An academic experience:
The DOSE course at ETH Zurich
Project: involving other universities

Since 2007:

1. ETH Zurich
2. Hanoi University of Technology (Vietnam)
3. ITMO, Russia
4. IT University of Copenhagen, Denmark
5. KAIST (Korea)
6. Odessa National Polytechnic (Ukraine)
7. Politecnico di Milano (Italy)
8. University of Debrecen (Hungary)
9. University of Delhi (India)
10. University of Nizhny Novgorod (Russia)
11. University of Rio Cuarto (Argentina)
12. University of Zurich
13. Universidad Politécnica de Madrid
14. Wuhan University (China)
Project principles and roles

Emulate industrial setting, but only where it makes sense
- Benefits of a controlled setting
- Goal #1 is to learn

All groups created equal
- We do not want one university to specify & another implement

Clear management structure
- Central management role, currently at ETH
- Technology choices imposed
  - Eiffel (as a language and method)
  - Origo software development platform
    - origo.ethz.ch
  - Web tools
  - Any others that may be necessary
- Universities can contribute, e.g. broadcast own lectures
Organization

Cluster-based, not process-based

- **Team**: a few students (2 or 3) from one university
- **Group**: collection of teams

Each group does the full project

Each team does a part of the project

This is a part of the system (“Cluster”), not a part of the lifecycle
Teams and groups

University A
Team A1
Team A2
Team A3
Team A4

Group 1

University B
Team B1
Team B2
Team B3

Group 2

University C
Team C1
Team C2
Team C3

Group 3

University D
Team D1
Team D2

University E
Team E1
Team E2
Team E3
Team E4
Project presentation (2007)

Attended by students from all universities involved

(through Skype)
Universities:

1. ETH Zurich
2. University of Zurich
3. Odessa National Polytechnic (Ukraine)
4. University of Nizhny Novgorod (Russia)

25 developers - 3 countries - 4 projects

Typical group configurations:

(A) Zurich - (B) Nizhny Novgorod - (C) Zurich
(A) Zurich - (B) Zurich - (C) Odessa
Workflow: 2007

Phases:
- Phase 1: Requirements (4 weeks)
- Phase 2: Interface specification (3 weeks)
- Phase 3: Implementation & Testing (4 weeks)

Project:
- A system to analyze and store email postings of computer science events (conferences, workshops, etc.), to feed the Computer Science Event List (CSEL, http://events.informatics-europe.org)
DOSE 2007 project results

• Delays to set up the projects
• Lack of communication
  • Delay in replying to e-mails
  • Technical problems with Skype conferences
• Misunderstandings in SRS
• Weak API design
  • Incomplete
  • Ambiguous
• Integration partially failed
D.1. The system shall be able to extract the elements of a call for paper from text e-mails.

D.2. The system can send the e-mail only if at least all key elements have been extracted or introduced by the user. The key elements are: (1) conference name, (2) conference dates, (3) abstract and submission deadline, (4) conference category, and (5) URL of the conference.

D.3. The conference category is either "Conference" or "Symposium" or "Workshop" or "Summer School"
Some problems

Case 1 - Submission deadline:
- Team A: day.month.year
- Team B: integers for the day and year but a string (such as "January" or "February") for the month.

Case 2 - Abstract deadline earlier than submission deadline:
- Team A: Not checked
- Team B: Checked - Exceptions were triggered
More problems

Case 3 - Conference Category:

- Team A: "Conference" or "Symposium" or "Workshop" or "Summer School"
- Team B: "Conference" xor "Symposium" xor "Workshop" xor "Summer School"
Solution: class specification

class EVENT feature
  submit_to_csel
    -- Submit the conference information by sending an e-mail.
    require
    valid_deadlines: abstract_deadline.earlier_than (paper_deadline)
    do ... end
feature -- Implementation
  name: STRING
  abstract_deadline, paper_deadline: DATE
  category: CATEGORY
invariant
  category_status: category.is_conference xor
  category.is_symposium xor
  category.is_workshop xor
  category.is_summer_school
end
class CATEGORY feature -- Status report
  is_conference: BOOLEAN
    -- Does this category represent conferences?
    do end
  is_symposium: BOOLEAN
    -- Does this category represent symposiums?
    do end
  is_workshop: BOOLEAN
    -- Does this category represent workshops?
    do end
  is_summer_school: BOOLEAN
    -- Does this category represent summer schools?
    do end
end
Main lesson from first session

APIs are critical

Techniques of abstraction & contracts
More problems

Students started assignments too late
Assignments were finished close to the deadline, leaving no time to solve integration problems.

