TOTAL METRICS

Project Tracking Using Functional Size Measurement

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Canberra February 2003

"Without objective data you are just another person with an opinion"

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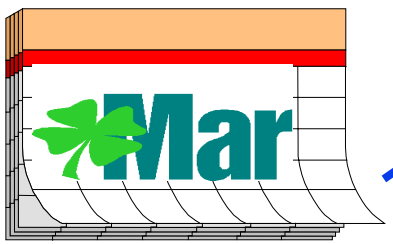
Agenda

- **Functionality Based Software Tracking Model**
  - **Product tracking model**
  - **Overview of Functional Size Measurement technique**
  - **Tracking Project Progress**
  - **Reporting Project Progress**
  - **Benefits and Limitations**

Tracking Deliverables vs Tasks

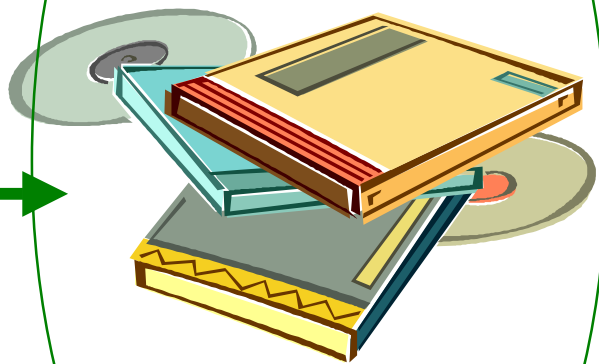


INPUTS

Process Based Tracking

PROJECT TASKS

Product Based Tracking



OUTPUTS

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Process Based Tracking

- Measures project progress by the completion of processes
- Project Work items tracked = tasks and activities
- Project Costs, Effort and Schedule are allocated to activities based on phased breakdown

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Product Based Tracking

- Measures project progress by completeness of individual software product components
- Project work items tracked = functional requirements
- Work items may be equivalent to:
  - Functional modules
  - Requirements statements
  - Use Cases
  - Base Functional Components
    (as defined in ISO/IEC 14143-1)

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ISO/IEC 14143-1 Functional Size Measurement

- ***B***ase ***F***unctional ***C***omponent (***BFC***)

  "*An elementary unit of functional user requirements* ***defined by and used by an FSM Method for measurement purposes.***"

- Functional User Requirements

  "A sub-set of the user requirements. ***The Functional User Requirements represent the user practices and procedures that the software must perform to fulfil the users' needs. They exclude Quality Requirements and any Technical Requirements."***

ISO/IEC 14143-1 Functional Size Measurement

- ***F***unctional ***S***ize ***M***easurement ***M***ethod

  "FSM Method: A specific implementation of FSM defined by a set of rules, which conforms to the mandatory features of this part of ISO/IEC 14143"

- ISO/IEC approved methods for ***FSM*** :
  - ***ISO/IEC 20926 - IFPUG Function Point Method***
  - ***ISOIEC 20968 - MKII Function Point Method***
  - ***ISO IEC 19761 - COSMIC-FFP Functional Size Method***

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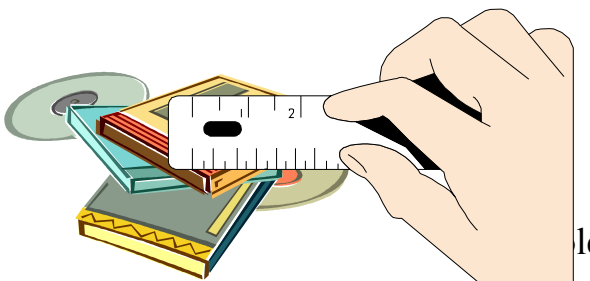
Functional Size Based Tracking

- Each ***Base Functional Unit*** is measured for size in function points
- Project Effort is allocated to each ***Base Functional Unit*** based its functional size and the assigned productivity rate
- Tracking compares actual effort consumed for that ***BFC*** to earned effort based on function points completed
- Project scope changes can be quantitatively tracked and measured in ***function points*** impacted
- Project estimates can be made at functional requirements stage based on ***functional size***

WHAT is Functional Size Measurement?

- **ISO/IEC/JTC1/SC7 Standard #14143 -1 definition**:

"*Functional Size : A size of software derived by quantifying the* ***functional user requirements***"



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Origins of Functional Size Measurement

- Developed late 1970's by Alan Albrecht at IBM
- Needed a measure of size which was independent of language, tools, techniques and technology
- **Size = functions delivered to the user**
- Allowed comparative measures of productivity
- ISO standard 14143 :1998

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Characteristics of Functional Size Measurement

- Measures Functional User Requirements
- external 'User' view
- applied any time in SDLC
- derived in terms understood by users
- derived without reference to:
  - effort
  - methods used
  - physical or technical components

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IFPUG
Base Functional Components

