



# Introducing Global Supply Chains into Software Engineering Education

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## Outline

- IT Offshore Outsourcing
- IT Offshore Outsourcing and Global Supply Chain Management
- Our Response: Introducing Global Supply Chain into Software Engineering Education
  - Setup
  - Some Findings
- Conclusion and Future Work

# IT Offshore Outsourcing



## Responding to IT Offshore Outsourcing

- Provide real-life Offshore Outsourcing software development experiences
- Understand the skills students require to be productive in Offshore Outsourcing software development
  - What technical and “softer” skills will students need to develop to work and communicate as productive members of a multi-cultural software development team?
  - What roles will students play in a global market place?
- Expose students to the realities of global supply chain management
  - How to divide up a project into component parts for different parties to work on across time zones and cultures?
- Issues for our study



## Project Planning and Preparation

- One faculty as coordinator/project manager
- Extended responsibilities of coordinator
- Responsibilities of the other faculty
- Data Gathering
  - Blogs, surveys, online questionnaires

## Setup: Projects

- Project 1: ITC Library Management System
  - Support administrators, librarians and patrons
  - Enforce the unique policies of the ITC library
- Project 2: Cambodian Crafts On-Line Store
  - Manage the registration of customers, the placement of orders, and the fulfilment and control tasks of service staff
- Project 3: Cambodian On-line Restaurant
  - Manage the registration of customers, the placement of orders, and the fulfilment and control tasks of service staff

## Setup: Tools and Technology

- Eclipse
- CVS
- Yahoo groups & IM & chats
- Blogger
- Trac
- Java Technology – Java, JSP, Sevlets, Joint, Java Beans
- RDBMS - MySQL & Oracle
- Apache/Tomcat



## Setup: Project Milestones

- Team bonding and initialization of communications (1 week)
- Requirements (5 weeks)
- Design (4 weeks)
- Mid-semester presentations
- Coding (3 weeks)
- Testing (1 weeks)
- Presentations (Last week of class)

## Setup: Roles & Responsibilities

- Cambodian students – Clients, testers and translators
  - Describe environment/problem/software
  - Review and give feedback on requirements, design and testing documents
  - Test the software and submit bug reports
  - Translate the software in French and Khmer
  - Report on the Pace team
  - Accept or reject the software
  - Compare the software developed in the US and in India
  - Present their experience
  - Demonstrate the software



## Setup: Roles & Responsibilities

- US students – Developers and lead contractors
  - “Capture” the requirements,
  - Propose design options
  - Handle requirements changes and integrate feedback
  - Implement and test the software
  - Deliver software for their client
  - Report on the ITC/Delhi University team
  - Answer a weekly questionnaire
  - Maintain a web page for the project, maintain a blog, save all chats, archive emails
  - Describe and reflect on the software engineering process and communication protocol followed
  - Present their work professionally
  - Demonstrate their software



## Setup: Roles & Responsibilities

- Indian students – Third-party suppliers
  - Provide US students with a database design and SQL code to be integrated into the overall system design
  - Report on the US team
- Indian students also developed the whole software product in parallel with the software that was developed by the US students
- Present and demonstrate their software



## How to Monitor Students' Work?

- Strict deadlines
- Entry survey to understand students' background
- Regular deliveries (with review/feedback and iteration)
- Weekly recording of communications of local and extended teams using an online questionnaire (done by the US students only)
- Maintain blogs, archive emails, save chats
- Interviews of the students by an external evaluator
- Reflections on the overall experience
- Post project survey focusing on what students learned from each other, the issues encountered and the perceived usefulness and effectiveness of the experience

## Findings: Requirements Engineering

- Requirements engineering process
  - Need of careful elicitation and negotiation
  - Role of requirements validation to check understanding
- Requirements changes
  - Aligned awareness on actions and responsiveness to avoid tensions
- Requirements assumptions
  - Differentiation between facts, constraints and assumptions
  - Direct contact between client and developer is crucial to control requirements assumptions

## Findings: Communication and Coordination

- Coordination was perceived as the largest problem by Indian and Cambodia students
  - Time zones, class load, Internet access problems
- Communication was perceived as the largest problem by the US students
  - Cultural and language differences
  - Response time of Cambodian and Indian students
- Crucial factors for the success of a global software development project
  - For Cambodia & US students– Good communications
  - For Indian students – Good communications and clear project plans
  - Collaborative tools were considered important by US

## Findings: Social and Cultural Aspects

- Relations
  - Different interactions between US/India and US/Cambodia due probably to their respective roles in the project
  - More social interactions between US and Cambodia
- Multicultural experience
- Learning from each other
  - Seriousness/motivation of other students
- Team unity and cohesion
  - Exchange of gifts
  - Perception of 'the team'
    - Cambodia/US - Global team
    - US/India – Global team



## Findings: Interaction and Quality

- No statistical correlation found between the quality of the interaction and the quality of the final product
  - The project with the most synchronous communication had the most problems
- Cambodian students were more positive about the US software than the Indian software
  - Less assumptions
  - Friendly contacts between Cambodia/US
  - Indian software were more technically advanced, reliable in operation and professional-looking products

## Findings: Realities

- Availability of clients/developers
  - Assumptions made by developers
  - Accountable for multiple perspectives
- Very Demanding client
  - Changes in requirements
  - Addition of functional requirements
- Discussion on requirements, little on testing and quality
- Coordination (time, semester/trimester, vacations)
- Language/cultural barrier

## Conclusion and Future Work

- Conclusion: Need to reflect realities of changing professional practice in SE education
- URL: <http://www.csis.pace.edu/~scharff/CS3892007>
- In spring 2007:
  - More social bonding activities
  - All sets of students will experience and learn about the problems and skills associated with the developer side of the IT Offshore Outsourcing equation
  - Use of more sophisticated collaborative tools
  - Dedicated resource to help students learn and develop as a team

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