



Finding the Estimating Data

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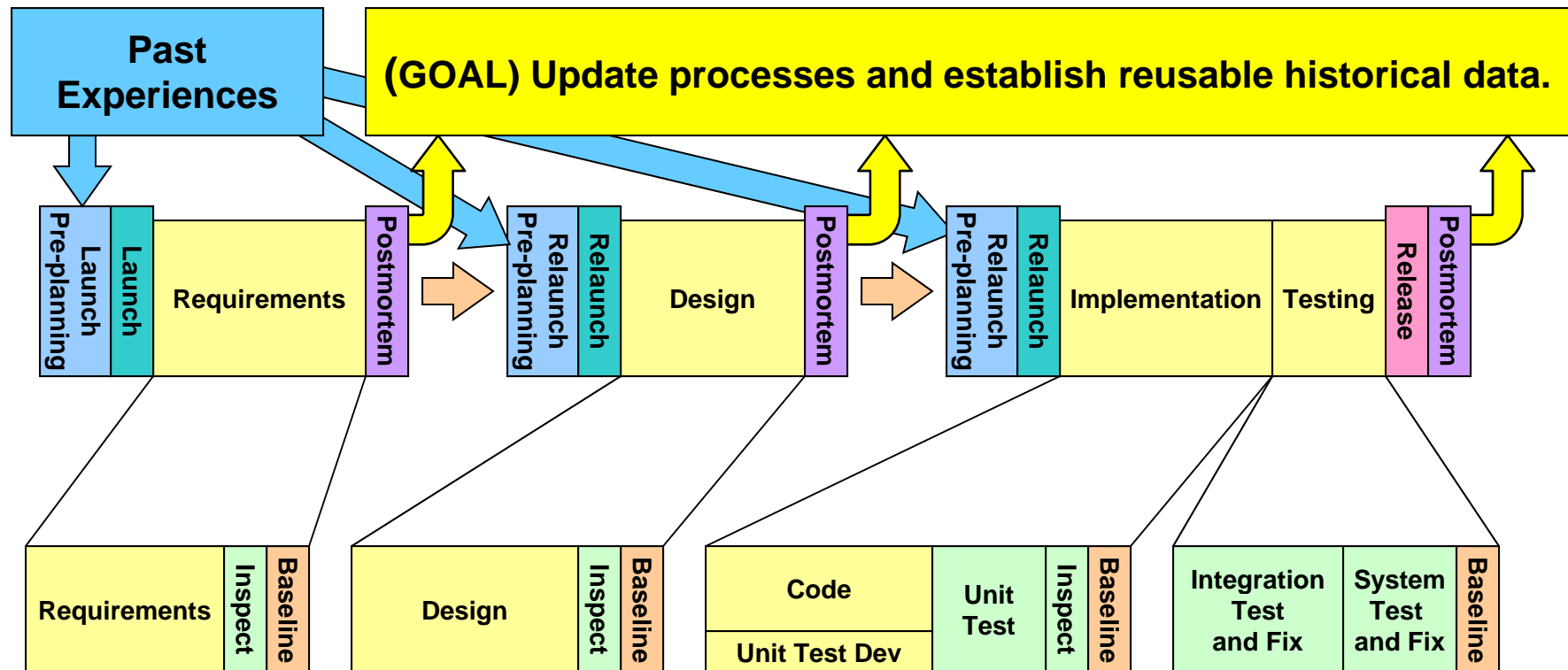
“Finding the Estimating Data”



This presentation will discuss our project’s journey in an attempt to discover how to collect and organize historical data in a way that is useful for future estimates. This presentation will give examples of the original approach and discuss its issues and drawback. Then, we will talk about the current approach being used, which includes the use of both size- and effort-based proxy tables based on the available historical data. We will discuss the full software development lifecycle from requirements elicitation to product delivery and provide the associated estimation variables.



Overall Development Cycle





The Journey



- *Reviewed individual workbooks from other projects to help plan and estimate the phase efforts*
- *Tailored the organizational processes, but the data from the previous projects did not align well*
- *Used a lot of “bucket” tasks due to lack of organized historical data and tasks*
- *Tracked actual effort and documented the actual tasking throughout the phases*





Goals



- ***Consistency - Assemblies, phases, tasks, units***
- ***Standards – Standard processes so we would not reinvent the engineering practices for each project***
- ***Efficiency – Each task in each process provides a ROI***
- ***Reusable Data – Data that is reusable and fed back into the organization's historical data set***
- ***Simple Data Mining - Able to correlate the tasks into historical data groupings***
- ***Flexibility – Enough flexibility to allow room for creativity***





Historical Data Organization



Early

- Requirements (Gather, Analyze, Document, SRS)
- Client Routine (Design, Modify, New)
- External I/O (Design, Modify, New)
- Graphical Product (Design, Modify, New)
- ...

