



IBM Integrated Supply Chain Solution Delivery

Conceptual Estimating of Deployment Costs for Technology-Driven Projects

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January 24, 2005



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Introduction

- **Movement into the knowledge age brings challenges/opportunities**
- **Integration of technology changed the landscape**
- **Speed of execution is a competitive advantage**
- **Effective deployment cost conceptual estimating is a differentiator**

History of Conceptual Estimating (Parametric)

- **Origins lie in World War II methods to predict costs of manufacturing aircraft**
- **Based upon work by T.P Wright involving learning curves**
- **1950's, Rand Corporation expanded use for the airplane industry**
- **DOD used the method for estimating costs of military programs**
- **1975, RCA Company released a hardware estimating model**
- **1994, Joint Government/Industry Parametric Estimating Initiative Steering Committee was formed**
- **Significant result was the Parametric Cost Estimating Handbook, DOD**

Application Areas for Parametric Estimating

- **Began with estimating new technology projects for the government (airplane, weapons acquisition, space exploration program)**
- **Used for projects with long durations and high capital investment**
- **Initial focus was on lifecycle costs**
- **Traditionally widest use is the construction industry**
- **Cross discipline nature of projects adds complexity (e.g., infusion of technology into infrastructure projects)**
- **Used for manufacturing conversion costs for new technologies within the electronics industry**
- **Most useful in early stages of project**

Conceptual Estimating Definition

- **Obtained by using cost estimating relationships (CER)**
- **Project characteristics are the independent variables**
- **Cost-to-cost or Cost-to-non-cost**
- **Relationships range from simple to complex**
- **Complex relationships are referred to as a model**
- **The method is associated with organization's strategic approach to project management**
- **Contains far less information than a detailed estimate**

Identifying Cost Estimating Relationships

Koenigseker (1982)	Gu (2003)
What are we building	Cost drivers selection
Where are we building it	Data Collection
When are we building it	Regression – fit CER
How are we building it	Test CER
How big are we building it	Select best CER
Who is building it	
What is it intended to do	