2008 solution:
- Each phase implemented in two cycles
- Students submitted an assignment every second week

Some students dropped out

2008 solution: outside of ETH, choose volunteers; strong pressure on students to commit (or leave early).

Some project could not integrate

2008 solution: force use of contracts
Difficulties (e-mails)

Some members of our team suffer from weak-English.

Aleksey couldn't read any emails last week because his Internet cable had been stolen by a drunk bear.

Team A has implemented the system in Java, and we have implemented in Eiffel; now, we cannot integrate it, any hints?

I'm sorry I could not make it to the implementation meeting yesterday. A water pipe in my apartment burst ... After some frantic hours of fixing and cleaning up, it is now more or less OK.
... it seems that this team is total absent and reject communication (probably because of a limit in their English)....

Team A complains of a lack of collaboration with its teammates (Team B and C). Also, we received a message concerning the unwillingness of Team B of using X ...

...please fill in the details of your functional requirement...
The last DOSE Courses

1. ETH Zurich
2. University of Zurich
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4. University of Nizhny Novgorod (Russia)
5. Politecnico di Milano (Italy)
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2007
2008
2009
2010
The last DOSE Courses

DOSE 2007
• 25 developers - 3 countries - 4 projects

DOSE 2008
• 42 developers - 5 countries - 21 teams - 7 projects

DOSE 2009:
• 50 developers - 6 countries - 16 teams - 1 project

DOSE 2010:
• 103 developers - 10 countries - 30 teams - 1 project

DOSE 2011:
• 101 developers - 10 countries - 31 teams - 1 project
Workflow

2 weeks

Envisioning

3 weeks

Requirements Elicitation

Scope document

Software requirements specification

2 weeks

Interface Specification

Software requirements Specification + API specified

6 weeks

Development
Groups’ presentation

**Shenji Schäppi**
Computer Science MSc Student at ETH Zurich
- Eiffel Exp.: good
- SRS Exp.: good
- Work Exp: Internship at Accenture India (Bangalore)
- O-O languages: Good Knowledge of Java, basic knowledge of C#, C++, C
- Languages spoken: English, German, French

**Minh Le Do**
Computer Science BSc Student at HUT
- Eiffel Exp.: none
- SRS Exp: basic
- Work Exp: Internship at LINC - HUT (Hanoi, Vietnam)
- Biggest project: 1'000 lines of code
- O-O languages: Basic Knowledge of Java, basic knowledge of C#
- Languages spoken: English, Vietnamese, German

**Conrado Plano**
Computer Science MSc Student at ETH Zurich
- Eiffel Exp.: good
- SRS Exp.: good
- Work Exp: Assistant for lecture Introduction to Programming, Internship at Accenture India (Bangalore) and Lotus Notes Consultant at ATEGRA AG
- O-O languages: Good Knowledge of Java, basic knowledge of C#
- Languages spoken: Spanish, English, German, Italian

**Duc Hoang Bui**
Computer Science MSc Student at HUT
- Eiffel Exp.: basic
- SRS Exp: good
- Work Exp: Internship at ATNAVN (Hanoi)
- Biggest project: 12'000 lines of code(a web application on Struts2)
- O-O languages: Good Knowledge of Java, basic knowledge of C#
- Languages spoken: English, Vietnamese, French
Application Architecture (DOSE 2009)
One game: two teams in two locations

Example: Logic of a Russian game is implemented in by a Russian team; GUI is done by an Italian team.
## Organization

<table>
<thead>
<tr>
<th>Project Leader</th>
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<tr>
<td>Zurich</td>
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<td>Debrecen</td>
<td>Hanoi</td>
<td>Odessa</td>
<td>N. Novgorod</td>
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<td>Group Leader Belot</td>
<td>Group Leader Briscola Chia.</td>
<td>Group Leader Rikiki</td>
<td>Group Leader Tien Len</td>
<td>Group Leader Bura</td>
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<td>Group Leader Tschau Sepp</td>
<td>Group Leader Scala 40</td>
<td>Group Leader Scala 40 (a)</td>
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<td>Group Leader Makao</td>
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The last DOSE Courses: Results

DOSE 2007
  • 4 projects failed

DOSE 2008
  • 4 projects fully implemented and integrated
  • 3 projects failed

DOSE 2009:
  • 8 projects fully implemented and integrated

DOSE 2010:
  • 11 projects fully implemented and integrated

DOSE 2011:
  • In progress
The last DOSE Courses: Results

2007

2008

2009

2010
Challenges at DOSE

Project management is difficult

API Design

Communication through phone/skype and video conference is difficult
  - Heavy accents
  - Noise in communication
Problems at DOSE

...Why is Mitko getting errors while it compiles for me. I think that Mitko might be using an older EiffelStudio...

