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Software Planning

- Size of project
- Cost of project
- Work break down structure
- Critical path method

Typical Size-Oriented Metrics

- errors per KLOC (thousand lines of code)
- defects per KLOC
- $ per LOC
- page of documentation per KLOC
- errors / person-month
- LOC per person-month
- $ / page of documentation

Create three-point or expected value estimate

- Optimistic values for size
- Most likely values for size
- Pessimistic values for size
- $S=(s_{opt}+4s_m+s_{pess})/6$
- Where S = the expected value for the estimation variable(size)

Example of LOC-Based Estimation

Function	**Est. LOC**
user interface and control (UIC)	2,300
2-D geometric analysis (2DGA)	5,300
3-D geometric analysis (3DGA)	6,800
data base management (DBM)	3,350
graphics displays (GD)	4,950
peripheral control (PC)	2,100
design analysis (DA)	8,400
estimated LOC	33,200

- Range of LOC estimates for the 3D geometric analysis function is optimistic-4600 LOC, most likely-6900 LOC, and pessimistic-8600 LOC

- Organizational average productivity=620 LOC/pm
- Labor rate = $8000 per month
- Estimated effort = ?

Total Estimated Effort = LOC est. / prod.

- Cost/LOC = ?

Cost / LOC = labor rate / prod.

- Total cost = ?

Total Project Cost = LOC est. * (cost / LOC)

Optimistic values	Most likely	Pessimistic values	Est. LOC
23	24	30	24.8
50	54	59	54.17
101	105	108	104.83
		Total LOC	183.8