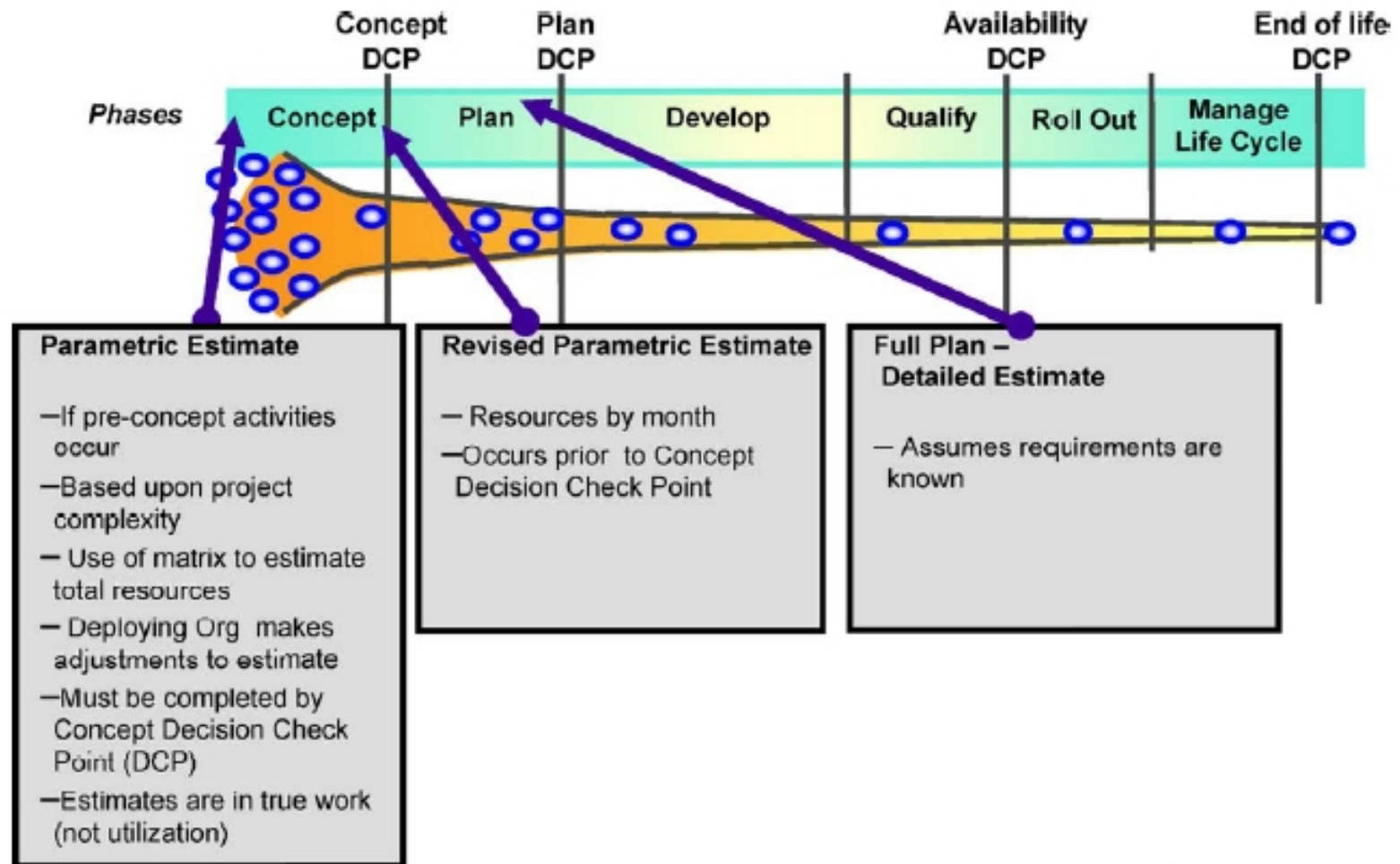
Table 1. Steps for Identifying CERs

Approaches for Obtaining Consistency

Black (1984)	Bajaj et al. (2002)	Koenigseker (1982)
Definition of the problem	Effective cost accounting	Develop standards
Collection of the data	Historical database	Develop parametric sets
Normalization of the data	Normalize data - multipliers	Define the project
Interdependencies	Exclude outliers	Apply sets to standards
Derivation of the CER	Statistical analysis - CERs	
Establishment of limitations	Apply multipliers	
Documentation	Prepare a template	

Table 2. Approaches for Obtaining Consistency

Suggested Timeline for Conceptual Estimating



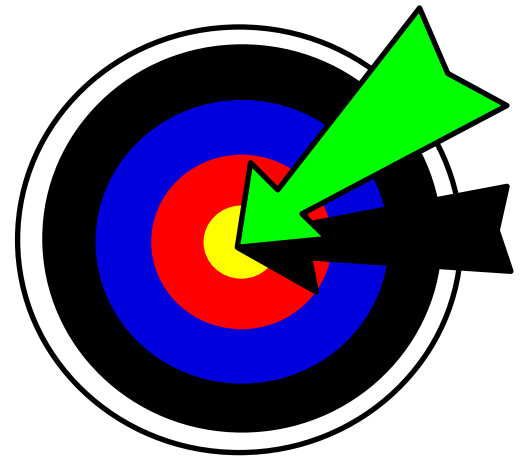
Benefits of Conceptual Estimating

- **Timely Estimates**
- **Limited Knowledge Required**
- **Quicker Response to Competitive Pressures**
- **Greater Insight into Cost Drivers**
- **Less Subjective**
- **Results in Defensible Estimate at Reasonable Cost**

Limitation: Accuracy Issues

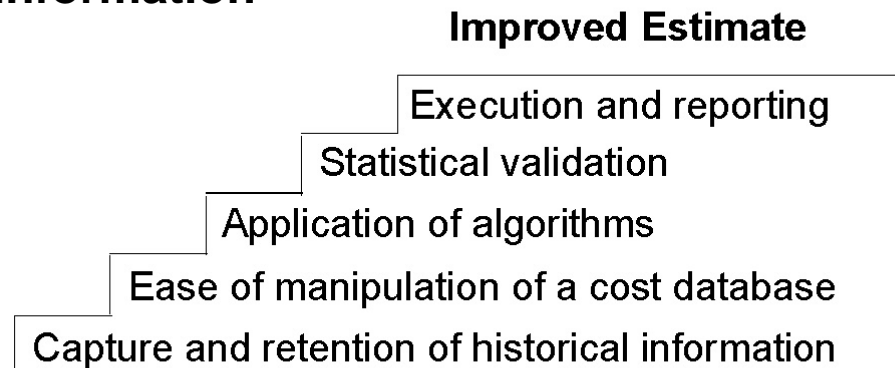
- **Four determinants (Oberlender and Trost – 2001)**
 - Who was involved in preparing the estimate
 - How the estimate was prepared
 - What was known about the project
 - Other factors considered while preparing the estimate

- **Accuracy affected by**
 - Changes in project scope
 - Changes in design standards
 - Incorrect unit cost/quantity assumptions
 - Unforeseen problems in implementation



