estimate

estimate • analyze • plan • control

A Structured Framework for Estimating IT Projects and IT Support

Karen McRitchie/Ross Hunt
Galorath Incorporated
SCEA/ISPA Conference
June 2008

SEER® by GALORATH

Project goals

- Build an estimation framework for the IT domain
  - Knowledge based
  - Easy to use
  - Intuitive
- Develop models that can learn from past project histories and adapt to changes
- Help IT organizations evaluate and prioritize project decisions
- Evaluate design alternatives
- Help IT organizations build an objective and repeatable estimation process

The challenge of IT estimation

- IT requirements and priorities are ever changing and driven by many factors
  - Business
  - Technology
  - Legislation/Regulation
- IT projects and initiatives cover a broad spectrum of activities
  - severs, training, establishing processes, deploying software, etc.
- IT managers need estimates that are comparable, yet robust
- Estimation processes are often subjective and not repeatable

SEER-IT development story

Research

Establish cost structure

Collect metrics

Develop models

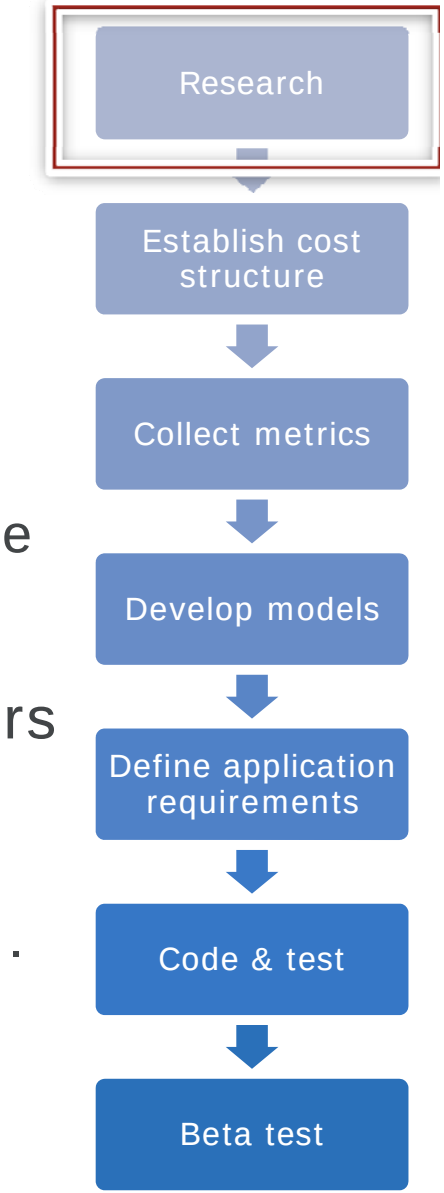
Define application requirements

Code & test

Beta test

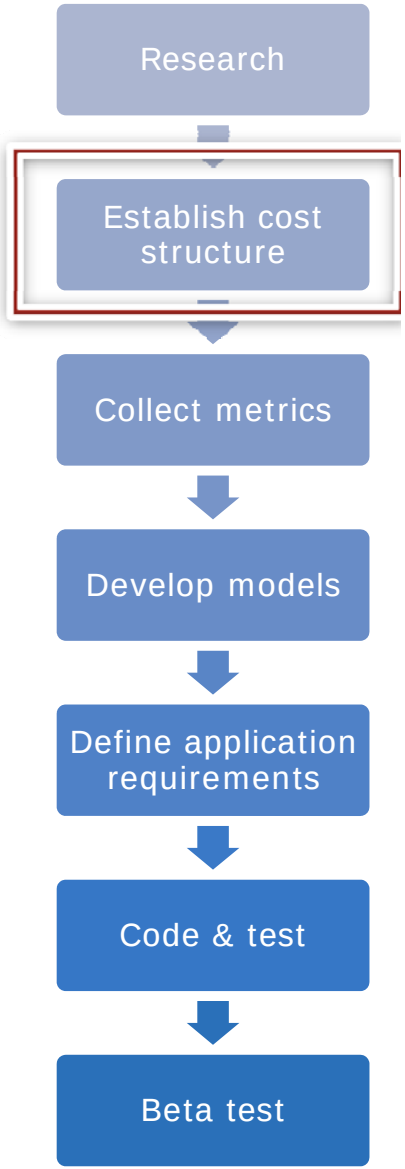
Research

- Review of current methodologies used
  - Looked at cost models currently used
- Sponsored an MIT/LAI research project
  - Survey based study
  - Identified a set of cost drivers
  - Used AHP to determine relative importance
  - Evaluated different industries
- Targeted research – employed researchers to gather data an information on specific topics
  - E.g. training, service desk, server setup…..
- Consulted with experts in the areas of IT service management and IT service providers



Establish a cost structure

- This task sounds deceivingly simple, but it is essential to have in order to make sense of data and metrics
- Review of charts of accounts
- Functional areas
- Major effort types
  - Project- initial effort to design and deploy a project
  - Ongoing Support
- Project phases
- Labor/role classification

