The Thai Cost and Process Models

Pongtip Aroonvatanaporn
Monvorath Phongphaibul
Agenda

- Motivation
- Model Calibration
- Thai COCOMO
- Model Usage
- Conclusion
Agenda

• Motivation
  – Problems
  – Goals

• Model Calibration

• Thai COCOMO

• Model Usage

• Conclusion
Motivation

• Initiated by the National Anti-Corruption Commission of Thailand
  – Reduce corruption
  – Make project costs explicit
  – Create a fair business between government and private sectors

• Project in conjunction with Ministry of Information and Communications Technology
  – Looking for a costing process and model

• Sources and reasoning behind costs
Problems

• Software is abstract
  – Multiple factors affecting effort and costs

• Lack of estimation expertise within government agencies
  – Rely heavily on proposal of private sectors

• Lack of standards
  – Cost model
  – Costing process
Goals

• Government Sector
  – A standardized way for cost estimation
  – Budgeting
  – Sources and reasoning for software project costs

• Private Sector
  – A standard way for estimating project proposals
  – Improved project and risk management

• Industry
  – Promote Thai software industry
  – Competitive edge
Agenda

• Motivation

• Model Calibration
  – Problems
  – Methodology

• Thai COCOMO

• Model Usage

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Calibration Problems

• Lack of documentation
  – Not enough detail
  – May not reflect actual system

• Unusable project data
  – Incomplete project data
  – Critical data not logged properly (i.e. effort, costs, complexity, etc.)
  – Unusable for model calibration
The Calibration Plan

• **1st stage**
  – Focused on refining impact factors

• **2nd stage (current stage)**
  – Pilot with selected government agencies
  – Collect preliminary data

• **3rd stage**
  – Roll out
  – Model validation
1st stage

• **Focus:** Refine cost factors

• **Gather project data for calibration**
  – Attempted to gather usable data
  – Analyzed available data

• **Expert judgment**
  – Surveyed experts and developers
    • Round 1: distributed 17 surveys, 9 surveys returned, 7 valid surveys
    • Round 2: distributed 500 surveys, about 200 surveys returned, less than 100 valid surveys
  – Focus groups of about 20 experts
  – Focused on critical factors
2nd Stage (Current)

- **Focus:** Collect data

- **Pilot with selected government agencies**
  - Active in IT development
  - Sufficient IT knowledge

- **Collect data from these government agencies with the ICT Cost Estimation system**
  - Performing the calibration using the pilot projects

- **Validate the model with experts**
3rd Stage

• **Focus:** Roll out to broader government agencies

• **Continue data collection**
  – With ICT Cost Estimation system

• **Potentially making the system to adjust the model automatically**
  – Collect estimation and actual data
  – Automatic + expert calibration

• **Model validation with real projects**
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  – The Model
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Model Adjustments

• Adjustments to the number of parameters
  – Scale Factors: 5 -> 3
  – Cost Drivers: 17 -> 7

• Add one additional cost driver
  – Explicitly define “Security”
  – Experimenting on impact of security factor

• Combined personnel capabilities and experiences parameters
  – Thai roles can be ambiguous and vaguely defined

• Redefined 1 scale factor
Thai COCOMO

- Post-architecture estimation model
- Takes
  - Size
  - Ratings for each parameter
- Estimates effort/resources required to complete project

**Cost Drivers**

**Product**
- Reliability
- Database Size
- Product Complexity
- Developed for Reusability
- Documentation Match to Life-Cycle Needs

**Platform**
- Execution Time Constraint
- Main Storage Constraint
- Platform Volatility

**Scale Factors**
- Precedentededness
- Development Flexibility
- Architecture / Risk Resolution
- Team Cohesion
- Process Maturity

**Personnel**
- Analyst Capability
- Programmer Capability
- Personnel Continuity
- Applications Experience
- Platform Experience
- Language and Tool Experience

**Project**
- Use of Software Tools
- Multisite Development
- Required Development Schedule

**Very Low** | **Low** | **Nominal** | **High** | **Very High** | **Extra High**
---|---|---|---|---|
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**Thai Cost and Process Models**

