



# The Thai Cost and Process Models

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# Agenda

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



# Agenda



- **Motivation**
  - Problems
  - Goals
- Model Calibration
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- **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**

- **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
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  - Problems
  - Methodology
- Thai COCOMO
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- **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
- **3<sup>rd</sup> stage**
  - Roll out
  - Model validation



- **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



# 2<sup>nd</sup> 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**



# 3<sup>rd</sup> 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**



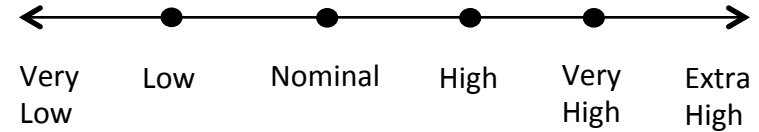
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  - The Model
  - Model Testing
- Model Usage
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- **Adjustments to the number of parameters**
  - Scale Factors: 5 -> 3
  - Cost Drivers: 17 -> 7
- **Add one additional cost driver**
  - Explicitly 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**

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



### Scale Factors

- Precedentedness PREC
- Development Flexibility FLEX
- Architecture / Risk Resolution RESL
- Team Cohesion TEAM
- Process Maturity PMAT

### Cost Drivers

#### **Product**

- Reliability RELY
- ~~Database Size~~ ~~DATA~~
- Product Complexity CPLX
- Developed for Reusability RUSE
- Documentation Match to Life-Cycle Needs DOCU

#### **Platform**

- Execution Time Constraint TIME
- Main Storage Constraint STOR
- Platform Volatility PVOL

#### **Personnel**

- Analyst Capability ACAP
- ~~Team Capability~~ ~~TCAP~~
- Programmer Capability PCAP
- Personnel Continuity PCON
- Applications Experience APEX
- ~~Platform Experience~~ ~~PEEX~~
- Language and Tool Experience LTEX

#### **Project**

- Use of Software Tools TOOL
- Multisite Development SITE
- Required Development Schedule SCED



# 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



	Cost (THB)		% Acc	Rationale (Lesson learned)
	Budget	Estimated		
Small < 1 million THB	792 K	731 K	92%	<ul style="list-style-type: none"> <li>Requirements were very detailed</li> <li>Sizing with function point was realistic</li> <li>Costs mainly related to development of software system</li> </ul>
Medium 1 – 5 Million THB	4.73 M	7.56 M	-60%	<ul style="list-style-type: none"> <li>2<sup>nd</sup> phase of the project</li> <li>Considered as software modifications</li> <li>Actually reimplementing of entire project</li> </ul>
Large > 10 Million THB	14.25 M	28.96 M	-200%	<ul style="list-style-type: none"> <li>Required effort was small</li> <li>Project consists of 22 consultants/experts. Majority of costs.</li> <li>No specific project personnel in requirements.</li> </ul>



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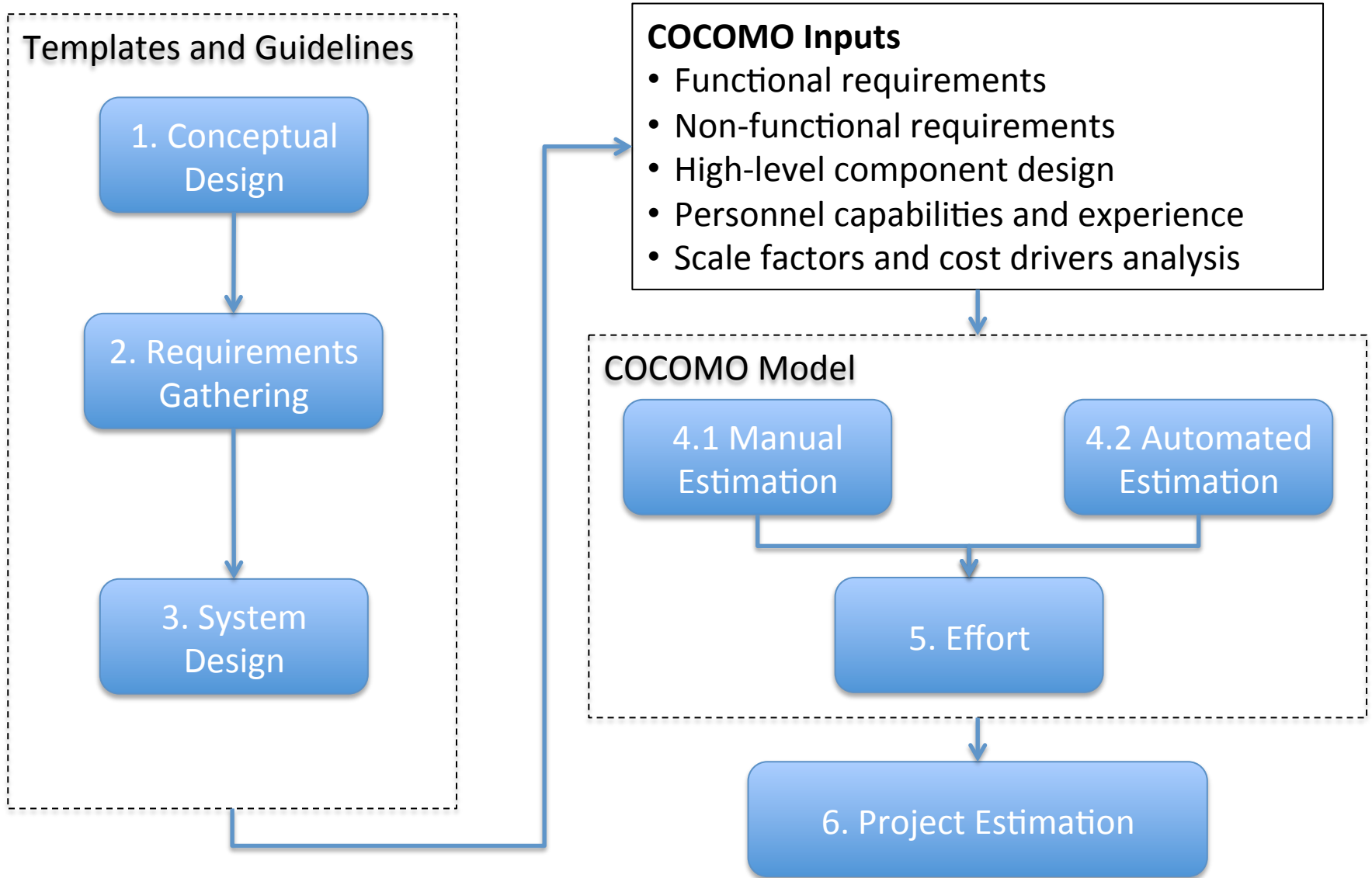
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  - ICT Standard Cost Estimation
  - Software Intellectual Property Valuation
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# ICT Cost Estimation Project