- **Processes**

  eg. Modify Job Details

  Enquire Job Details

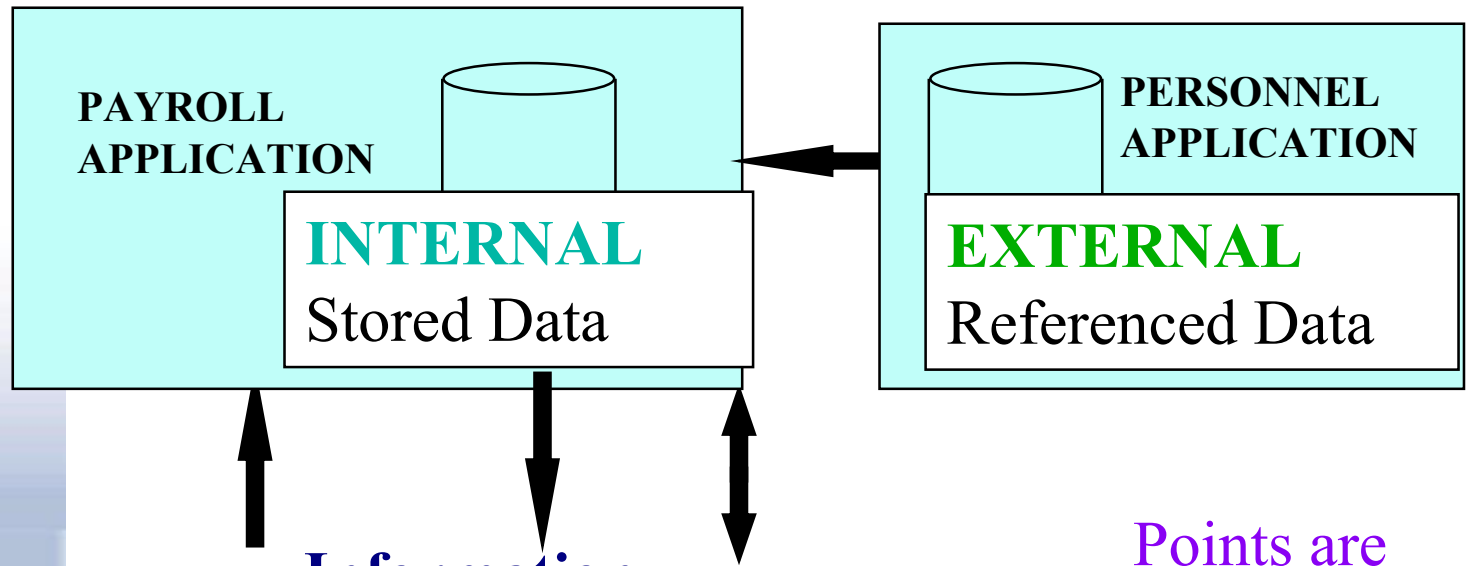
  Report Job Allocations

- **Data**

  eg. Job Details

  Employee Data

IFPUG FSM Method
Measured components



Data INPUT to Store

Information Extracted as OUTPUT

ENQUIRY on stored Data

Points are allocated to each **Transaction** and **Data File** based on the type and complexity of the function.