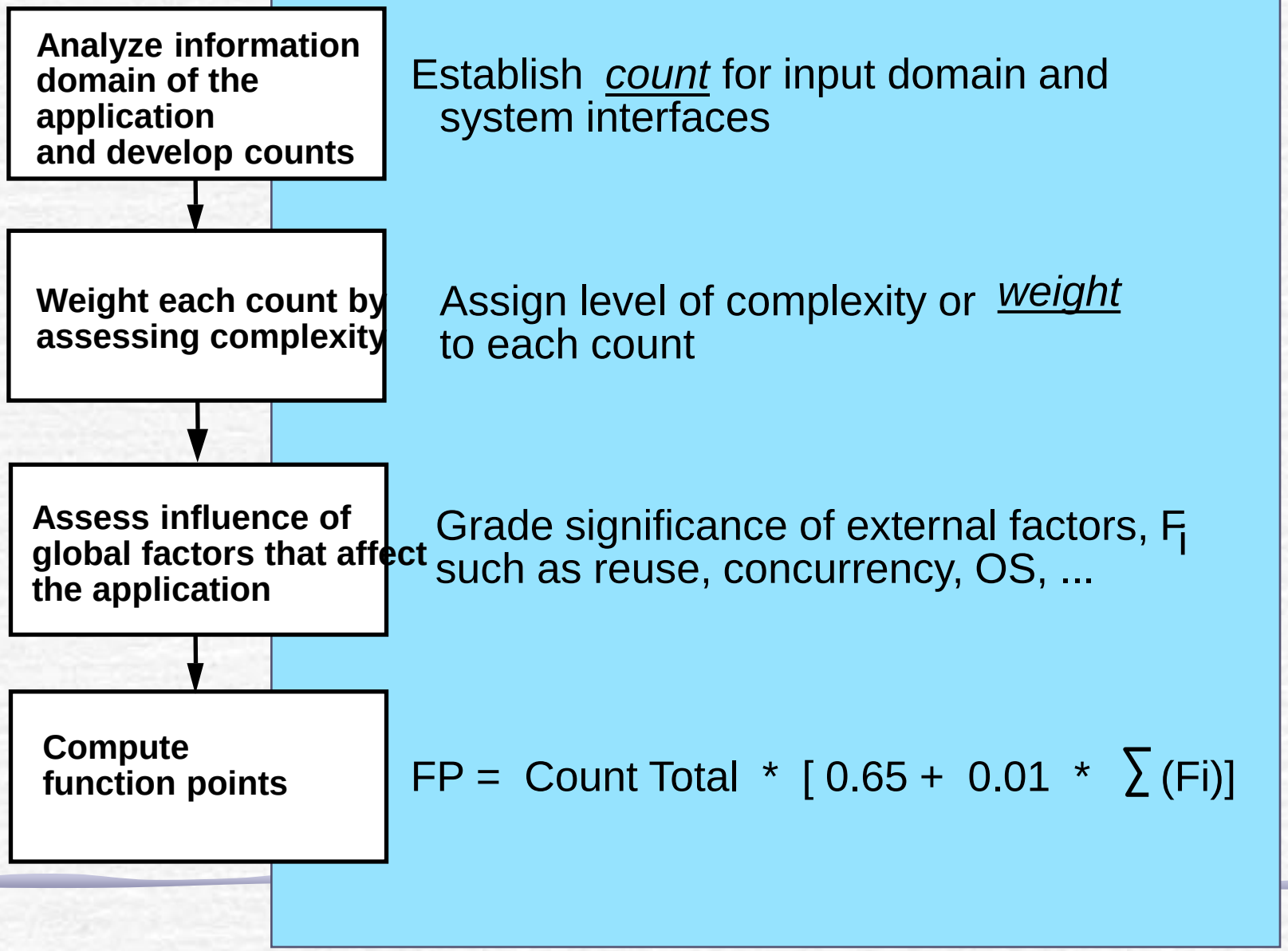
Function-Oriented Metrics

- Uses a measure of the functionality
  - – inputs, outputs, files, inquiries, Interfaces
- Indirectly derived
- Function point
  - scaled by simple, average, complex