- **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





# 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



- **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)**

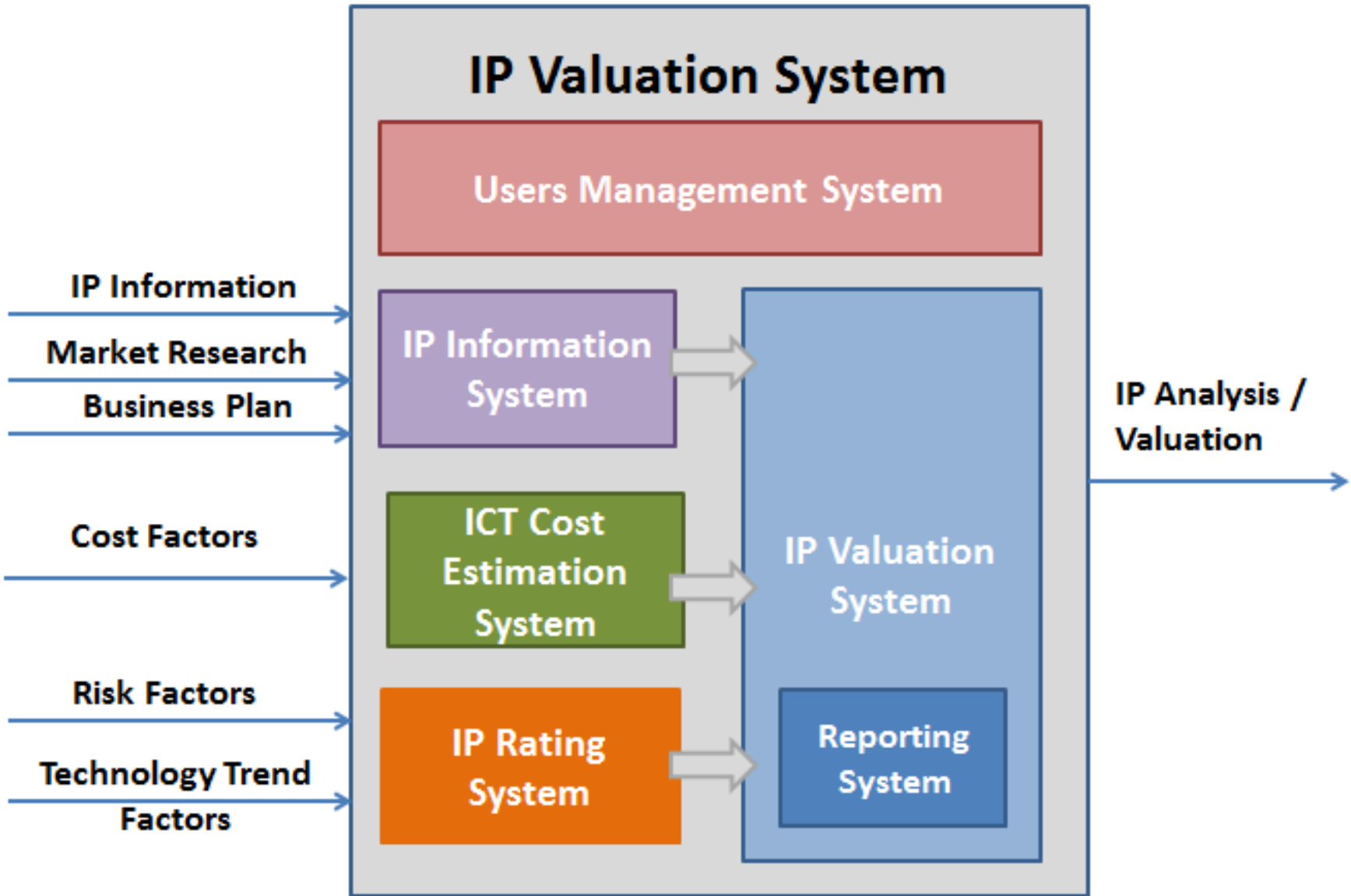


# Valuation Model



- **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

# IP Valuation System







- **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**