Later

- Requirements (Conceptual Design, Elicitation, Analysis, Requirements, Use Cases, Screen Sketches, Trace Matrix)
- Design (Class Diag., Seq. Diag., Class Spec., Screen Design, State Diagram, Method Spec., DDD, STP, STD)
- Implementation (Configuration, Model, View, Controller, DB Access, Outputs)
- ...

Latest

- Elicitation Process
- SRS Process
- SDD Process
- DDD Process
- Feature (Model, View, Controller) Implementation Processes
- User's Guide Document Process
- STP Process
- STD Process
- Integration Testing Process
- System Testing Process





Latest Approach



- **Processes**
 - Logical units of work
- **Relative–Size Tables**
- **Allocation Tables (Task Distributions)**
- **Proxy Table (Effort and Size Data)**
- **TSP Workbook Integration**
 - Custom Processes
 - SUMS
 - Task Planner
 - Task Creation

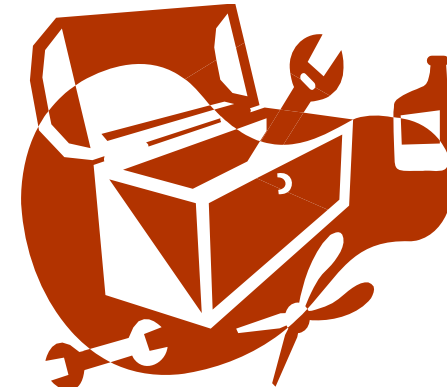




Processes



- ***Elicitation Process***
- ***Software Requirements Specification Process***
- ***Software Design Process***
- ***Database Design Process***
- ***Software Test [Plan/Description] Processes***
- ***Feature [Model/View/Controller] Impl Processes***
- ***User's Guide Document Process***
- ***Integration Testing Process***
- ***System Testing Process***