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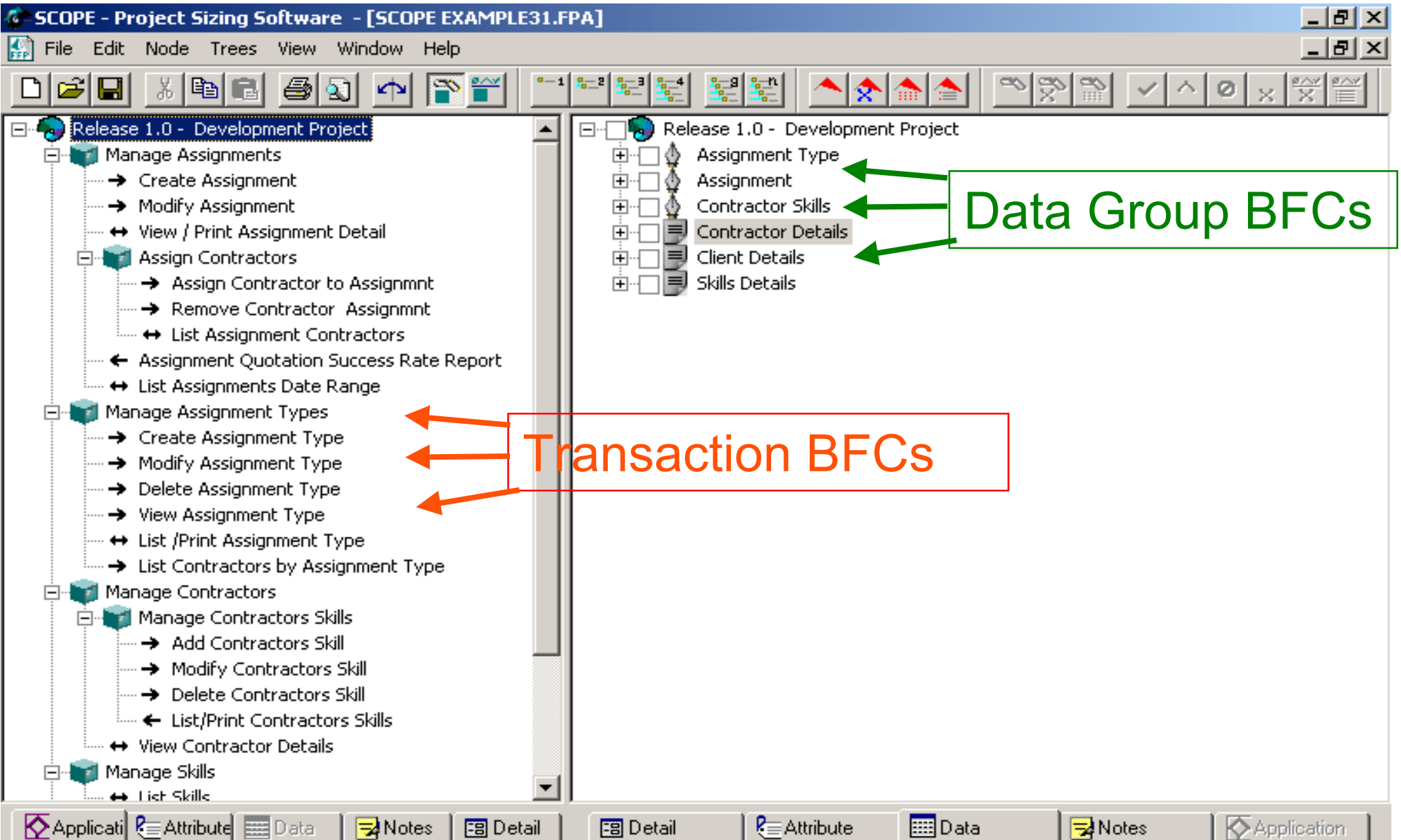
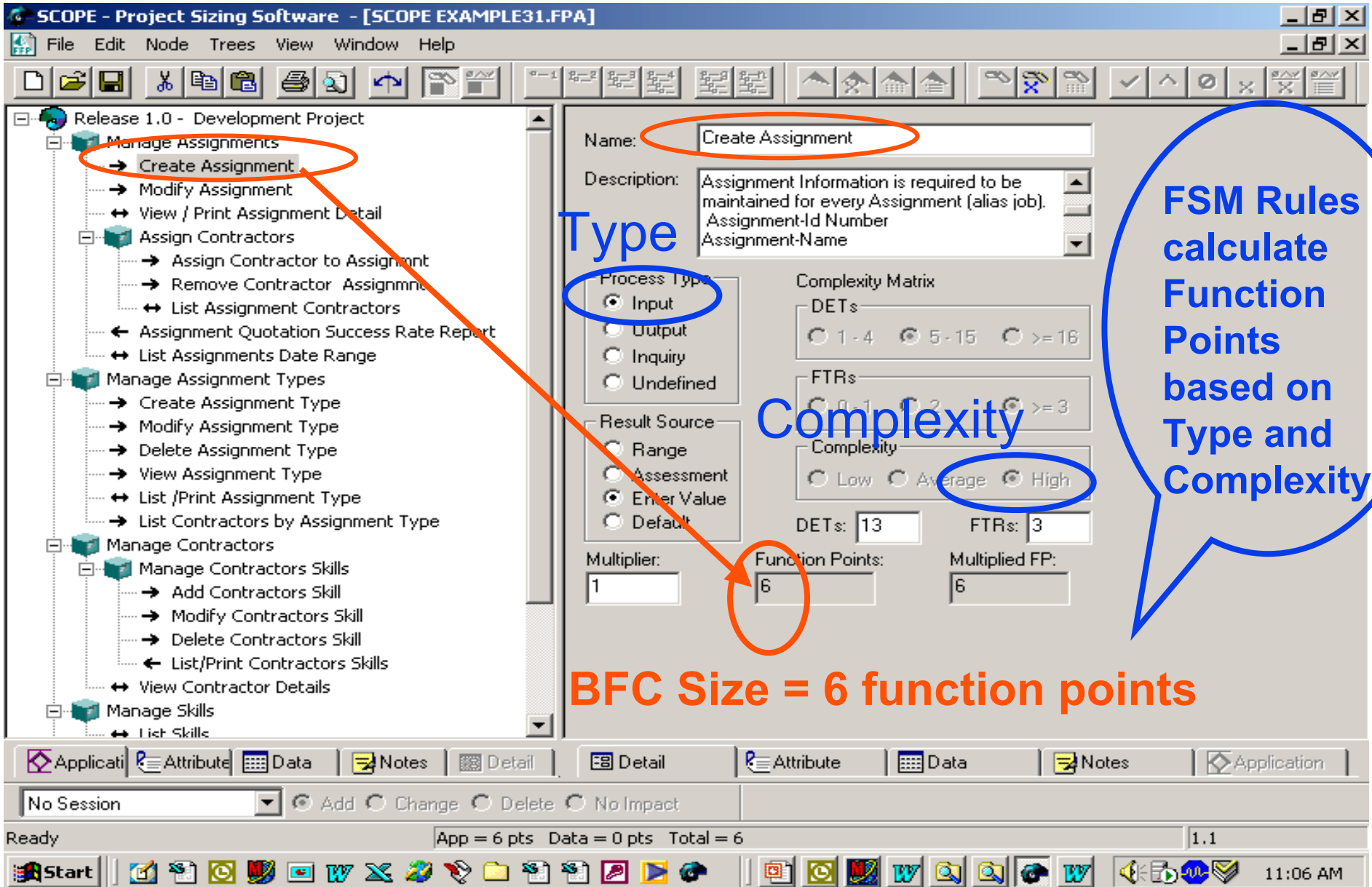
Steps in Product Tracking