Limitation: Data Availability Issues

- **Available information in 5 -20% range (Harbuck – 2002)**
- **Quantity-based CERs not completely adequate because estimator's rationale for the relationship is not captured (Staub-French et al – 2003)**
- **Steps to improve estimate in absence of complete information**



Question

- **What project characteristics can be identified and quantified to perform competitive conceptual project deployment cost estimating?**

Approach to Model Development

- **Step 1: Construct Definition**
 - Provide the theoretical rationale for model development and testing.
- **Step 2: Selection of Cost Estimating Relationships**
 - Determine the cost estimating relationship (CER) variables.
- **Step 3: Determination of Estimates**
 - Determine the appropriate values for the dependent variable based upon the values of the CERs.
 - Establish ranges based upon historical data from similar projects.
- **Step 4: Subject Matter Expertise (SME)**
 - Review of model parameters and estimate data by experienced project managers for revision.
 - Use of modified Delphi technique to reach a consensus on parameters and estimated values.
- **Step 5: Update of Estimates – Revision of Model**
 - Update the values for the dependent variable per input from experience project managers.
- **Step 6: Create and Use Estimation Tool Based upon the Model**
 - Model parameters entered into spreadsheet.
 - Project characteristics used to create estimates.
- **Step 7: Calibrate the Model**
 - Create estimated costs for specific projects.
 - Capture actual costs from historical data.

SME Participants in ROT Tool Development

- Dave Barker
- Cathy Barr
- Christopher Brzozowski
- Andrea Calza
- Julian Cox
- Doug Crozier
- Joe Giordano
- Kazuo Hiruma
- Ann Longo
- Young Tae Oh
- Linda O'Neill
- Eileen Packer
- Mary L. Price
- Maria Rabil
- Faye Randolph
- Jean-Francis Renson
- Robert Rottkamp
- Frank Sbertoli
- Karen Sim
- Faye Wainscott
- Robert Williams
- Charles Young

Variables within the Estimating Model

- **Independent Variables**
 - **Number of different user organizations**
 - **Application**
 - **Process**
 - **Number of new interfaces**
 - **Project duration**
 - **System architecture**

- **Intervening Variables**
 - **Task complexity**
 - **Overall project complexity**

- **Dependent Variable**
 - **Hours**

Estimating Model

C = technology-driven deployment cost estimate
P_t = project complexity at time t
T_{X_i(t)} = task complexity of specific task X_i at time t
X_i = specific task estimate for task category i
n = total number of specific tasks

$$C = f (P_t * \sum_{i=(1-n)} X_i * T_{X_i(t)})$$

Conceptual Estimating: Project Complexity Criteria

Project Criteria	High	Medium	Low	Complexity for Project: <hr/> H-M-L
Number of Stakeholder Organizations Supported	3 or more	2	1	
Number of Geographic Regions Deployed	2 or more	1	1	
Number of Countries Deployed within this region	3 or more	2	1	
A new deploy or upgrade to existing system	New	Enhancement	Rollout Existing Function	
Interfaces (Develop Local Interfaces)	3 or more new interfaces	2 or less new interfaces: 2 or less changes to existing interfaces	Very Few Changes to Existing Interfaces	
Process	New Process Deployment	Process Enhancements	Existing Process	
Duration of project	Seven months or greater	Five to seven months	Four months or less	
Architecture	On Demand	E-business, B2B	Client / Server	
Overall Project Complexity	–	–	–	

Example: Three or more criteria checked under high constitutes a high complexity project

Conceptual Estimating: Task Complexity Criteria

Task / Complexity Criteria	High	Med	Low	High Med or Low
TM - Transformation Management				TM =
Previous organizations deployed successfully in country or region	0	1	2+	
Use of a centralized common resources	No	Partial	Yes	
PM - Project Management				PM =
Use of experienced Project Manager	No		Yes	
Previous similar deployments	No		Yes	
Use of common Project Office Resources	Yes		No	
DA - Data Conversion and Migration				DA =
Use of centralized skills	No	Partial	Yes	
Size of data to be converted – volume of Master Data & Operational Data	Large	Med	Small	

Conceptual Estimating: Task Complexity Criteria

Task / Complexity Criteria	High	Med	Low	High Med or Low
PR - Process Management				PR =
Previous organization deployed successfully in country or region	0		1	
Translation into National Language	Yes	No	No	
CO - Communications Management				CO =
Previous organization deployed successfully in country or region	0		1	
Translation into National Language	Yes	No	No	
IT - Information Technology				IT =
Workstation Replacement / Printers (Do you have the required technology installed)	No	Partial	Yes	
Network Infrastructure (Is your infrastructure up to required guidelines for project)	No	Partial	Yes	