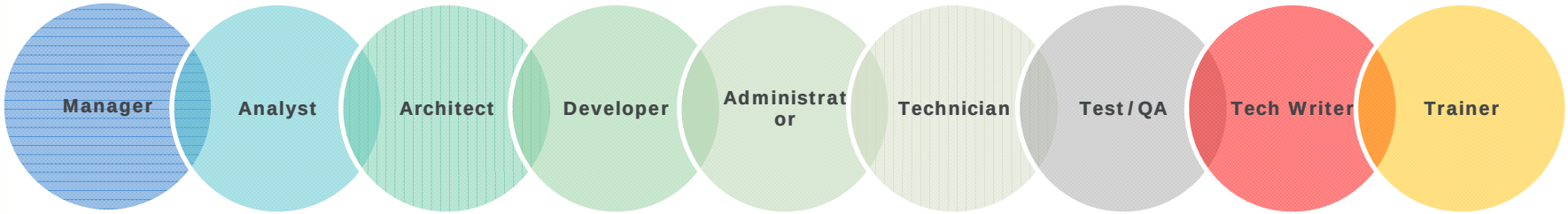


Dimensions of SEER-IT cost structure

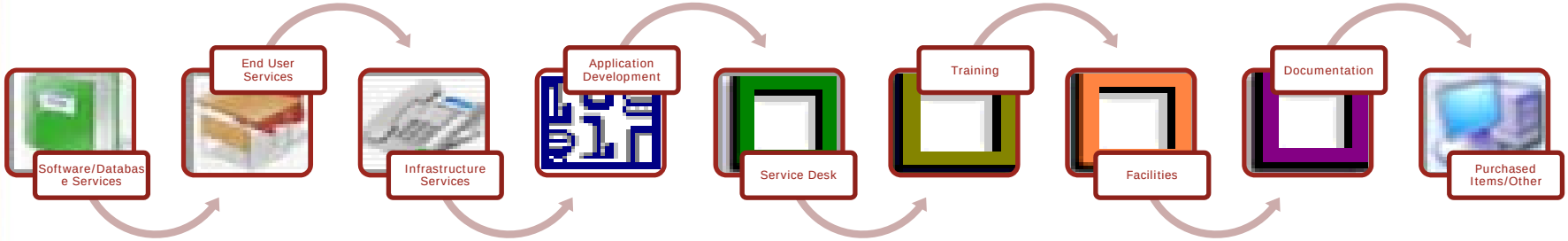
SEER by GALORATH

- Life Cycle Phases

- Labor/Role

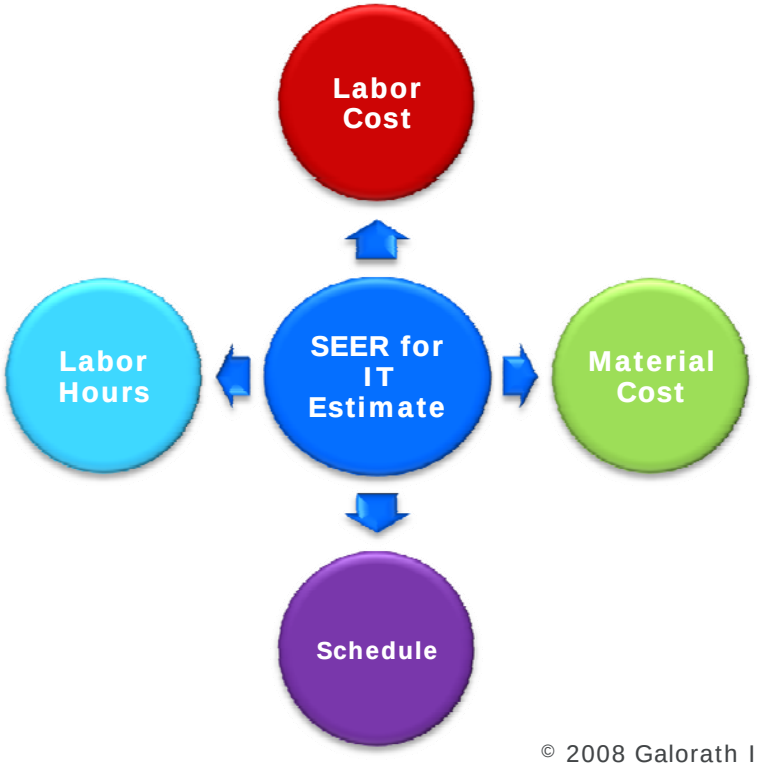


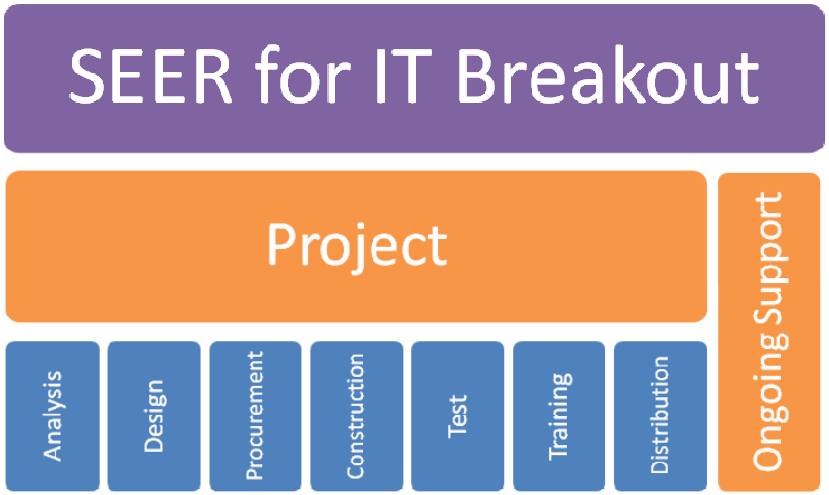
- Functional Areas



Comprehensive cost structure

- SEER for IT covers all components of TCO
  - Labor and material costs
  - Project and ongoing support
  - Plus schedule estimates – giving time phased estimates





Phase cost structure

- SEER IT evaluates and estimates projects based on key phases
  - **Analysis**. Evaluation of requirements and determination of general approaches.
  - **Design**. Detailed design of systems to be built including drawings, schematics and engineering studies.
  - **Procurement**. Time and cost for purchased goods and services.
  - **Construction**. Building of systems including unique setup efforts.
  - **Testing**. Test and checkout of systems being deployed.
  - **Training**. Development of user documentation, courseware and training activities.
  - **Distribution**. Setups and installation of hardware and software for end users.
  - **Ongoing Support**. The effort required to maintain and support the systems once operational.
- SEER IT allows you to estimate any or all of these phases

Labor cost structure

- SEER IT allocates estimates into labor categories or roles
  - **Management**
  - **Analyst**
  - **Architect**
  - **Software Development**
  - **Technician**
  - **Test / QA**
  - **Documentation**
  - **Training**
  - **Administrator**
  - **Operator**
  - **Support**

ECONOMIC FACTORS			
MANAGEMENT			
Management In-house Hourly Labor Rate	120.00	120.00	120.00
Management Contractor Hourly Labor Rate	0.00	0.00	0.00
Percentage of Management Labor In-house	100.00%	100.00%	100.00%
ANALYST			
Analyst In-house Hourly Labor Rate	85.00	85.00	85.00
Analyst Contractor Hourly Labor Rate	0.00	0.00	0.00
Percentage of Analyst Labor In-house	100.00%	100.00%	100.00%
ARCHITECT			
Architect In-house Hourly Labor Rate	150.00	150.00	150.00
Architect Contractor Hourly Labor Rate	0.00	0.00	0.00
Percentage of Architect Labor In-house	100.00%	100.00%	100.00%
SOFTWARE DEVELOPMENT			
Software Development In-house Hourly La...	140.00	140.00	140.00
Software Development Contractor Hourly ...	0.00	0.00	0.00
Percentage of Software Development Lab...	100.00%	100.00%	100.00%
TECHNICIAN			
Technician In-house Hourly Labor Rate	65.00	65.00	65.00

- Each category has a labor rate for both in-house and contracted effort

Functional cost structure

aka WBS elements

WBS Elements
Purchased Hardware
Purchased Software
Application Development
Training
Service Desk
Software/Database Services
End User Services
Infrastructure Services
User Documentation
Facilities
Additional Items