..There are compilation errors in the code of the teams BriscolaChiamata, Bura, Scala 40, and TschauSepp...

Someone added a cluster but did not update the current project file which produced a broken build

...The GUI works fine in Windows, but it does not work in Linux...
More DOSE problems

There is clear progress in the teams Scala 40 and TschauSepp. But, what is the status of the teams BriscolaChiamata and Bura?

The Vietnamese team promised a new GUI by last Monday, but they have not committed jet; what should we do?
Technical problems

Requirements:

- Weak description of functionalities of each component
- Requirements for UI: only high level description, any UI for any game could satisfy the SRS
- Requirements for Logic: the rules of the games are not described
- Requirements for Net: the communication protocol is not specified
- Lack of deep review
Technical problems

API:

• A very small set of functionalities are in the API; main functionalities are missing
• Weak contracts
• Wrong signature for the features
• It is still unclear how implements what

Implementation

• Integration of the components in the last week (instead of integrating them from the first day)
• One team implements most of the project: limited results
• Bad SRS -> delays in implementation
Lessons

Setting up the project is very important: provide templates for documents, basic implementation project, etc.

Contracts helps to document and understand the interfaces.

Critical part of the project should not be outsourced: keep control of what could fail the project.

Communication is the core issue.

Infrastructure (network, tools...) is critical.
DOSE course lessons for the industry:

Challenges and Practical Advice for Distributed and Outsourced Software Engineering
Challenges of DOSE

Project Management

Cultural Differences

Time zones

Communication and Language skills
Challenges: project management

Project management is difficult

In a traditional one-site setting, the manager can just go to a developer’s office and ask to see the current state.

It is difficult for the project manager to form a good picture of the project’s progress.

Configuration management plays an important role.
Practical advice for project management

Provide templates

Monitor the tasks constantly

Maintain regular communication
   For example, one hour weekly meetings

Remind the team about deadlines and double check with the developers if the deadline is still realistic
Practical advice for project management

Require the developers to show a proof of progress (for example by showing a demo, asking deep questions about the implementation, monitoring the code, etc).

Define commit rules
- Code must compile before commit
- Test must run before commit
- Code must review before commit

Apply code reviews:
- Review-to-commit
- Commit-then-review
Challenges: cultural differences

Working in the same culture
  Common knowledge

Different cultures
  Different cultural backgrounds
  Different national holydays
  Different interpretations
Cultural differences: train in India
Cultural differences: traffic in Hanoi
Cultural differences: Cambodia
Illustrative Examples (these examples are only illustrative examples)

CULTURAL DIFFERENCES
Indian Culture

For example, for Indians:

“yes” means “yes, I have heard you”
“done” means “I will start to do it tomorrow”

Negative feedback is giving by
not responding
Trying not to answer
Suggesting alternatives

[Examples from: Working with India – Wolfgang Messner]
Yes, No: India

http://www.youtube.com/watch?v=3hCV2oO2akw
Company C in Germany sends a feedback form to Company D in India

After 5 days: C contacts D asking about the feedback

Company D: feedback form? When?

[Examples from: Working with India – Wolfgang Messner]
Be aware of the cultural differences and learn about the counterpart’s cultures

Indicate the country holidays in a common calendar

Take into account the country holidays when defining a deadline
Practical advice: time zones

Keep meetings on schedule

Keep in mind the Daylight Saving Time

Do not wait to send an e-mail (even if it is late or early in the other time zones)
Challenges: communication and language skills

E-mail is not enough – need for voice communication

Communication through phone/skype and video conference is difficult

Heavy accents

Different English mistakes to the ones one is used to

Tools are important
More practical advice

Use several forms of communications: e-mail, voice conferences, wikis, docs

Create mailing lists

Send the important information in writing

Write minutes of the meetings recording decisions taken, and action items (todos)
Lessons

The world has gone global, so has the software world
Many issues remain, failure always possible
Lessons

Solutions exist, improving all the time
Lessons

Many software engineering lessons apply, made even more relevant by distributed development
Lessons

Communication is the core issue:

• Between people

• Between modules: crucial role of APIs and contracts
Lessons

Infrastructure is critical
Lessons

Technology changes our mode of working
The written word remains essential
Lessons

We can’t do this without O-O and contracts
Lessons

Universities should teach this