



Early COCOTS Workshop Out-Brief

17 COCOMO/SCE Forum
October 2002



Workshop Attendees

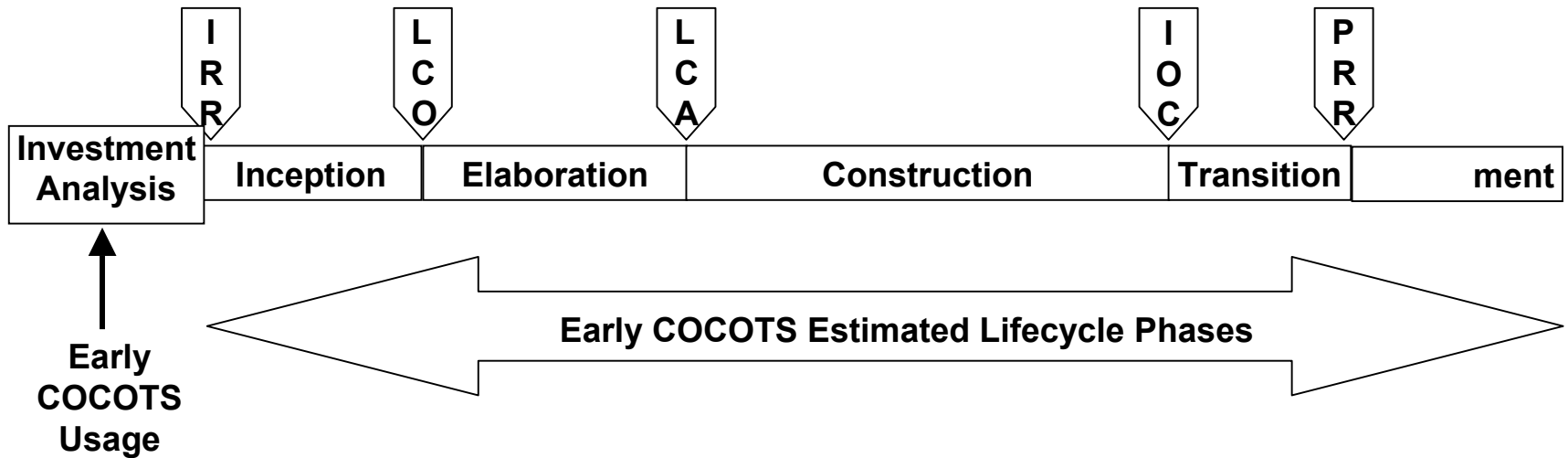
- Chris Abts (Texas A&M)
- Ahmad Alswai (USC-CSE)
- Jesal Bhuta (USC-CSE)
- Linda Brooks (TRW)
- Brad Clark (Software-Metrics)
- Duane Eilers (IBM)
- Ronald Kohl (R.J. Kohl and associates)
- Ye Yang (USC-CSE)



Model Approach

- Model will estimate total life-cycle costs
- Lifecycle costs are estimated as a range of outputs, not a single point estimate
- Costs will be estimated at the system level, not at the level of individual components
- Cost will be aggregated across activities

Model Scope





Workshop Focus

- Do we have a reasonable set of early-lifecycle cost drivers?



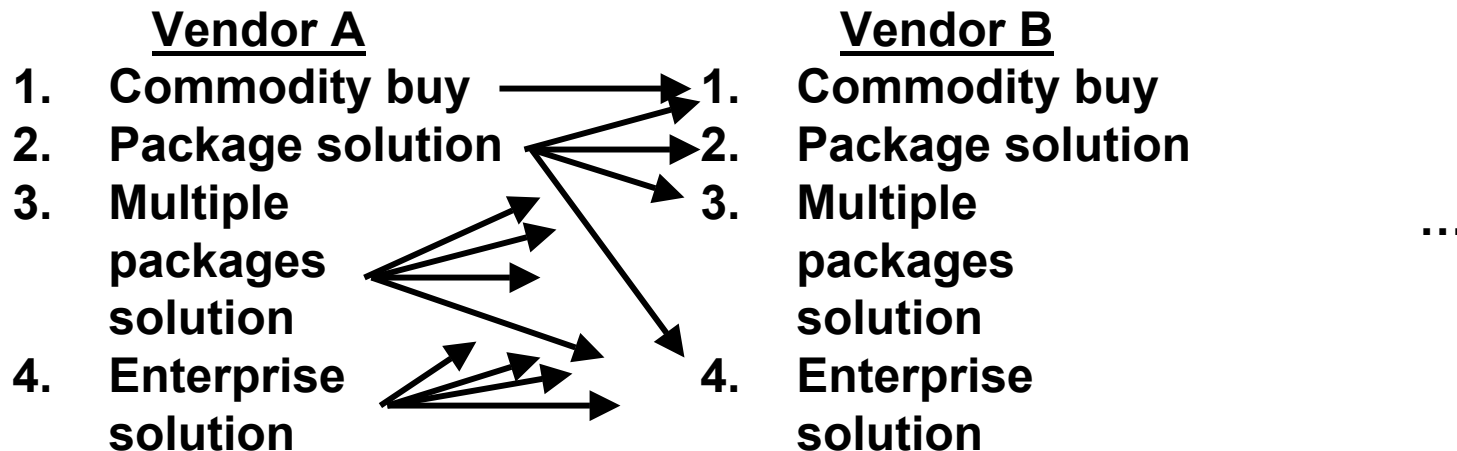
Effort Cost Driver Issue -1

- What is included in Total Cost of Ownership
 - Actual cost of the COTS products
 - Effort to build / integrate the COTS-Based system
 - Maintenance costs