Each process model has a set of inputs, calculations and outputs

Process Models provide logical groupings of IT activities

An IT project will typically use a combination of WBS elements

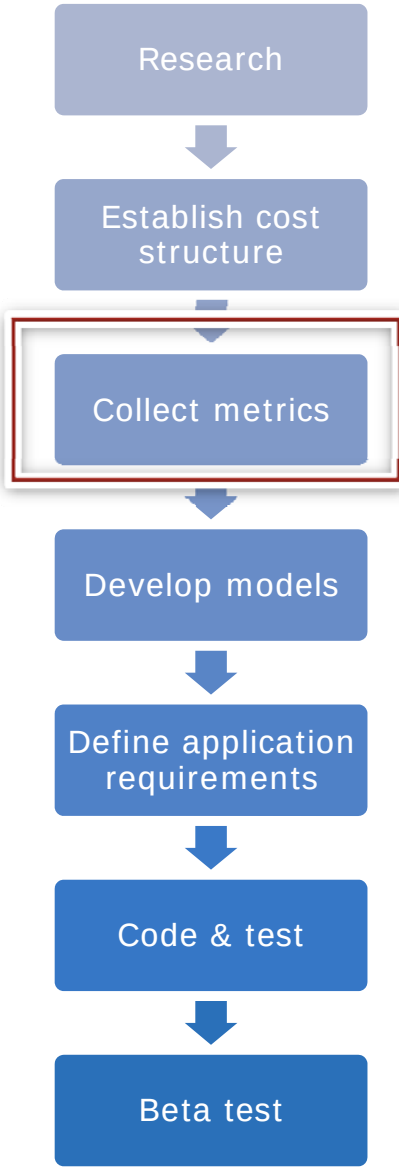
Relating functional areas to project phases

- SEER IT estimates are allocated into general phases of an IT project or initiative

Activities / Element Types	Purchased Hardware	Purchased Software	Application Development	Training	Service Desk	Software/Database Services	End User Services	Infrastructure Services	User Documentation	Facilities	Additional Items
Analysis			x	x		x	x	x	x		x
Design			x			x		x	x		x
Procurement	x	x				x				x	x
Construction			x	X		x		x	x	x	x
Testing			x			x	x	x		x	x
Training				x							x
Distribution						x	X	x			x
Ongoing Support	x	x	x	x	x	x	X	x	x	x	x

Collect & analyze metrics

- The cost structure gave a framework for classifying cost metrics
  - Project effort data
  - Staffing trends and ratios
  - Labor standards
- Used data collected organically as well as purchased research



Organizing metrics

- The standards database gives an opportunity to customize/calibrate SEER-IT
- Only administrators will have access to this database

CableType	Cost	InstallTime	HorzDensity	BackboneDensity	PatchCordCost	SupportFactor
CAT 5	0.4	15.0	1.0	4.0	4.0	0.02
CAT 5e	0.5	15.0	1.0	4.0	5.0	0.018
CAT 6	1.0	15.0	1.0	4.0	7.0	0.016
Multi-Mode Fiber	4.0	15.0	4.0	144.0	35.0	0.011
Single-Mode Fiber	112.0	15.0	4.0	144.0	40.0	0.01

Factor	MajorUpgradeInterval	UpgradeFactor	HoursPerNewUser	AnnualHoursPe...	IncidentInterva...	MTTR_HW	IncidentInterva...
Desktop	36.0	0.5	0.5	0.1	12.0	4.0	12.0
Notebook	36.0	0.5	0.5	0.1	12.0	4.0	12.0
Mobile	36.0	0.5	0.5	0.1	12.0	2.0	12.0

Item	Value
AnalyzeTrainingRequirementsPerKUsers	8.0
NominalCourseDuration	8.0
NominalPercentUsersTrained	0.5
NominalCoursewarePrepPerCourseHour	162.5
NominalStudentsPerInstructor	100.0
CoursewareChangePerUpgrade	0.1
CoursewareGeneralChangePerYear	0.02

Sample tables

Sample metrics tables

- Each phase is allocated into labor categories using a configurable table

Infrastructure Services	Labor Categories	Management	Analyst	Architect	Software Development	Technician	Test/QA	Documentation	Training	Administrator	Operator	Support
Activities												
Analysis		5.00%	45.00%	50.00%								
Design		5.00%		95.00%								
Procurement												
Construction		5.00%		15.00%		80.00%						
Testing		5.00%				15.00%	80.00%					
Training												
Distribution												
Ongoing Support	SPECIAL	x		x		x				x		

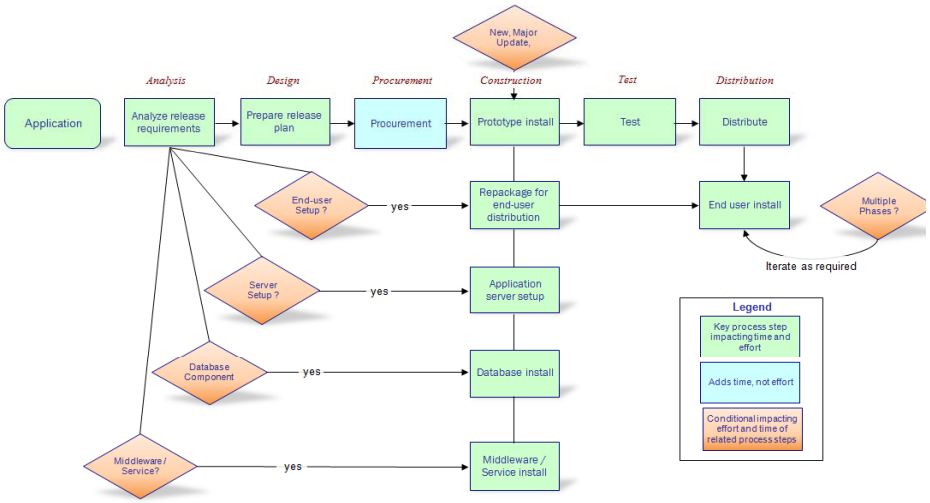
- Some phases are allocated at the sub-task level

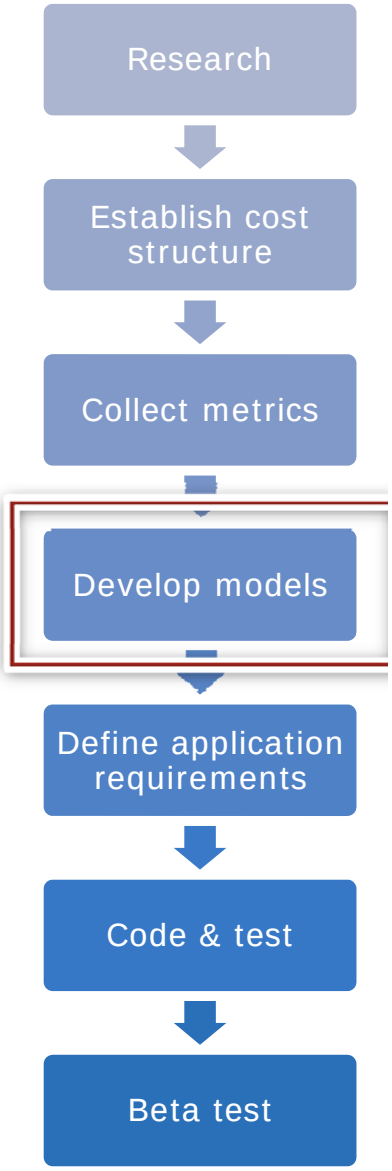
Ongoing Support	Labor Categories	Management	Analyst	Architect	Software Development	Technician	Test/QA	Documentation	Training	Administrator	Operator	Support
Activities												
PerformanceMonitorTuning		5.00%				47.50%				47.50%		
CapacityManagement		5.00%				47.50%				47.50%		
SystemSupport		5.00%				20.00%				75.00%		
AdvancedProblemResolution		5.00%				47.50%				47.50%		
HardwareMaintUpgrades		5.00%		10.00%		85.00%						
OngoingAssetConfigMgmt		5.00%		15.00%		40.00%				40.00%		