- Decompose Product into Base Functional Components
  (IFPUG method groups BFCs by:
  - Transactions
  - Data Groups)
- Measure Function Size of each BFC in function points (FPs)
- Determine Productivity Rate to deliver a function point
- Map Project Phase to Completeness Indicator
- Calculate Project Resource Estimates using FPs
  - Predict total Effort Hours
  - Predict total Elapsed time (duration)
  - Predict total Costs
- Assign Predicted Effort hours to each function
- Record Project Metrics
  - Effort expended against each function
  - Completion Status of each function
- Report Completion status of Project

1. Decompose Product



2. Assign Points to each BFC



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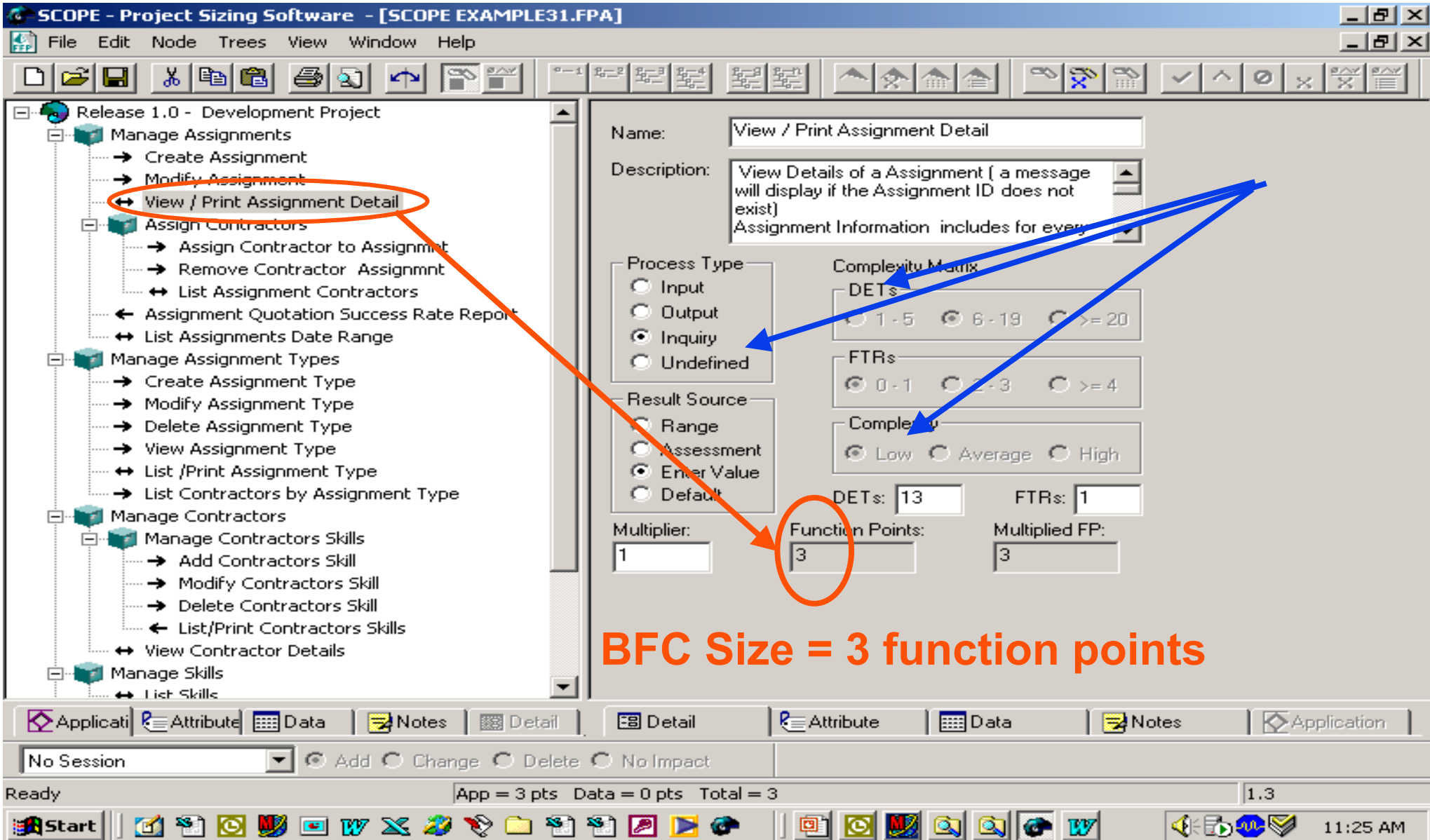

