharField(max_length=100, null=True)
    version = models.CharField(max_length=100, null=True)
    layer_version = models.ForeignKey('Layer_Version', related_name='recipe_layer_version')
    summary = models.CharField(max_length=100, null=True)
    description = models.CharField(max_length=100, null=True)
    section = models.CharField(max_length=100, null=True)
    license = models.CharField(max_length=200, null=True)
    licensing_info = models.TextField(null=True)
    homepage = models.URLField(null=True)
    bugtracker = models.URLField(null=True)
    author = models.CharField(max_length=100, null=True)
    file_path = models.FilePathField(max_length=255)

class Recipe_Dependency(models.Model):
    TYPE_DEPENDS = 0
    TYPE_RDEPENDS = 1

    DEPENDS_TYPE = (  
        (TYPE_DEPENDS, "depends"),
        (TYPE_RDEPENDS, "rdepends"),  
    )
    recipe = models.ForeignKey(Recipe, related_name='r_dependencies_recipe')
    depends_on = models.ForeignKey(Recipe, related_name='r_dependencies_depends')
    dep_type = models.IntegerField(choices=DEPENDS_TYPE)

class Layer(models.Model):
    name = models.CharField(max_length=100)
    local_path = models.FilePathField(max_length=255)
    layer_index_url = models.URLField()
BitBake server

observer UI
DSI

web back-end
Django 1.5

controller UI
Knotty, Hob

data store
SQLite

XML-RPC

REST API
Usability testing

“A process that employs people as testing participants who are representative of the target audience to evaluate the degree to which a product meets specific usability criteria.”

Handbook of Usability Testing 2nd Ed., J. Rubin and D. Chisnell
Ethnography

“Ethnography (...) has always meant the attempt to understand another life world using the self - as much of it as possible - as the instrument of knowing.”

Resistance and the Problem of Ethnographic Refusal, Sherry B. Ortner
About ReD

Who We Are

ReD Associates is an innovation and strategy consultancy. The anthropologists, sociologists, economists, journalists, and designers who make up ReD employ the methods of social science to study human behavior.

Our teams in Copenhagen and New York work together to develop deep insights into the complex behavioral and cultural dynamics that shape how people make decisions. We analyze data, conduct field studies, and consult with clients to help them understand and engage with their customers in new and innovative ways.
Professor Adam Kuper

Adam Kuper is a specialist on the ethnography of Southern Africa, and he has written widely on the history and theory of anthropology.

Selected Publications


Professor Kuper on BBC Radio 4’s 'Thinking Allowed'
Adam Kuper is one of a panel discussing "dirt and why it provokes such fear, loathing and occasionally desire" (broadcast 8 June 2011).
Please stand up everyone
Sit down if you have contributed to Toaster
Sit down if you have submitted a patch for BitBake, OE core or Poky over the past 6 months
Sit down if you don’t like beer
Sit down if you are absolutely terrified by the idea of being listened to
A task

This is the web interface to the Yocto Project build system. It allows you to look at what happened during the process of building something.

You have done two builds. They look quite similar, but there are some differences between them. Could you explain to me what those differences might be?
thank you

https://lists.yoctoproject.org/listinfo/toaster

belen.barros.pena@linux.intel.com
Credits

Slides 3: boring by Strevo under CC BY-SA 2.0
Slide 4: Modified toaster by zack leiws under CC BY-NC 2.0
Slides 5: grubby yet cute toaster by sharyn morrow under CC BY-NC-ND 2.0
Slide 7: AZERBAIJAN 2006 by Loom Studio under CC BY-NC-ND 2.0
Slide 9: Bill Mogridge Presentation by Garret Keogh under CC BY-NC-SA 2.0
Slide 11: Thomas Hammer HQ by Terry Bain under CC BY-NC-ND 2.0
Slide 15: On the Internet... by Alan Levine under CC BY-SA 2.0
Slide 31: LIFT08 054 Genevieve Bell by Stephanie Booth under CC BY-NC-SA 2.0
Slide 32: Jan Chipchase - PopTech 2011 by PopTech under CC BY-SA 2.0