SEER by GALORATH

Build models

- Each major functional area has a parametric model
- Models start with a process flow
- Each process step has drivers influencing the effort
- Drivers and metrics were combined to develop a CER for each process step
- Integrate CERs to establish a comprehensive model





SEER-IT model logic

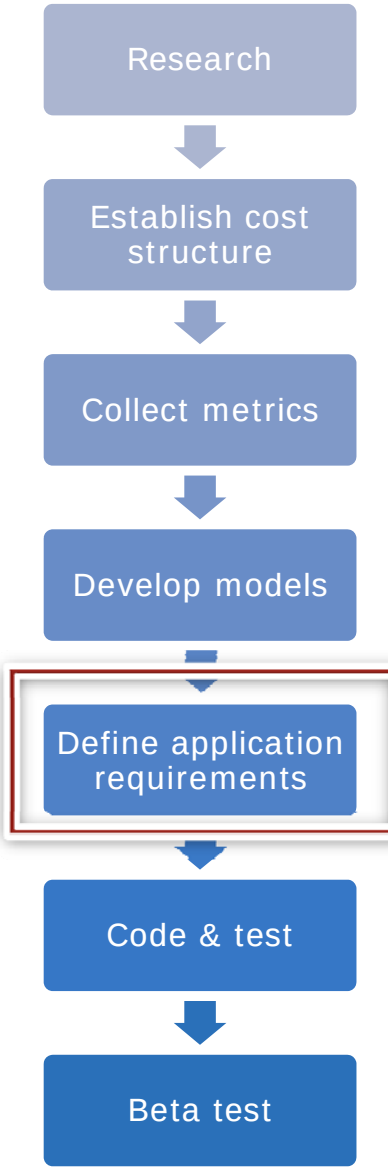
- SEER-IT estimates labor associated with IT projects
- Effort is estimated for each phase
  - Phases are sometimes broken down into sub-tasks and estimated at that level
- Each phase (or sub-task) has an effort estimating relationship, typically of the form:

$$EffortTask_k = \left(\prod_i p_i \right) \times StdTime_k$$

- $StdTime$ is a nominal time found in the standards database *(e.g. Hours to set up a server)*
- p_i are adjustment factors used to adjust the nominal time to the estimate's specific scenario *(e.g. experience level, reliability level)*

SEER-IT program requirements

- We used the current SEER UI as a basic framework
  - Wanted it to be familiar to a SEER-SEM or SEER-H user
- Made improvements where they made sense
- Reporting requirements were established based on interviews with user prospects



Develop the application

SEER® for IT - SEER® for IT2

File Edit Estimate View Tools Options Window Help

Options

WBS Elements

Rollup

Purchased Hardware

Purchased Software

Application Development

Software/Database Services

End User Services

Infrastructure Services

Training

Service Desk

Facilities

Additional Items

User Documentation

Scenarios

SEER® for IT2

- Σ 1 eCommerce Release 1 (Alpha Data Center)
  - Σ 1.1 Project Management Office
  - Σ 1.2 Project Infrastructure
    - Σ 1.2.1 Network Augmentation - Medi
    - Σ 1.2.2 Production Environment
      - 1.2.2.1 PROD Server - Dell 6850
      - 1.2.2.2 PROD Support - Dell 6850
      - 1.2.2.3 PROD Firewall
      - 1.2.2.4 PROD Support - Firewall
      - 1.2.2.5 PROD Security Gateway
      - 1.2.2.6 PROD Support - Security Ga
      - 1.2.2.7 PROD SAN Storage Array
      - 1.2.2.8 PROD Support - SAN
      - 1.2.2.9 PROD Tape Library
      - 1.2.2.10 PROD Support - Tape Libra
      - 1.2.2.11 PROD Fiber Switches
      - 1.2.2.12 PROD Support - Fiber Switc
      - 1.2.2.13 PROD Server Racks

Software/Database Services: PROD Supp...	Least	Likely	Most	Note
USERS				
Number of Users	1,000	1,200	1,500	
Concurrent Users	100	100	300	
User Turnover	0.00%	0.00%	0.00%	
Business Units	1	1	1	
Physical Locations	1	1	1	
APPLICATION				
Setup Type (Application)		New Installation		
Applications	1	1	1	
Platform Type		PC		
Architecture		Standalone		
Client Type		None		
Application Size	Nom	Nom	Nom	
Distribution Technology	Nom	Nom	Nom	
Origin		In-house		
DATABASE				
Setup Type (Database)		New Installation		

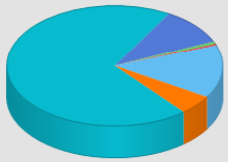
Quick Estimate | Phased Activity

ITEM	VALUE	REFERENCE	DIFFERENCE
TOTAL			
Total Cost	139,704	168,751	-16%
Total Labor Cost	139,704	168,751	-16%
Total Material Cost	0	0	0%
Total Labor Hours	1,633	1,974	-16%
Total Schedule Months	132.05	132.05	0%
Project			
Project Cost	54,600	76,964	-28%
Project Labor Cost	54,600	76,964	-28%
Project Material Cost	0	0	0%
Project Labor Hours	634	897	-28%
Project Schedule Months	3.13	3.25	-3%
Project Start Date	1/3/2009	1/3/2009	
Project End Date	4/6/2009	4/10/2009	
Ongoing Support			
Ongoing Support Cost	85,104	91,787	-6%
Ongoing Support Labor Cost	85,104	91,787	-6%
Ongoing Support Material Cost	0	0	0%
Ongoing Support Labor Hours	999	1,077	-6%
Ongoing Support Schedule Months	120.02	120.02	0%
Ongoing Support Start Date	1/4/2010	1/4/2010	
Ongoing Support End Date	1/4/2020	1/4/2020	