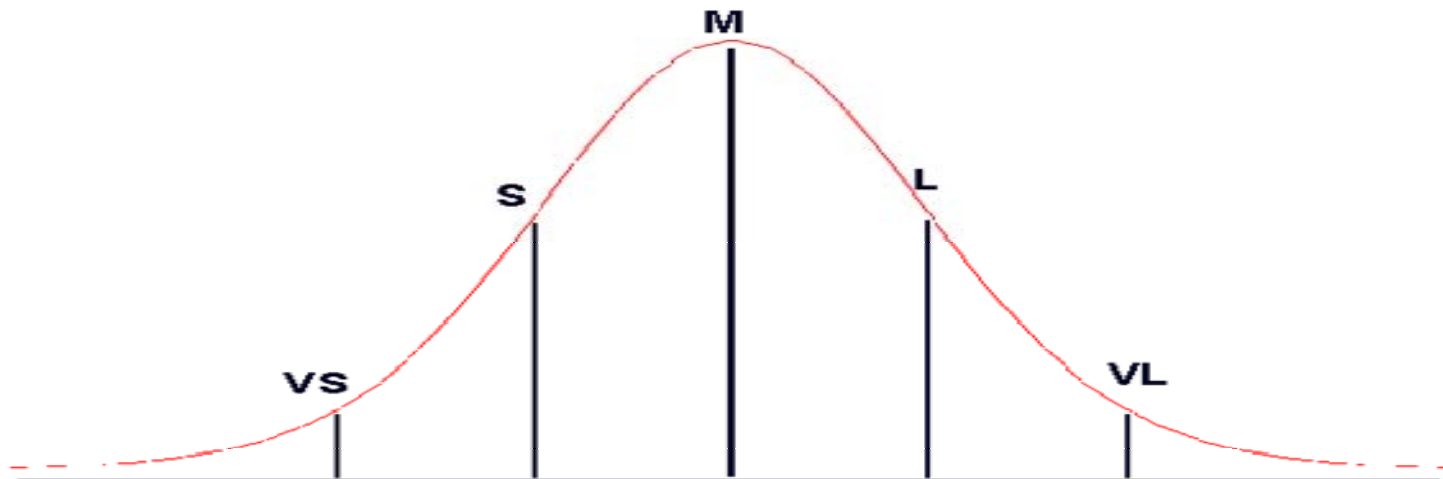




Relative-Size Table



Historical data are used to produce relative-size tables¹



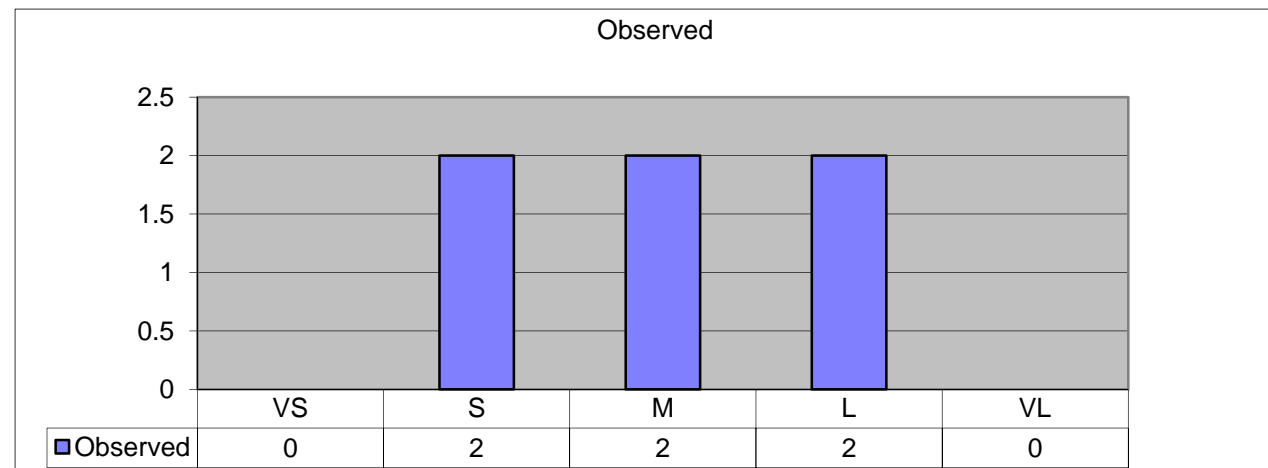
¹ Watts S. Humphrey, PSP: A Self-Improvement Process for Software Engineers (Pearson Education, Inc., 2005) p. 78.



Relative-Size Table²



6		130.3	In	Avg In										chi^2=
Elicitation (Hours Per Person)		2.97	0.50	Log Midpts	Log Bnds	Midpts	Upper Bnds	Expected %	Cnt	MidPts	Size	Observ	Expect	
Cyc1 Per1	39.7	3.68			0		0	0.066	6	7.20	VS	0	0.40	0.40
Cyc1 Per2	19.1	2.94		1.974		7.202		0.241		11.88	S	2	1.45	0.20
Cyc2 Per1	21.3	3.05			2.224		9.250	0.382		19.60	M	2	2.30	0.03
Cyc2 Per2	10.0	2.30		2.474		11.880		0.241		32.33	L	2	1.45	0.20
Cyc3 Per1	12.8	2.54			2.725		15.258	0.066		53.32	VL	0	0.40	0.40
Cyc3 Per2	27.4	3.31		2.975		19.597								0.31
					3.225		25.169							
				3.475		32.325								
					3.726		41.517							
				3.976		53.321								





Allocation Table



RCAT v1.0 Project #2					
Elicitation Process	Resources	Hrs	Hrs	Projects Total	% in phase
Plan	2	19.9		19.9	19.26%
Interview	2	29.5		29.5	28.56%
Analysis	2	32.6		32.6	31.56%
Verification	2	11.8		11.8	11.42%
Validation	2	9.5		9.5	9.20%
Total		103.3		103.3	100.00%

SRS Process	Resources	Avg Hrs /Person	Avg Hrs /Person	Projects Total	% in phase
Conceptual Design	1	4.6		4.6	6.91%
Context Diagram	1	2.6		2.6	3.91%
Screen Sketches	2	18.3		18.3	27.42%
Use Cases	2	13.7		13.7	20.58%
Requirements	2	9.3		9.3	13.99%
Assemble SRS	1	2.2		2.2	3.31%
SRS Inspection	2	8.6		8.6	12.92%
SRS Fixes	2	5.1		5.1	7.66%
Trace Matrix	2	2.2		2.2	3.31%
Total		66.6		66.6	100.00%

Miscellaneous	Resources	Hrs	Hrs	Projects Total	Average
CM Plan	1	0.5		0.5	0.5
Product Registration	1	2.7		2.7	2.7