Effort Cost Driver Issue -2



Need to consider the range between the two endpoints in estimating cost



Application Architecture Interactions



Effort Cost Driver Issue -3

- Requirements Flexibility – Consensus of members is that it exists. However it is not a *cost driver* but a *risk factor*
 - You may not be able to convince the customer to tailor their process to suit of COTS products
- Data Conversion – very important and often overlooked
 - Great influence in real time systems.
 - Consider this driver with real-time versus business (application) interface.



Effort Cost Driver Issue -4

- Technical Architecture (aggregate several proposed cost drivers under this concept)
 - Operational Complexity: security levels, user profiles, user base complexity
 - Configuration Complexity: # of unique sites, # of software system configurations, # of platforms
 - Interface Complexity: # and type of interfacing new or legacy systems
 - Real-time interfaces
 - Application interfaces



Effort Cost Driver Issue -5

- Skill Mismatch
 - Recommend change driver name to BPR or changes in Operational Behavior
 - BPR depends upon the sort of COTS solution you plan to use.
 - It needs to be addressed, however, cannot be addressed accurately at this level
 - Recommend it needs to be considered but cannot be addressed by the model
 - Perhaps make this source of cost part of Operational Constraints



Size Cost Driver Issues -1

- Number of COTS Products
 - Intended to capture the cost of writing *glue code* to integrate pieces
 - Terminology: Products vs. Modules vs. Components
 - Proposed rating is a number of range bins:
 - Small: Single product
 - Medium: 2 – 5 products
 - Large: 6 – 20 products
 - Very Large: 21 – 50 products
 - Extra Large: Greater than 50 products
 - Recommendation: use the estimate number of products
 - Least – Most Likely – Most number of products

Size Cost Driver Issues -2

- Number of COTS-provided user functions
 - Intended to capture the cost of tailoring COTS products
 - Proposed rating is a number of range bins:
 - Small: Simple archive, cataloguing and access
 - Medium: Small business order processing
 - Large: Large business order processing
 - Very Large: Large business ERP
 - Extra Large: Nation-level critical services: air traffic, defense
 - Functions to be tailored
 - Percentage of fulfilled requirements
 - Percentage of functionality that has to be modified – Tailoring
 - Percentage of missing functionality – Custom dev.
 - Recommendation:
 Change ratings to a higher level of abstraction

User Requirements	Percentage Fulfilled	COTS	
	Tailored Percentage		
	Additional Requirements	New Code / products	New Code
			Glue Code



Backup Slides

- Complete set of *candidate* cost drivers
 - Only a strawman set of drivers

Driver	Small	Medium	Large	Very Large	Extra Large
Number of Independent COTS Products	Single product	2 to 5 products	6 to 20 products	21 to 50 products	≥ 51 products
Number of COTS-provided user functions	Simple archive cataloguing and access	Small-business order processing	Large business order processing	Large business ERP	National-level critical services: air traffic, defense
Degree of Uncertainty about product choice	Clear choices	Manual ratings of key criteria	Simple exercise of 1 to 3 candidates	Thorough benchmarking, prototyping to access key criteria	Major evaluations of complex interoperability
Amount of newly developed software (equivalent SLOC)	< 5 K	5 to 20 K	20 to 100 K	100 to 500 K	500 to 2,000 K

Effort Multipliers -1

Multiplier	Very Low	Low	Nominal	High	Very High
Complexity of Integration	Simple Adaptations	Straightforward glue code	Some critical-issue glue-code engineering	Complex, coupled glue-code engineering	Very complex, highly coupled glue-code engineering
Required tailoring, BPR, training, data conversion	Minimal, straightforward	Modest, straightforward	A few workable complexities involved	Significant effort needed on key issues	Major organizational rework involved
Integrator difficulties with COTS products and integration	Highly capable and experienced	Capable and experienced	A few shortfalls in capability, experience	Large but workable shortfalls in capability, experience	Many serious shortfalls in capability, experience
Degree of mismatch between COTS capabilities and user needs: maturity, flexibility, levels of service	User needs fully covered	Modest work to satisfy user needs	A few mismatches requiring appreciable work to resolve	Some serious mismatches requiring major work	Many serious, interacting mismatches requiring major work



Effort Multipliers -2

Multiplier	Very Low	Low	Nominal	High	Very High
Requirements Volatility	None	Small, non-critical redirections	Occasional moderate redirections	Frequent moderate or occasional major redirections	Frequent major redirections
COTS Volatility	Infrequent versions, low criticality components	Infrequent versions of loosely coupled or non-critical components	Frequent versions of loosely coupled components	Frequent versions of critical, moderately coupled components	Frequent versions of highly coupled, critical components