Activity Allocation | Labor Category Allocation

PROD Support - ILook

Labor Hours by Labor Category

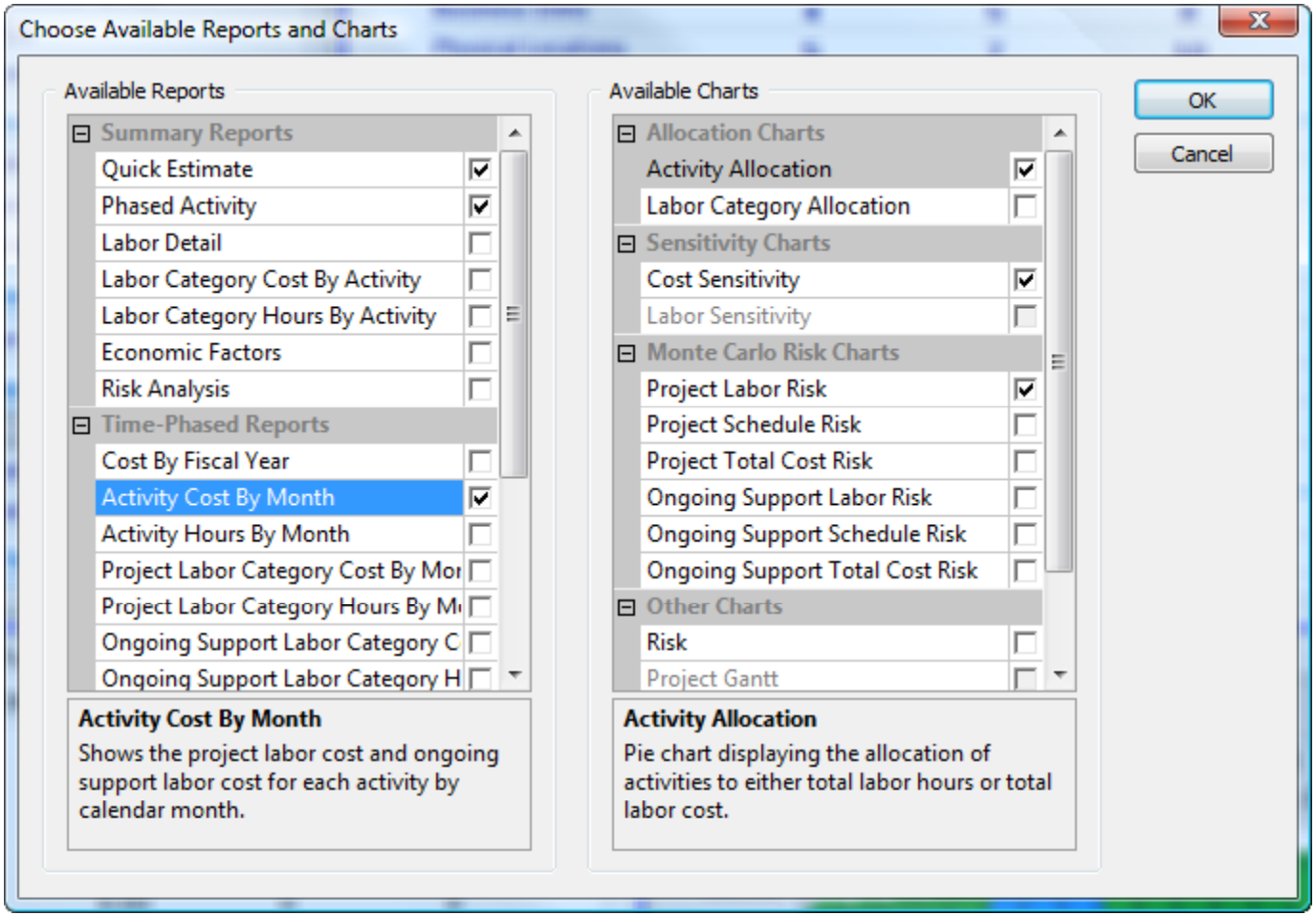


Management, Analyst, Architect, Software Development, Technician, Test/QA, Documentation, Training, Administrator, Operator, Support

For Help, press F1

CAP NUM SCRL

SEER-IT reports and charts



Reporting

- Results are reported…
  - For each WBS element
  - At any rollup or summary level
- Outputs may also be exported to support non-standard formats

Quick Estimate | Phased Activity | Labor Detail | Economic Factors | Monthly

ACTIVITY	HOURS	LABOR COST	MATERIAL COST	TOTAL COST
Analysis	533.13	61,994	0	61,994
Design	1,685.83	250,346	0	250,346
Procurement	0.00	0	276,928	276,928
Construction	1,204.17	169,185	0	169,185
Testing	1,480.00	134,400	0	134,400
Training	0.00	0	0	0
Distribution	3,843.43	234,449	0	234,449
Ongoing Support	0.00	0	20	20
Other	0.00	0	0	0
Total	8,746.57	850,375	276,948	1,127,323

SEER for IT report examples

Quick Estimate | Labor Detail | Labor Category Cost By Activity | Cost By Fiscal Year

ACTIVITY	MANAGEMENT	ANALYST	ARCHITECT	SOFTWARE D...	TECHNICIAN	TEST/QA	D(
Analysis	8,209	50,862	60,462	0	0	0	
Design	12,827	0	268,696	0	0	0	
Procurement	0	0	0	0	0	0	
Construction	11,471	0	27,274	134,867	7,838	0	
Test	25,554	0	0	30,345	28,783	129,450	
Training	35,277	0	0	0	0	0	
Distribution	34,406	0	0	0	172,756	0	
Other	0	0	0	0	0	0	
Project Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Ongoing Support							
Total							

Quick Estimate | Labor Detail | Labor Category Cost By Activity | Cost By Fiscal Year

Fiscal Year Start Month: 1
Base Year: 2007

FISCAL YEAR	PROJECT IN-HOUSE	PROJECT CONTRACTOR	PROJECT MATERIAL	ONGOING ... IN-HOUSE	ONGOING S... CONTRACTOR	ONGOING S... MATERIAL	TOTAL	TOTAL CUMULATIVE
2007	1,000,...	88,404	875,025	0	0	0	1,96...	1,963,619
2008	100,399	0	0	497,617	418,894	4,890	1,02...	2,985,417
2009	0	0	0	3,252	0	4,890	8,142	2,993,560
2010	0	0	0	3,252	0	4,890	8,142	3,001,702
2011	0	0	0	3,252	0	4,890	8,142	3,009,844
2012	0	0	0	2,924	0	4,890	7,814	3,017,659
2013	0	0	0	0	0	0	0	3,017,659
2014	0	0	0	0	0	0	0	3,017,659
2015	0	0	0	0	0	0	0	3,017,659