Conceptual Estimating: Task Complexity Criteria

Task / Complexity Criteria	High	Med	Low	High Med or Low
JD - Job Design				JD =
Have common Job Design Templates been rolled out	No		Yes	
MS - Measurement Systems				MS =
Will you require any additional measurement systems a part from those rolled out as standard with the system	Yes	Yes	No	
TST - Test				TST =
Use of Centralized Test Team (Re-use of Skill)	No	Partial	Yes	
Number of test cases and test steps, especially number of region or country unique test cases based on size of region or country	Large		Small	
A new deploy or upgrade to existing system	New		Upgrade	

Conceptual Estimating: Task Complexity Criteria

Task / Complexity Criteria	High	Med	Low	High Med or Low
ET - Education and Training				ET =
Number of users	>35	10 - 25	<10	
Translation into National Language	Yes	No	No	
Previous organization deployed successfully in region or country	No	Yes	Yes	
ASCA - Application Systems Control and Auditability				ASCA =
Type of Review: Delta2 = with control point changes - additional countries, Delta1 = no control point changes	Full	Delta-2	Delta-1	
First deployment in region or country	Yes	No	No	
MTP - Move to Production				MTP =
Size of data that has to be migrated for new regions or countries	Large		Small	
First deployment of this application in the organization	Yes	No	No	
First deployment for a new country	Yes	No	No	

Overall Project Complexity - High Deployment Resource Estimates

Deployment Category	High Med or Low	Low Task Complexity Hours	Med Task Complexity Hours	High Task Complexity Hours	Estimate for _____ Project
TM - Transformation Management		100	300	600+	
PM - Project Management		800	1700	2600+	
DA - Data Conversion and Migration		500	1500	2600+	
PR - Process Management		300	1000	1800+	
CO - Communications Management		100	200	350+	
IT - Information Technology		500	1100	1800+	
JD - Job Design		100	350	600+	
MS - Measurement Systems		50	200	350+	
TST - Testing		3500	4200	5200+	
ET - Education and Training		500	700	1000+	
ASCA - ASCA Certification		150	250	350+	
MTP - Move to Production		800	1700	2600+	
Deployment					

Overall Project Complexity - Med Deployment Resource Estimates

Deployment Category	High Med or Low	Low Task Complexity Hours	Med Task Complexity Hours	High Task Complexity Hours	Geo Estimate for _____ Project
TM - Transformation Management		50	100	300	
PM - Project Management		500	800	1000	
DA - Data Conversion and Migration		100	500	1000	
PR - Process Management		100	300	500	
CO - Communications Management		20	50	100	
IT - Information Technology		200	500	700	
JD - Job Design		50	100	300	
MS - Measurement Systems		20	50	100	
TST - Testing		1000	1500	2500	
ET - Education and Training		300	400	500	
ASCA - ASCA Certification		100	150	200	
MTP - Move to Production		20	500	800	
Deployment					

Overall Project Complexity - Low Deployment Resource Estimates

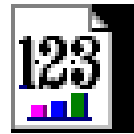
Deployment Category	High Med or Low	Low Task Complexity Hours	Med Task Complexity Hours	High Task Complexity Hours	Estimate for _____ Project
TM - Transformation Management		10	20	50	
PM - Project Management		100	200	400	
DA - Data Conversion and Migration		50	150	400	
PR - Process Management		20	50	100	
CO - Communications Management		10	20	50	
IT - Information Technology		20	50	100	
JD - Job Design		10	20	50	
MS - Measurement Systems		10	20	50	
TST - Testing		200	500	1000	
ET - Education and Training		50	100	200	
ASCA - ASCA Certification		10	50	100	
MTP - Move to Production		20	50	100	
Deployment					

Quick Check Validation

Percentage of Total Project Costs By Category

Deployment Category	Estimates for _____ Project	Percent of Total by Category	Recommended Percent of Total by Category
TM - Transformation Management			>0 - 4
PM - Project Management			8 - 12
DA - Data Conversion and Migration			3 - 15
PR - Process Management			5 - 15
CO - Communications Management			>0 - 2
IT - Information Technology			4 - 10
JD - Job Design			>0 - 4
MS - Measurement Systems			>0 - 2
TST - Testing			20 - 35
ET - Education and Training			1 - 6
ASCA - ASCA Certification			>0 - 2
MTP - Move to Production			5 - 15
Deployment Total		100%	

Demo of “Rule of Thumb” Tool



Lotus 1-2-3 9
Workbook