Proxy Table



Process	Units	VS	S	M	L	VL	Rate
Elicitation	Hours	7.20	11.88	19.60	32.33	53.32	1.00
Software Requirement Spec	Hours	47.17	53.49	60.66	68.79	78.00	1.00
Database Design Doc	Pages	7.81	10.18	13.27	17.29	22.54	0.28
Software Design Doc	Pages	17.11	25.04	36.66	53.67	78.57	1.19
Class Diagrams	Diagrams	1.47	3.19	6.93	15.07	32.76	0.22
Screen Designs	Screens	2.09	4.10	8.06	15.84	31.14	0.30
Sequence Diagrams	Diagrams	9.44	10.63	11.96	13.46	15.15	0.29
Software Test Plan	Pages	21.12	21.80	22.49	23.21	23.95	3.55
Software Test Desc	Pages	10.85	23.21	49.65	106.20	227.18	0.43
Feature Model	Hours	2.61	8.75	29.38	98.61	330.96	1.00
Feature View	Hours	0.91	3.50	13.52	52.19	201.43	1.00
Feature Controller	Hours	1.40	5.28	19.92	75.20	283.90	1.00



TSP Workbook – Custom Processes



TSP Custom Processes Form

Name Individual Development Plan

Team Requirements

Date 9/7/2011

Cycle REQ

**Data from
Allocation Table**

Process	Phase	Default Task Name	Map-to Phase	Time in Phase%	# of Resources
Task	Task	- Task	PLAN	100.00	1.00
Elicitation Process	EP	- Planning	PLAN	19.28	2.00
Elicitation Process	ECI	- Conduct Interviews	REQ	28.56	2.00
Elicitation Process	ERA	- Analysis	CODE	31.56	2.00
Elicitation Process	EPR	- Verification	CR	11.42	2.00
Elicitation Process	ETR	- Validation	CODEINSP	9.20	2.00
SRS Document Process	SRSCONCEPT	- Conceptual Design	HLD	6.91	1.00
SRS Document Process	SRSCONTENT	- Context Diagram	DLD	3.91	1.00
SRS Document Process	SRSSS	- Screen Sketches	DLDR	27.42	2.00
SRS Document Process	SRSUC	- Use Cases	REQ	20.58	2.00
SRS Document Process	SRSREQ	- Requirements	CODE	13.99	2.00
SRS Document Process	SRSASSEM	- Assemble SRS	COMPILE	3.31	1.00
SRS Document Process	SRSINSP	- SRS Inspection	CODEINSP	12.92	2.00
SRS Document Process	SRSFIX	- SRS Fixes	UT	7.66	2.00
SRS Document Process	SRSRTM	- RTM	ST	3.31	2.00



TSP Workbook - SUMS



**Data from
relative-size table
or proxy table**

TSP Size Summary - Form SUMS						Planned Size							
Name		Individual Development Plan											
Team		Requirements											
Date		9/7/2011											
Cycle		REQ											
ID	Assembly, Sub-Assembly, or Part Name	(A)ssembly or (P)art	Parent Assembly Name	Owner	Size Measure	Estimating Assumptions	Base	Deleted	Modified	Added	Reused	New and Changed	Total
1	Elicitation	A	SYSTEM		Text Pages		0	0	0	108.02	0	108.02	108.02
2	Req	A	SYSTEM		Req Pages		0	0	0	78	0	78	78
3	Elicitation - Cust Grp1 Cyc1	A	Elicitation		Text Pages	L - Elicitation Process	0	0	0	32.33	0	32.33	32.33
4	Elicitation - Cust Grp1 Cyc2	A	Elicitation		Text Pages	M - Elicitation Process	0	0	0	19.6	0	19.6	19.6
5	Elicitation - Cust Grp2 Cyc1	A	Elicitation		Text Pages	L - Elicitation Process	0	0	0	32.33	0	32.33	32.33
6	Elicitation - Cust Grp2 Cyc2	A	Elicitation		Text Pages	S - Elicitation Process	0	0	0	11.88	0	11.88	11.88
7	Elicitation - Cust Grp1 Cyc3	A	Elicitation		Text Pages	S - Elicitation Process	0	0	0	11.88	0	11.88	11.88
8	SRS	A	Req		Req Pages	VL - Doc Process	0	0	0	78	0	78	78
9	Prod Registration	A	SYSTEM		Text Pages	Task	0	0	0	3	0	3	3
10	CM Plan	A	SYSTEM		Text Pages	Task	0	0	0	1	0	1	1