Report preview, print and export

Preview

100% 5 Close

SEER by GALORATH

Risk Analysis

1.3.1 - Server Installation

Element Type: Infrastructure Services

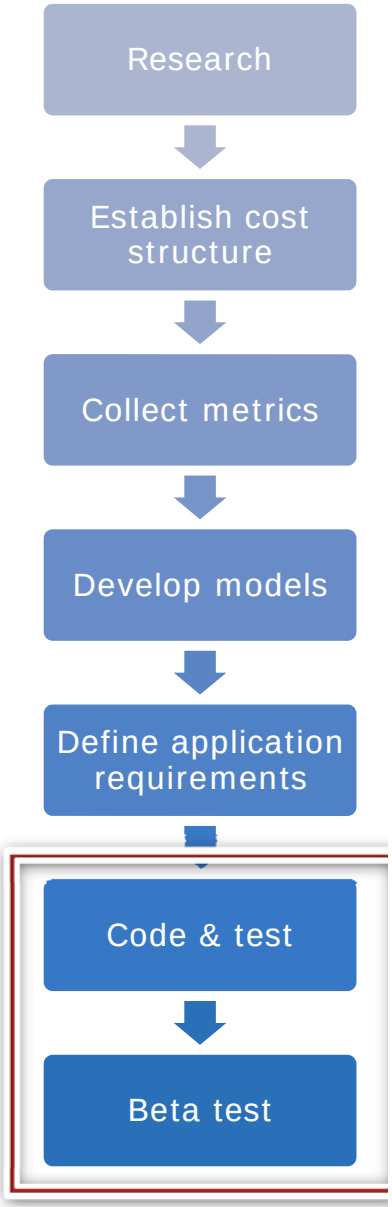
Project: C:\Users\karen mcritchie\Documents\SEER\SEER-IT\Projec

PROBABILITY	PROJECT LABOR HOURS	PROJECT LABOR COST	PROJECT MATERIAL COST	PROJECT TOTAL COST	ONGOING SUPPORT LABOR HOURS	ONGOING SUPPORT LABOR COST	ONGOING SUPPORT MATERIAL COST	O S TO
1%	335.49	39,679.74	0.00	39,679.74	161.64	13,252.92	0.00	
10%	378.30	44,787.05	0.00	44,787.05	167.76	13,748.68	0.00	
20%	397.37	47,062.46	0.00	47,062.46	170.38	13,960.83	0.00	
30%	411.52	48,750.36	0.00	48,750.36	172.28	14,115.06	0.00	
40%	423.87	50,224.41	0.00	50,224.41	173.92	14,247.69	0.00	
50%	435.65	51,628.98	0.00	51,628.98	175.46	14,372.35	0.00	
60%	443.98	52,623.65	0.00	52,623.65	176.36	14,445.96	0.00	
70%	452.99	53,699.61	0.00	53,699.61	177.33	14,524.83	0.00	
80%	463.67	54,974.35	0.00	54,974.35	178.46	14,617.31	0.00	
90%	478.71	56,770.09	0.00	56,770.09	180.04	14,745.86	0.00	
99%	515.54	61,166.02	0.00	61,166.02	183.80	15,052.53	0.00	

Page 5 of 5

Code, test and beta test

- Based on requirements established, the SEER-IT application has been developed and tested
- Pilot test site since September 2007
- Wide beta testing since January 2008



A view of the SEER-IT solution

SEER by GALORATH

SEER-IT - Outside Sales Upgrade.IT

File Edit Estimate View Tools Options Window Help

Options

WBS Elements

Rollup

Purchased Hardware

Purchased Software

Application Development

Software/Database Services

End U s

Infrastructure Services

Training

Service Desk

Facilities

Scenarios

Outside Sales Upgrade.IT

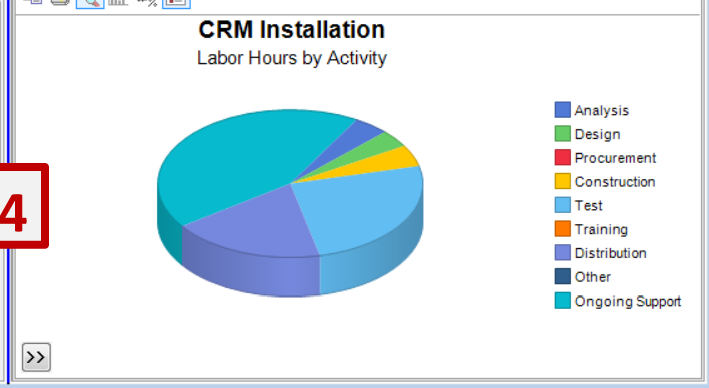
- Σ 1 Outside Sales Upgrade Package
  - Σ 1.1 Procurement Items
    - 1.1.1 Application Server
    - 1.1.2 Database Server
    - 1.1.3 PDA
    - 1.1.4 Database
  - Σ 1.2 Internal Development
    - 1.2.1 CRM Integration
    - 1.2.2 Security Module
    - 1.2.3 Enterprise Database Interface
  - Σ 1.3 Common Services
    - 1.3 nstallation
  - Σ 1.4 S etup/Support
    - 1.4 tallation
    - 1.4.2 End User PDA Setup
    - 1.4.3 End user application setup

Software/Database Services: CRM Installation	Least	Likely	Most	Note
USERS				
Number of Users	1,200	1,300	1,500	
Concurrent Users	200	300	500	
User Turnover	5.00%	5.00%	5.00%	
Business Units	4	5	8	
Physical Locations	5	7	10	
APPLICATION				
Setup Type (Application)		New Installation		
Applications	2	2	3	
Platform Type		Midrange		
Architecture		Client-Server		
Client Type		Hybrid		
Application Size	Low	Low	Nom	
Distribution Technology	Nom	Nom	Nom	
Origin		Inhouse		
DATABASE				

Quick Estimate | Phased Activity | Project Labor Risk

ITEM	VALUE	REFERENC
TOTAL		
Total Cost	350,086	
Total Labor Cost	350,086	
Total Material Cost	0	
Total Labor Hours	3,866	
Total Schedule Months	21.98	
Project		
Project Cost	200,837	
Project Labor Cost	200,837	
Project Material Cost	0	
Project Labor Hours	2,199	
Project Schedule Months	8.14	
Project Start Date	3/1/2007	
Project End Date	11/5/2007	
Ongoing Support		
Ongoing Support Cost	149,249	
Ongoing Support Labor Cost	149,249	