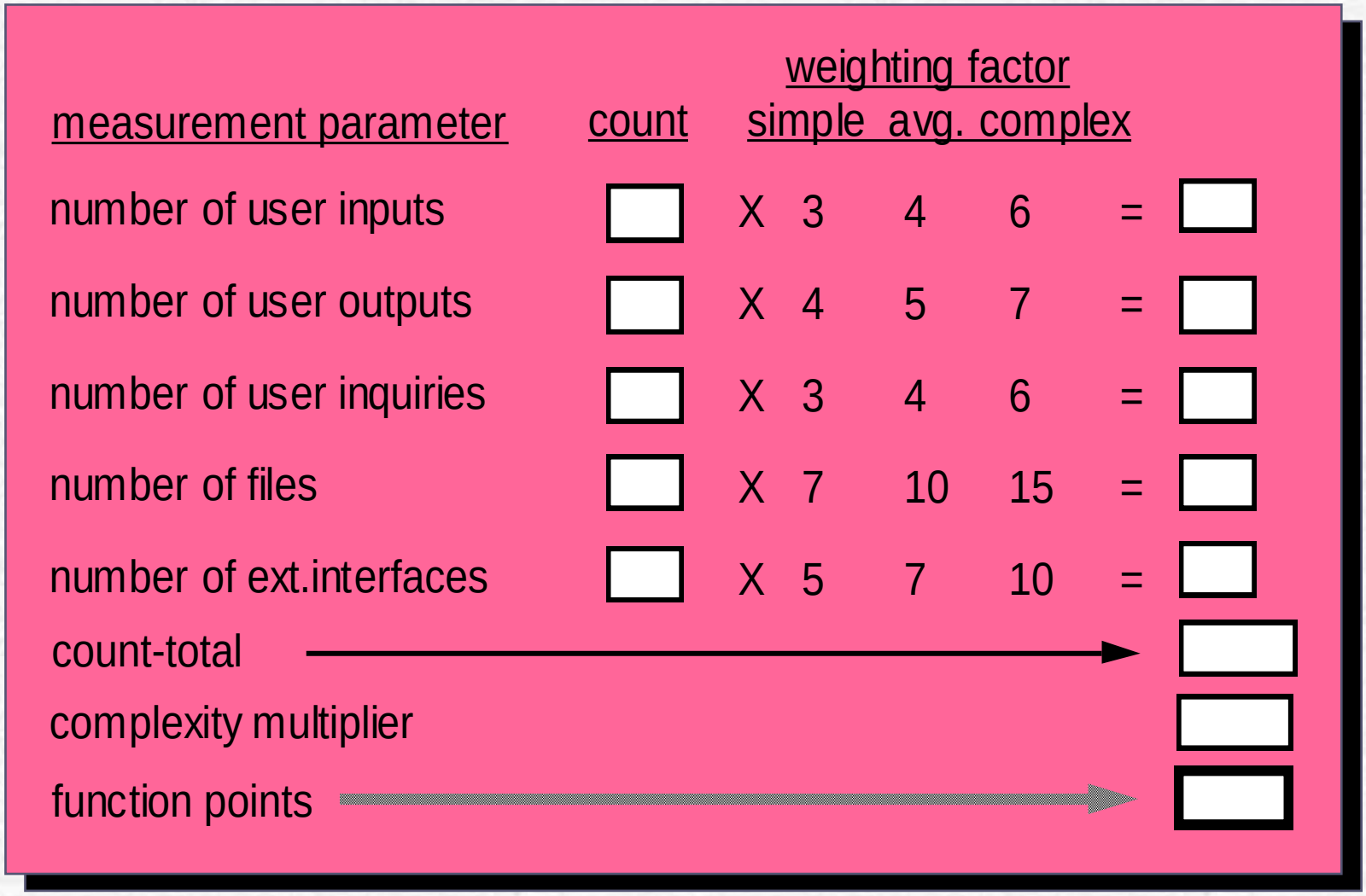
Typical Function-Oriented Metrics

- errors per FP (thousand lines of code)
- defects per FP
- $ per FP
- pages of documentation per FP
- FP per person-month

Computing Function Points



Analyzing the Information Domain



Taking Complexity into Account

Factors are rated on a scale of 0 (not important) to 5 (very important):

data communications
distributed functions
heavily used configuration
transaction rate
on-line data entry
end user efficiency
on-line update
complex processing
installation ease
operational ease
multiple sites
facilitate change

- Apply the following formula
  - $Fp_{estimated}$=count-total*[0.65+0.01* Σ(Fj)]

Example of FP-Based Estimation

Information domain value	Optimistic	Most Likely	Pessimistic
Number of inputs	20	24	30
Number of outputs	12	15	22
Number of inquiries	16	22	28
Number of files	4	4	5
Number of external interfaces	2	2	3

measurement parameter	count	weighting factor simple	avg.	complex	
number of user inputs		X 3	4	6	=
number of user outputs		X 4	5	7	=
number of user inquiries		X 3	4	6	=
number of files		X 7	10	15	=
number of ext.interfaces		X 5	7	10	=
count-total →					
complexity multiplier					
function points →					

Information domain value	Estimated count	Weight	FP count
Number of inputs	24	4	97
Number of outputs	16	5	78
Number of inquiries	22	4	88
Number of files	4	10	42
Number of external interfaces	2	7	15

Factor	Value
Backup and recovery	4
Data communication	2
Distributed processing	0
Performance critical	4
Existing operating environment	3
On-line data entry	4
Input transaction over multiple screens	5
Master files updated on-line	3
Information domain values complex	5
Internal processing complex	5
Code designed for reuse	4
Conversion/installation in design	3
Multiple installations	5
Application designed for change	5
Total	52

- $Fp_{estimated}$=count-total*[0.65+0.01* Σ(Fj)]
- $Fp_{estimated}$=372
- Organizational average productivity=620 FP/pm
- Labor rate = $8000 per month
- Estimated effort = ?
  - **Total Estimated Effort = FP est. / prod.**
- Cost/FP = ?

  Cost / FP = labor rate / prod.
- Total cost = ?
  - **Total Project Cost = FP est. * (cost / FP)**