Making the chumby®

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Talk Organization

• Intro to chumby
• Design
• Manufacturing
• Q&A
What is Chumby?

• Chumby is: primarily a service and secondarily a device platform
  – Chumby brings the sophistication of the Internet to simple devices
• Service
  – Widget service that enables mash-up Internet content
  – Content is usable on simple, low-end devices
  – Users can generate and contribute content
• Device platform
  – Low-end hardware reference design, iconified by the chumby device
  – Open source hardware design
What is a Chumby device?

- Open Source reference design:
  - Embedded 350 MHz ARM linux, 802.11g, QVGA touchscreen, stereo audio, microphone, squeeze & tilt/tilt/shake sensors
What is the Chumby Service?

• First you create your channels
How Do you Use a Chumby?

• Then you add content!
• Channels and widgets can also be shared between buddies (“chums”)
How Chumby is Open

• Open software
  – Linux-based OS
  – Open-licensed toolchain
  – Open-licensed support software (bootloader, etc.)

• User-Generated Content
  – Widgets can be uploaded and shared if the user elects to apply an open license
  – Closed licenses are also allowed
How Chumby is Open

• Open Hardware
  – Schematics
  – Gerbers for boards
    • Gerber is an interchange format for PCB CAD tools
  – Bill of materials
  – Flat patterns
  – IGES for plastics
    • IGES is an interchange format for 3-D mechanical CAD tools
How Chumby is Not Open

• Closed-licensed software is used
  – Adobe Flashlite 3.0
Why we Decided to Open Chumby Hardware

• Chumby’s value is in the network it develops around it
  – Developers
  – Users
• Chumby is about adoption
• Adoption requires low cost
  – Hardware is just a barrier to adoption
• Innovation is resource-intensive
• And closing hardware just is not possible
Invite Innovators!

• Being open is being able to never have to say you’re sorry
  – You wish chumby had your favorite feature?
    Build it yourself!
How do we Make Money?

• Ad-sponsored revenue
  – Interstitial ads
    • “Push” widgets targeted to users’ interests
    • Non-offensive: does not play or make sounds, and ideally, entertaining / engaging or exciting in some way
    • Can skip over them
  – Embedded ads
    • Brands embedded in functional widgets
    • E.g., “this game brought to you by Coca-Cola”

• Subscription content

• Service fees
  – Referral
    • Media, product, storefront or other referrals
  – Payment
    • % of purchases made through device
Making the Chumby

- Design concept
- Picking a factory
- Plastics (tooling & pressing)
- Sewing
- PCB assembly
- Final assembly
- Testing
Design Concept

Volume Prototype
Pillow Dimensions

4 cm
13 cm
10 cm

Total volume: 520 cubic cm

11/2008

meyertofter

chumby™
Frame Size B
Frame Size E (Smallest)
Current Chumby Pillow Positioning
Frame Mock-Ups with 3.5in Screen
Fill Materials

- PolyFill (recycled plastic bottles)

- Granulated Cork (size from 1-3mm)

- Injection molding Pellets (recycled or virgin)

- Ball Bearings (plastic or ceramic)
core

WiFi dongle

backup battery

Chumbilical connector

speaker

speaker

Chumbilical connector

daughterboard
Battery access may be hidden under extra fabric.
Finding a Factory
A Toy Factory
Soft mold tooling
Shoe Making
Shoe Making
Final Sewing Vendor
Fast Sewing
Pattern Making
Cut, Glue and Sew
Glue
Sew
Color Picking
Color Picking
Fabric Sourcing
Fabric Sourcing
Fabric Sourcing
Leather Inspection
Plastics

• Exterior CAD design
• Interior fastening design (bosses, braces, etc.)
• Tool design
  – Gates, ejectors, sliders
• Tool cutting
• Tool refinement
• Production
CAD work
Steel Tooling
Steel cutting
Steel cutting

Note: rough cut is refined via Electron Discharge Machining
EDM Finishing
EDM Finishing
Hand Polishing
Hand Polishing
Raw Plastic
Molds
Molding
Molding
Molding
Molding
Molding
Fine Tuning
PCB Manufacture
Chip Shooter
Chip Shooter
Pick and Place
Manual Placement
Bake
End of the Line
Inspect
Untested Boards
Lots of Boards
Tester Development
Tester Development
Tester Training
Phase I Testing
Example Testing
When Things Don’t Work...
EMC Pre-Screen
EMC Testing
EMC Testing
Final Assembly
Jigs
Jigs Everywhere
Final Assembly
Finished Chumbys
Celebration!
Q&A

• Thanks for your attention!