Activity Allocation | Project Labor Risk

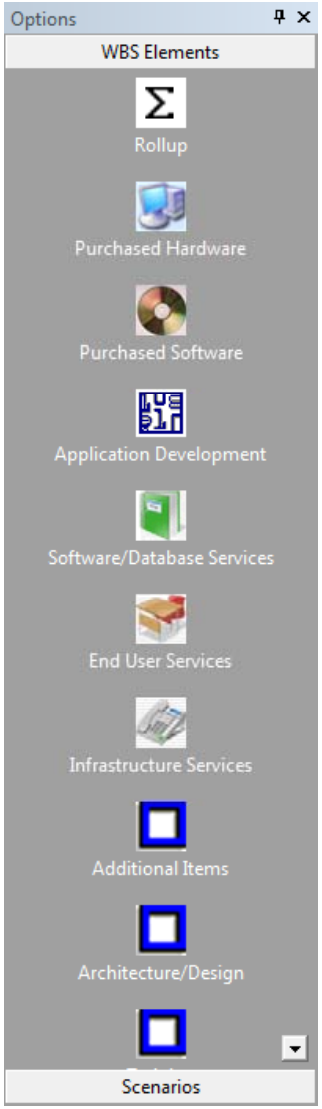


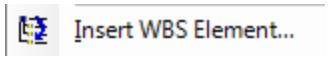
1 2 3 4

For Help, press F1

CAP NUM SCRL

1 – WBS Element Menu



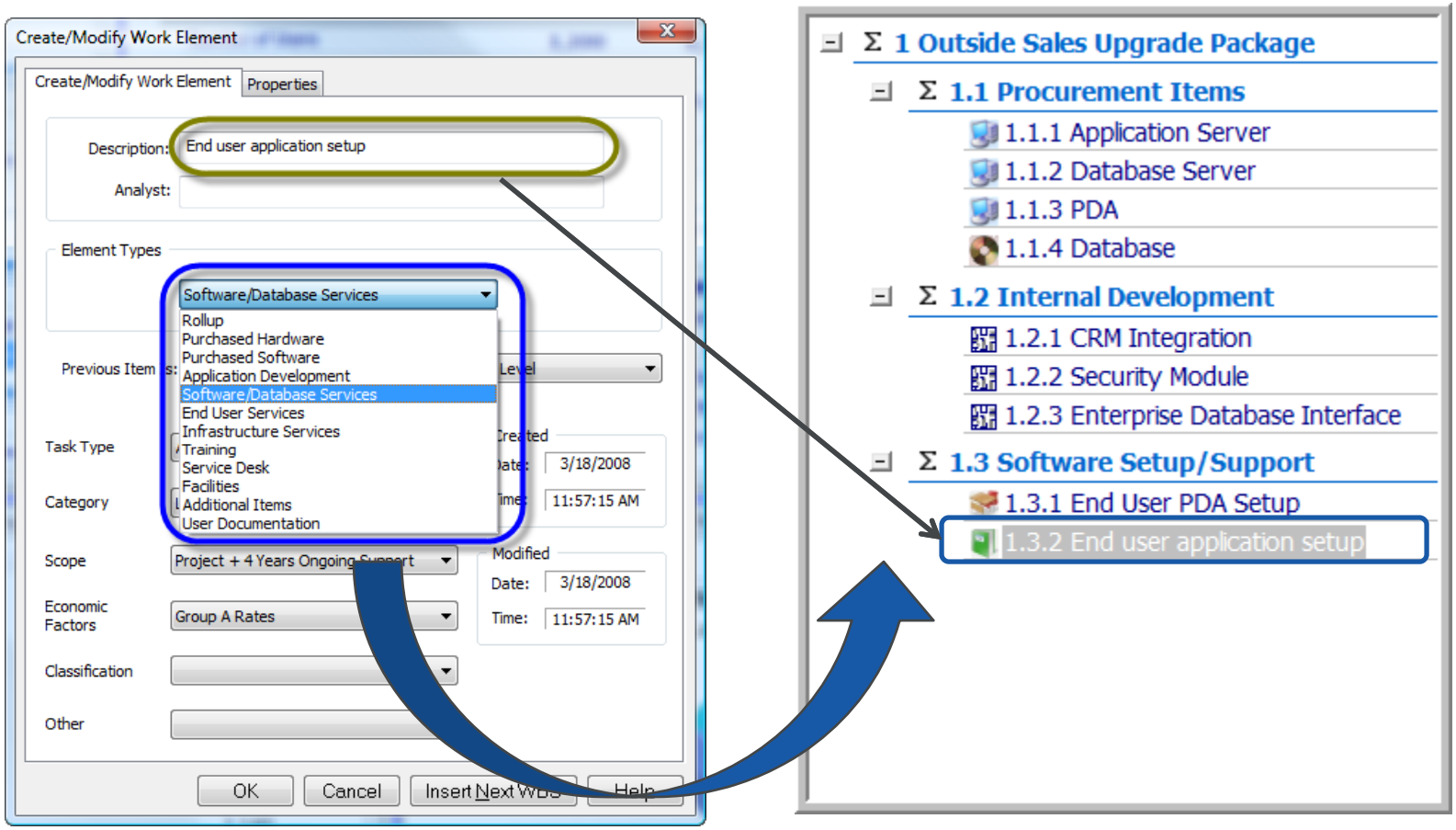
- Insert WBS elements by clicking on an element choice 

  - *(or from the edit menu or toolbar)*
- Projects generally have multiple elements
- Some elements estimate labor
  - *Software/Database Services*
  - *End User Services*
  - *Infrastructure Services*
  - *Documentation*
  - *Facilities*
  - *Service Desk*
  - *Training*
- Some elements allow you to enter labor or purchased costs
  - *Purchased Hardware*
  - *Application Development*
  - *Purchased Software*
  - *Additional Items*

2- Work Breakdown Structure

SEER by GALORATH

- Elements can be organized in any way



Choose from many element types to create a project WBS

3 - Parameters

Software/Database Services: En...	Least	Likely	Most	Note
USERS				
Number of Users	1,200	1,300	1,500	Users equivalen
Concurrent Users	120	120	150	Only 10% of use
User Turnover	2.00%	4.00%	5.00%	
Business Units	4	5	8	4-8 business un
Physical Locations	5	7	10	Will cover 5 - 10
APPLICATION				
Setup Type (Application)		New Installation		
Applications	1	1	1	
Platform Type		Mobile		
Architecture		Client-Server		
Client Type		Fat		
Application Size	Low	Low+	Nom-	
Distribution Technology	Nom	Nom+	Hi-	
Origin		In-house		
DATABASE				