4/14/15
Model Testing

• Tested with 3 sample projects
  – Large, > 10 Million THB
  – Medium, 1-5 Million THB
  – Small, < 1 Million THB

• Based on completed projects
  – Requirement objectives
  – System design and prototypes
  – User survey

• Results were inconclusive
  – Compared to budget, not actual costs (unavailable)

• Using pilot testing instead
## Test Results

<table>
<thead>
<tr>
<th>Budget</th>
<th>Estimated</th>
<th>% Acc</th>
<th>Rationale (Lesson learned)</th>
</tr>
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</table>
| Small < 1 million THB | 792 K | 731 K | 92% | • Requirements were very detailed  
• Sizing with function point was realistic  
• Costs mainly related to development of software system |
| Medium 1 – 5 Million THB | 4.73 M | 7.56 M | -60% | • 2\textsuperscript{nd} phase of the project  
• Considered as software modifications  
• Actually reimplementation of entire project |
| Large > 10 Million THB | 14.25 M | 28.96 M | -200% | • Required effort was small  
• Project consists of 22 consultants/experts. Majority of costs.  
• No specific project personnel in requirements. |
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• Model Usage
  – ICT Standard Cost Estimation
  – Software Intellectual Property Valuation

• Conclusion
ICT Cost Estimation Project

• By the Ministry of Information and Communications Technology (MICT)

• Two parts
  – Costing process and guidelines
  – Cost estimation system

• System for estimating software project costs
  – Hardware/software costs
  – Development effort
  – Personnel costs
  – Other costs

• Used by all government agencies
  – A standardized way to estimate cost
  – Cost tracking and control
COCOMO Framework

Templates and Guidelines

1. Conceptual Design
2. Requirements Gathering
3. System Design

COCOMO Inputs
- Functional requirements
- Non-functional requirements
- High-level component design
- Personnel capabilities and experience
- Scale factors and cost drivers analysis

COCOMO Model
4.1 Manual Estimation
4.2 Automated Estimation
5. Effort
6. Project Estimation

Thai Cost and Process Models
Costing Process

• Requirement gathering and preliminary designs
  – Templates and guidelines
  – Required information for estimating costs

• Sizing
  – Function point
  – A standard way to determine complexity and relative sizes
  – Forces details of requirements

• Costing
  – Use COCOMO for development effort
  – Convert into monetary by estimating personnel
Intellectual Property Valuation Project

• By the Software Industry Promotion Agency (SIPA)

• Two parts
  – Develop methodology for evaluating value of software intellectual property
  – Develop a system for executing the methodology

• Potential collaboration with Korea Technology Finance Corporation (KOTEC)
Valuation Model

• **Risk-based analysis**
  – 34 risks indicators in 4 dimensions
    • Management
    • Technology prospects
    • Market feasibility
    • Business and profit prospects
  – Requires expert analysis and judgment

• **Costing**
  – Estimated costs of production during proposal or developmental stage
  – Reverse engineering costs with COCOMO when released to the market but cost information is unavailable
  – Actual costs when there are costs accounting recorded

• **Discount cash flow**
  – For value estimation and prediction
  – Risk analysis used to determine discount factor
Publications

• Book
  – Guidelines and concepts for software intellectual property valuation

• Technical Report
  – Aroonvatanaporn, P. and Phongphaibul, M. “Reverse Engineering Software Costs with COCOMO II to Support Software Valuation”
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Conclusion

• Developed a standard costing process and framework
  – Model adjustment is still in progress
  – Evolving model

• Model being used/tested with pilot projects

• Model implemented in two systems
  – ICT Standard Cost Estimation System
  – IP Valuation System for Software
Lessons Learned

• People tend to find ways around costs
• COCOMO is suited for development effort
  – Project costs must be explicitly software development
  – Clearly specify development team personnel
  – Don’t go overboard with consultants
• People need to be educated about requirements
  – Correctly stating requirements
  – Details are important
Thank You