Software Engineering at Columbia

- Two related one semester courses
  - CS3156 Introduction to Software Engineering
    - Required sophomore CS/CE course
  - CS4156 Software Engineering
    - Breadth graduate (mostly masters) course
    - CVN (distance learning) students
    - "honors" undergraduates
- Bottom line: Much success transitioning MBASE to one semester Columbia courses, both measured and anecdotal, but lots of curriculum reform needed
  - Students and TA's made many creative and valuable contributions
    - use of tools, docs, collaboration, resources, etc.
  - Many more customers than can be serviced despite large enrollments! True for S00 semester too.
Challenge

- 2->1 semester compression (12 week hyper-RAD)
- Undergraduates and graduates together
  - Required "gate" for undergrads, elective for grads.
- Same MBASE invariants as USC, different variants
  (more on this later)
- Less "history" of course
  - Only one previous semester
  - Not many established customers
  - Previous courses were radically different
- Large enrollments
  - More TA's (1 per 25 students)

Challenge (cont.)

- Serious lack of resources
  - New NT lab
  - General CS dept. support minimal
- MBASE customizations
  - Some tailoring to Columbia constraints
  - Few people to do it!
- Broader project domains and customers
  - Library
  - CS dept. (very tough!)
  - Other depts. (e.g. Chemistry)
  - Teachers College
  - Barnard Technical
  - Commercial (e.g. WebTV)
  - Hardware+Software system (Butler Q)
CS4156/3156 Team Projects
1. Butler Library Queue Analyzer
2. Meta Search Engine
3. Recruit Tracking
4. Robot Warz
5. E-bay Wizard for WebTV
6. Adobe Acrobat PDF Data Merging
7. Books for Children

CS3156 Team Projects
1. Chemistry Resource Database
2. Barnard Web-Based Registration System
3. Intelligent Indexer’s Aid
4. Disbanded
5. Web-Based Course Evaluation System
6. Acis Equipment Tracking System
7. Chemistry Dept. Web Submission System
8. Photos On The Web
9. New Jobs Awareness
10. Enabling Wide-Area Human Observer Studies
11. Online Resume Database
Project Customers

Repeat:
- CS Department
- Chemistry Department
- Butler Library

New:
- AcIS
- Barnard
- CU Teachers College
- CU Business School
- Web TV
- IntraSolv
- Small Photo Agency

We had many potential projects, but not enough teams!

Schedule Comparison

CU S99

CU F99

USC
Summary of differences: CU vs. USC

- 1 semester
- Some “recycled” projects
- Each team has individual TA “liaison”
- Diverse customer base
- “Street Fair” open-source policy
- Workshops on Fridays and last part of class
- Project+Example based lectures (model driven)
- No COTS, language, etc. mandates
- Less tool use mandates
  - Many tools made available (MS project, COCOMO, WinWin, etc.)
  - Rose98, WWW, Word Templates only mandated tool
- No formal inspections
- Recitations with “practical” topics (web-dev, Perl, DB, etc.)

### Comparison USC/Columbia

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Use of MBASE

- Pretty much according to guidelines
  - Little use of EPG
  - Templates used extensively
  - Course "process" guide retained in guidelines
- Very positive results
  - Excellent quality
  - No significant increase in document size
    - Some indication of decrease
- Many variants used
  - Cost and effort (Brooks, ad-hoc, object points)
  - WinWin (semi-manual methods)
  - ISDM, not RUP

Differences in use of MBASE

- Many refinements
- More flexibility in model choice
  - Estimation
  - Metrics
  - Process model
- Relevance challenge
- Evolutionary use of prototypes
  - Early pre-LCO
  - LCA
- Flexible use of tools (expect Rose)
- Schedule (lectures material, deliverables, etc.) in alignment with S/WE activities breakdown
  - E.g. 10 days for construction
Differences S99 and F99

- Mandated risk management
- Penalties for sloppy work, "fluff", etc.
- Rewards for re-use, giving credit, helping others
- Expanded metrics reporting
- Web project archive
  - pre-set structure, must place on established archive site
- Java is default language
- Commercial customers!!
- No "parallel" projects

Plans from S99 Semester

- 3156 and 4156 together again
- Many new projects
  - some old customers
  - some new customers waiting
- TA's will be from previous class and TA's
- Preparation for use of CHIME in Spring
- Trimming and streamline of deliverables
- More specified and established schedule based on modifications to previous course
- Reduced, more relevant homework's
- Microsoft lab
- new tools (WW Lite, MBASE manager, Brooks,...)
- Tighter lectures, recitations, running case study, selection of examples

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Critique Results F99

- Verbal and slide warnings are not very effective
- Previous project examples both good and bad
- Common pitfalls work, need more explicit application
- MBASE guidelines good, sometimes tedious and redundant, but very helpful overall
- ISDM notes good, need elaboration on design
- Simplifiers/Complicators so so
- WinWin extremely effective, tool support no
  - Negotiations not sustained over entire life-cycle
  - Developer driven, customers passive
- Documentation size understandable, but too much for actual project size, information spread out too much
- Class was one of the most valuable CS experiences (so far)
- Need more architecture, OOAD, project management
- Need to cover MBASE concepts before items due
- Lecture slides not effective, workshops were good
- Brooks MMM book — either loved it or hated it
- ARB’s excellent
- “Real” customers were essential

Jobs for Students

- Many CU students went on to summer internships arranged by instructor!!!
  - Most companies very happy
  - Some companies became customers (WebTV)
- Most students used new skills
- Industry VERY interested in MBASE skills
- Significant increase in interest by local industry and other university departments
Conclusions

• Successful transition of MBASE to another institution with radically different constraints
• MBASE not specific to project domains
• Invariants and variants work
• WinWin is a sound approach, tool use is a variant
• MBASE can be used with “recycled” projects or extending an previous project
• MBASE scales to smaller, hyper-RAD projects (and undergraduates)