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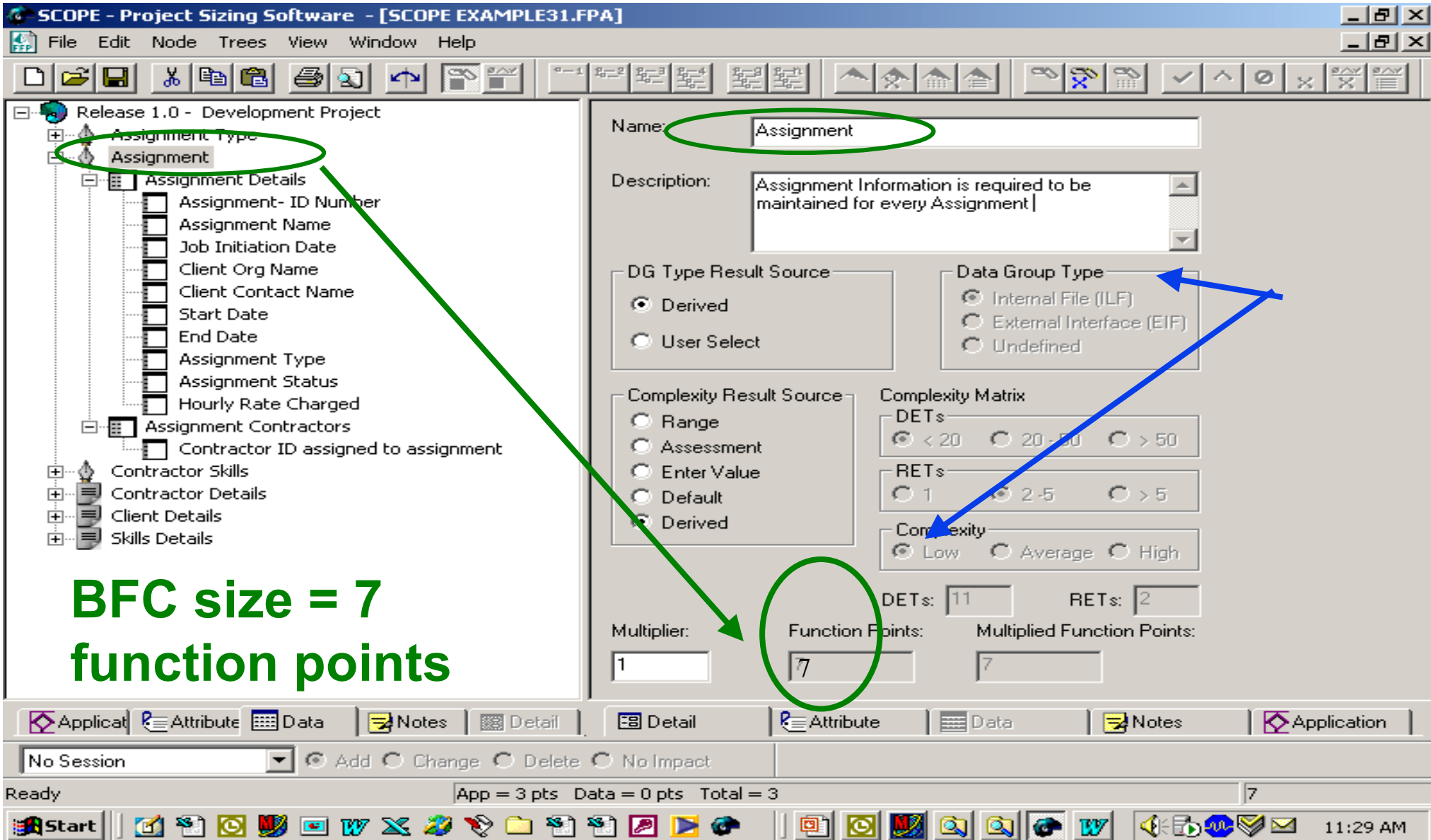

2. Determine Productivity Rate

- Productivity rate
  = effort hours / function point of product delivered
  - Use Industry based figures
- International Software Benchmarking Group (ISBSG) - Publicly Available Data based on Functional Size measurement
  - Release 8, February 2003
  - >2000 projects
  - >20 Countries
  - Over 70 programming languages