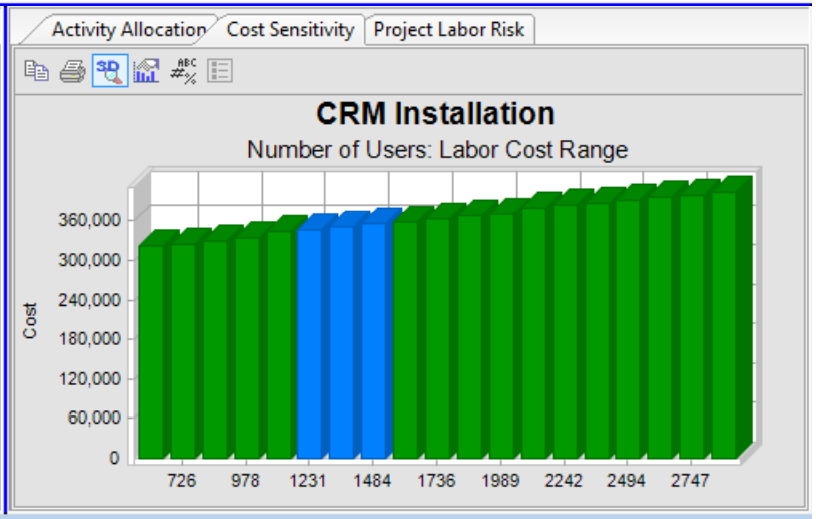
- Each element has a set of parameters used to drive calculations
- Most parameters are expressed as least, likely and most inputs
- Each parameter can be annotated to keep track of the assumption behind the input

4 – Reports and charts

- Choose from several report and chart types to view results
- The reports displayed will be for the selected WBS element
- If the selected element is a rollup, the result will be a summary figure

Quick Estimate | Phased Activity | Project Labor Risk

ACTIVITY	SCHEDULE M...	LABOR HO...	LABOR COST	MATERIAL C
Analysis	1.22	167	14,927	
Design	1.10	147	21,791	
Procurement	0.00	0	0	
Construction	1.48	181	15,416	
Test	2.24	977	86,978	
Training	0.00	0	0	
Distribution	2.10	727	61,724	
Other	0.00	0	0	
Project Total	*8.14*	*2,199*	*200,837*	
Ongoing Support	11.98	1,667	149,249	
Total	21.98	3,866	350,086	



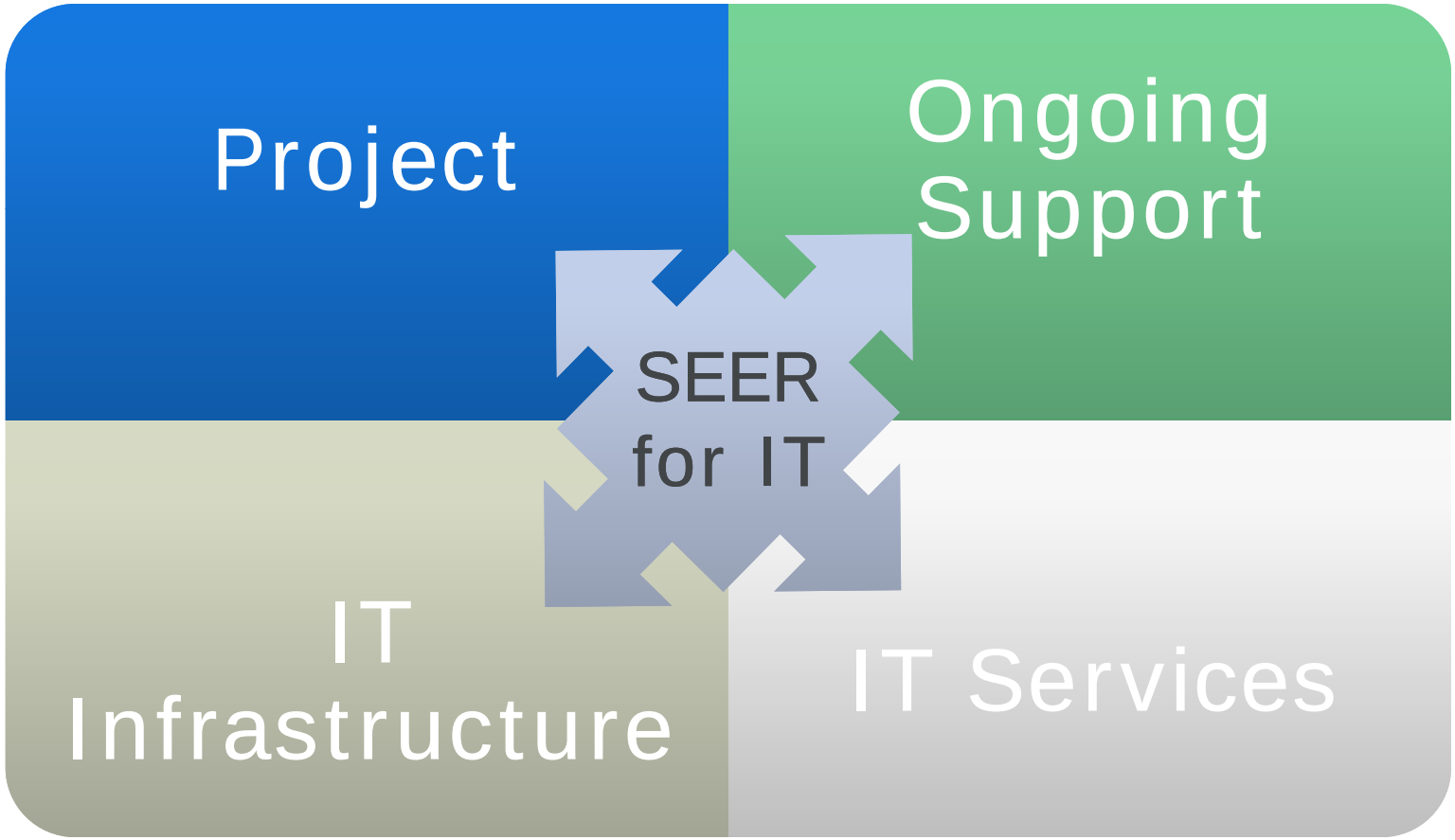
Conclusions

- SEER-IT project goals met
  - Developed an easy to use tool for IT estimation
  - Being used by various types of IT organizations to develop estimates and evaluate trades
- SEER-IT addresses estimating challenges with
  - Comparable estimates
  - Repeatable processes
  - Covers a broad spectrum of IT projects
- Work on this type of model is ongoing
  - Functional models can be calibrated and updated with new data
- Software features will continue to improve

SEER-IT estimates allow you to…

- Tie costs drivers to requirements
- Look at a project from different angles
  - Organizational (marketing vs. engineering)
  - Functional (network services vs. data center)
  - Physical (headquarters vs. field office)
  - Business requirement
- Organize estimates by
  - Phase (requirements vs. design vs. distribution)
  - Role (administrators vs. technicians)
  - Cost category (in-house vs. contractor)
  - Time phased (monthly vs. annual)
- Evaluate risk

SEER IT Provides Total Costs Of IT Systems & Support



Contact Information

SEER by GALORATH

Website:

http://www.galorath.com/

Corporate Headquarters:

Americas

Phone: +1 (310) 414 3222

E-mail: info@galorath.com

International Headquarters

Europe, Asia, Australia & Africa

Galorath International Ltd.

United Kingdom

Phone: +44 (0) 1252 724 518

Mobile: +44 (0) 7764 685 332

E-mail: international@galorath.com