TSP Workbook – Task Planner



Assembly Task Planner

Assemblies

- SYSTEM
 - Elicitation
 - Elicitation - Cust Grp1 Cyc1
 - Elicitation - Cust Grp1 Cyc2
 - Elicitation - Cust Grp2 Cyc1
 - Elicitation - Cust Grp2 Cyc2
 - Elicitation - Cust Grp1 Cyc3
 - Req
 - SRS
 - Prod Registration
 - CM Plan

Assembly Elicitation - Cust Grp1 Cyc1

Size 32.33 **Text Page**

Rate 1

Total Hours 64.7

Process Elicitation Process

Tasks

Task	Plan Hrs.	Engrs.	Defects	
			Inj.	Rem.
Elicitation - Cust Grp1 Cyc1 - Planning	12.5	2.0	0.0	0.0
Elicitation - Cust Grp1 Cyc1 - Conduct Interviews	18.5	2.0	0.0	0.0
Elicitation - Cust Grp1 Cyc1 - Analysis	20.4	2.0	0.0	0.0
Elicitation - Cust Grp1 Cyc1 - Verification	7.4	2.0	0.0	0.0
Elicitation - Cust Grp1 Cyc1 - Validation	5.9	2.0	0.0	0.0

Delete Tasks Add Tasks Close



TSP Workbook – Task



TSP Task Planning Template - Form TASK

Name Individual Development Plan

Team Requirements

Date 9/7/2011

Cycle REQ

Selected Assembly

Generate Task List

Update Plan

Total Plan Hours

252.9

Custom Phase Names

Reminder:

If Size and Rate are present, estimated hours is calculated as Size / Rate whenever the plan is updated. To prevent calculation, size or rate must

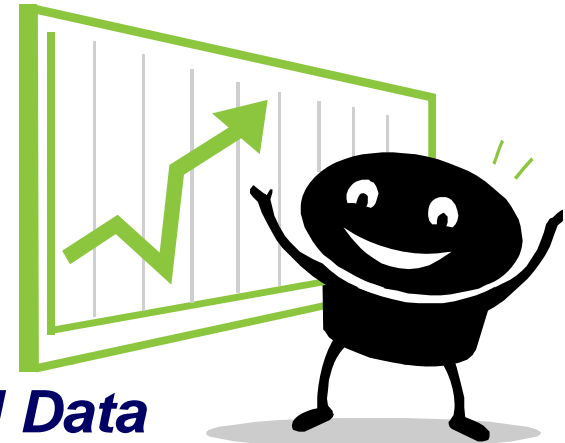
Assembly	Phase	Task	Resources	Estimated Size	Size Measure	Rate (per Hr.)	Time in Phase %	Estimated Hours	Engrs	Plan Hours	
Elicitation - Cust Grp1 Cyc1	PLAN	Elicitation - Cust Grp1 Cyc1 - Planning		32.33	Text I	1.0	19.3	6.2	2.0	12.5	EP
Elicitation - Cust Grp1 Cyc1	REQ	Elicitation - Cust Grp1 Cyc1 - Conduct Interviews		32.33	Text I	1.0	28.6	9.2	2.0	18.5	ECI
Elicitation - Cust Grp1 Cyc1	CODE	Elicitation - Cust Grp1 Cyc1 - Analysis		32.33	Text I	1.0	31.6	10.2	2.0	20.4	EA
Elicitation - Cust Grp1 Cyc1	CR	Elicitation - Cust Grp1 Cyc1 - Verification		32.33	Text I	1.0	11.4	3.7	2.0	7.4	EVER
Elicitation - Cust Grp1 Cyc1	CODEINSP	Elicitation - Cust Grp1 Cyc1 - Validation		32.33	Text I	1.0	9.2	3.0	2.0	5.9	EVAL
Elicitation - Cust Grp1 Cyc2	PLAN	Elicitation - Cust Grp1 Cyc2 - Planning		19.6	Text I	1.0	19.3	3.8	2.0	7.5	EP
Elicitation - Cust Grp1 Cyc2	REQ	Elicitation - Cust Grp1 Cyc2 - Conduct Interviews		19.6	Text I	1.0	28.6	5.6	2.0	11.2	ECI
Elicitation - Cust Grp1 Cyc2	CODE	Elicitation - Cust Grp1 Cyc2 - Analysis		19.6	Text I	1.0	31.6	6.2	2.0	12.4	EA
Elicitation - Cust Grp1 Cyc2	CR	Elicitation - Cust Grp1 Cyc2 - Verification		19.6	Text I	1.0	11.4	2.2	2.0	4.5	EVER
Elicitation - Cust Grp1 Cyc2	CODEINSP	Elicitation - Cust Grp1 Cyc2 - Validation		19.6	Text I	1.0	9.2	1.8	2.0	3.6	EVAL
SRS	HLD	SRS - Conceptual Design		78	Req F	1.0	6.9	5.4	1.0	5.4	SRSCONCEPT
SRS	DLD	SRS - Context Diagram		78	Req F	1.0	3.9	3.0	1.0	3.0	SRSCONTENT
SRS	DLDR	SRS - Screen Sketches		78	Req F	1.0	27.4	21.4	2.0	42.8	SRSSS
SRS	REQ	SRS - Use Cases		78	Req F	1.0	20.6	16.1	2.0	32.1	SRSSUC
SRS	CODE	SRS - Requirements		78	Req F	1.0	14.0	10.9	2.0	21.8	SRSSREQ
SRS	COMPILE	SRS - Assemble SRS		78	Req F	1.0	3.3	2.6	1.0	2.6	SRSSASSEM
SRS	CODEINSP	SRS - SRS Inspection		78	Req F	1.0	12.9	10.1	2.0	20.2	SRSSINSP
SRS	UT	SRS - SRS Fixes		78	Req F	1.0	7.7	6.0	2.0	11.9	SRSSFIX
SRS	ST	SRS - RTM		78	Req F	1.0	3.3	2.6	2.0	5.2	SRSSRTM
Prod Registration	PLAN	Prod Registration - Task		3	Text I	1.0	100.0	3.0	1.0	3.0	Task
CM Plan	PLAN	CM Plan - Task		1	Text I	1.0	100.0	1.0	1.0	1.0	Task