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Productivity Factors

- Team Size
- Context
  - Organisation type, business area
- Development Platform
  - Language, DBMS, type of computer
- Team Skills

- Reference “Soft” Factors and Software Productivity – Which Ones Matter Chris Lokan, University of NSW, 2002

Typical Productivity Rates

- PDR = product delivery rate
- = hours per function point

Platform Options	Median PDR hours / fp (ISBSG - Release 7)	Predicted Total Effort Hours	Predicted Total Cost per fp (@ $120/hr	Predicted Total Cost
Microsoft Access	2.4	286	$288/fp	$34,271
Visual Basic	7.5	893	$900/fp	$107,100
Oracle	10.3	1226	$1236/fp	$147,084
Customised Package	9.8	1166	$1176/fp	$139,944
Java	19.6	2332	$2332.4/fp	$279,888

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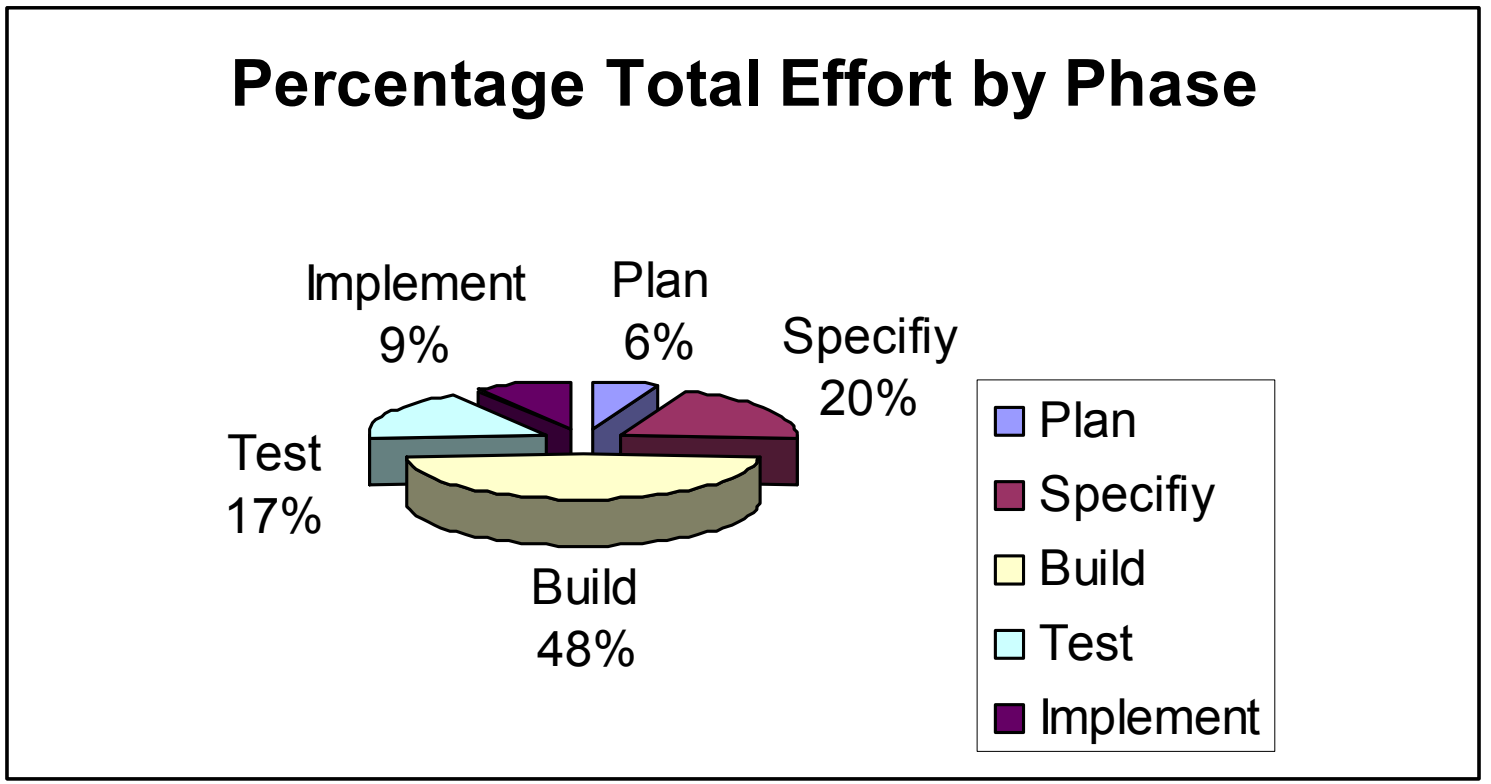
4. Map BFC Completeness to Phase



International Software Benchmarking Standards Group - ISBSG – The Software Metrics Compendium - 2002

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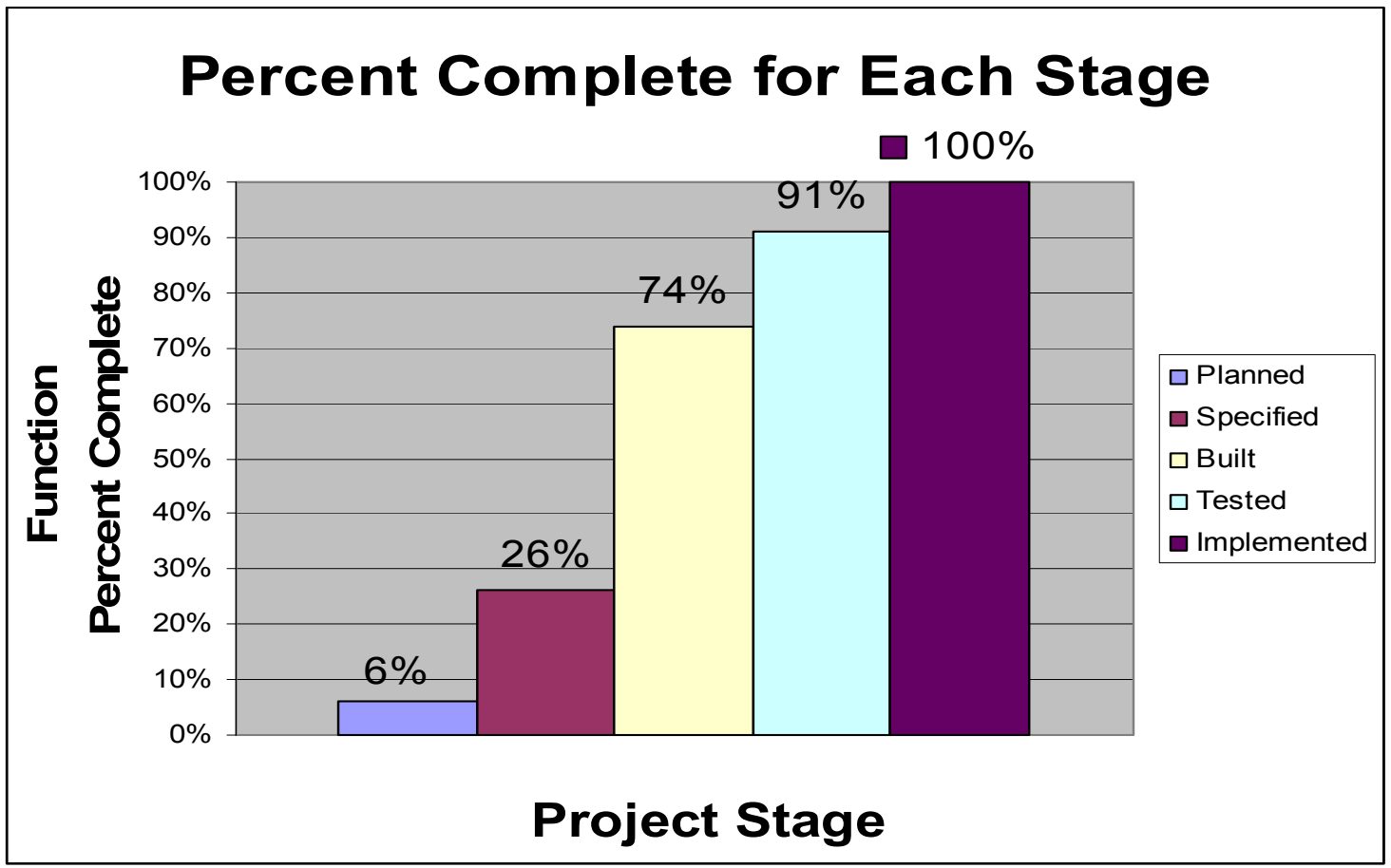
4. Map BFC Completeness to Phase

- Function % completeness determined when BFC has completed each milestone.



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5. Calculate Project Resource Estimates

- Productivity Rate = 2.4 hours / fp
- Size = 119 fps
- Maximum Team Size = 2
- Effort Costs = $120 /hour
- Total Predicted Effort = 286 hours = (119*2.4)
- Cost rate = $288 / fp
- Total Predicted Cost = $34,272
- Project Start Date = 1st March 2002
- ++ Predicted End Date = 1st July 2002

++Project Duration (months) = Constant*Size^{E1}*Maximum Team Size^{E2}
= 3.9 Calendar Months