Benefits

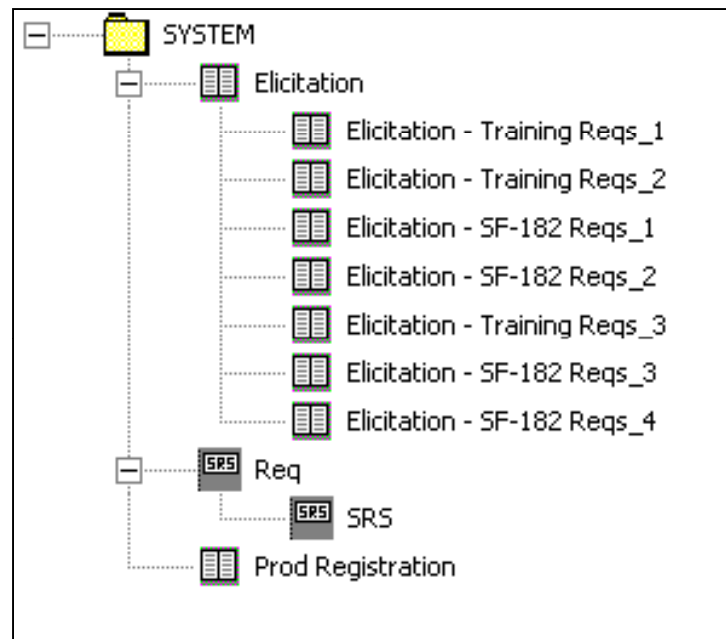


- **Consistent Data Tracking**
- **Standardized Task Definitions**
- **Simplified Data Mining**
- **Organization, Project, and Individual Data**
- **Training**
- **Improved Efficiencies**
- **Advanced Improvement Practices**
 - *Build on a common approach*
- **Improves Repeatability (IDP, PTS, RTS, RCAT)**
- **Process-Oriented Strategy**





IDP Data Comparisons



IDP REQ phase is 3 weeks from completion:

- Project has turned out to be larger than thought
- There has been a balance of over/under estimates
- IDP is estimated to complete 1 week late (7% error)
- IDP is estimated to complete with more hours than planned (7%)



Team Member Testimonials



“The current approach is much more efficient and effective. Estimating in a less granular way is much easier. We completed the launch faster. The SUMS structure along with the task planner feature makes it a breeze to add new work to our plans”



“Organizing the estimating data in logical chunks makes so much more sense. For years we’ve been filling out spreadsheets and have not been able to mine the data in a useful way. I’m optimistic about using the data for the upcoming design phase launch and I’m confident that our organizational data is going to get better and better as we add new data points.”



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