++ ISBSG Estimation Workbook

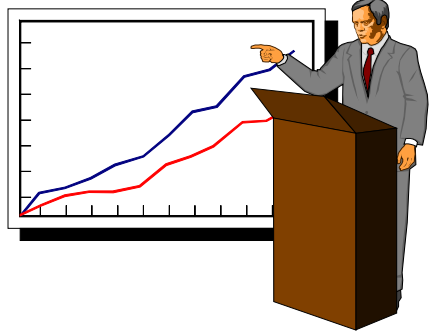
7. Progress Recording

Project Team record Actual time against function

Completed % Status of Function predicts Effort Consumed

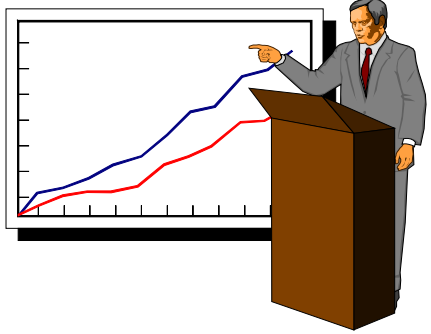
TodaysD	25-Apr-02	Predicted PDR (hrs/fp)	Completed Stage	Current Completion %	Function Points	Predicted Total Hours	Actual Hours Consumed	FP Predicted Hours Consumed	Actual Hours Remaining
Week #	8								
	BFCs								
1.1	Create Assignment	2.4	Specified	26%	6	14.4	3.0	3.7	11.4
1.2	Modify Assignment	2.4	Specified	26%	6	14.4	5.0	3.7	9.4
1.3	View / Print Assignment Detail	2.4	Specified	26%	3	7.2	5.0	1.9	2.2
1.4.1	Assign Contractor to Assignmnt	2.4	Specified	26%	4	9.6	4.0	2.5	5.6
1.4.2	Remove Contractor Assignmnt	2.4	Specified	26%	3	7.2	7.0	1.9	0.2
1.4.3	List Assignment Contractors	2.4	Specified	26%	4	9.6	4.0	2.5	5.6
1.5	Quotation Success	2.4	Built	74%	4	9.6	6.0	7.1	3.6
1.6	List Assignments Date Range	2.4	Built	74%	3	7.2	1.5	5.3	5.7
2.1	Create Assignment Type	2.4	Built	74%	4	9.6	6.5	7.1	3.1
2.2	Modify Assignment Type	2.4	Built	74%	4	9.6	5.5	7.1	4.1
2.3	Delete Assignment Type	2.4	Specified	26%	3	7.2	1.5	1.9	5.7
2.4	View Assignment Type	2.4	Specified	26%	3	7.2	1.5	1.9	5.7
2.5	List /Print Assignment Type	2.4	Tested	91%	3	7.2	4.7	6.6	2.5
	etc.....	etc.....							
			TOTAL		119	285.6	105.9	139.5	178.2

8. Progress Reporting



start	01-Mar-02	Week Number	8	Actual Value Calculation based on:
today	25-Apr-02	Actual	Original Plan	
PDR		1.8	2.4	Hours consumed for FPs delivered
Function Points Delivered		58.1	46.5	FPs by Percentage completion
Effort Hours Consumed		105.9	132.8	Recorded by team for work against a function
Effort Hours Remaining		178.2	161.8	Total hours predicted minus hours consumed
Weeks Remaining		10.5	9.6	Relationship between Effort and Duration
Due Completion Date		07-Jul-02	01-Jul-02	Predicted by Remaining hours

8. Progress Reporting



start	01-Mar-02	Week Number	8	Calculation based on:
today	25-Apr-02	Actual	Original Plan	
% Product Delivered		48.9% Π	39.1%	%FPs Delivered of total compared to that predicted to be delivered for effort consumed
% Effort Consumed		40.2% Π	48.9%	%Effort Consumed of total compared to Effort predicted to be consumed for FPs delivered
%Schedule Consumed		45.1% O	36.0%	%Schedule Consumed of total compared to predicted to be consumed for the effort expended

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Benefits

- Internationally Standardised method of breaking User requirements into ***Base Functional Components***
- ***Base Functional Components*** are individually objectively sized (not assumed to be all equivalent)
- ***Internationally standardised*** method of project sizing
- Publicly available Productivity data for estimating resources and schedules based on Functional size
- Formalises and facilitates ***auditable and objective***
  - Planning
  - Estimating of schedule and effort
  - Data collection
  - Translation of effort to costs
  - Monitoring of impact of Scope creep
  - Reporting progress to client

- Early warning of project slippage
- Fits with ***southernSCOPE*** method contract management methodology

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Limitations

- Requires Skilled Resources to :
  - Select appropriate FSM Method
  - perform the FSM sizing
  - assess productivity criteria and select appropriate PDR to selected functional areas
- Requires Committed staff to :
  - accurately record effort against functions
  - maintain BFC size as requirements change
- Difficulty in apportioning effort :
  - to specific BFCs when working on ‘common use’ modules
  - spent on “non-functional requirements”
- Need for tools to integrate functional sizing and project tracking
- Only trialled on smaller projects <200fps
- Most FSMs were designed to be used at a more Macro level

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Where to now

- More trials with the technique on larger projects
- Evaluate effectiveness of different FSMs with the tracking method
- Integration with other tracking methodologies and tools
- Formalisation of the technique

FPs and Project Tracking

Download presentation from :

WWW.totalmetrics.com

The End

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" To measure is to know!"