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COSMIC Early Sizing

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MODULE 6

In this module 6

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You will learn:

- How to estimate the functional size of software **early in the life cycle**

Topics in other modules:

- Module 1: Why and When Measure Functional Size
- Module 2: COSMIC Key Concepts & Definitions
- Module 3: MIS Case Study Overview
- Module 4: Real-time Case Study Overview
- Module 5: COSMIC NFR
- Module 7: Estimation Process



Why **estimate** the COSMIC size?

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It is necessary to **estimate** the size when:

- The quality of the documentation of the actual requirements is not sufficient
- Early in the project, we need a measure of the functional size to get an idea of its size for cost (or effort) estimation purposes
- Approximated size measurement is acceptable

Measurement vs Estimation of Size

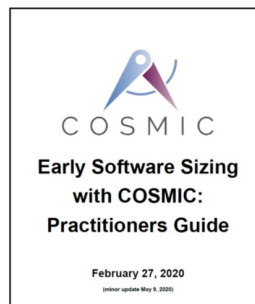
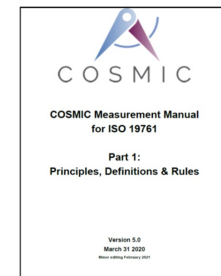
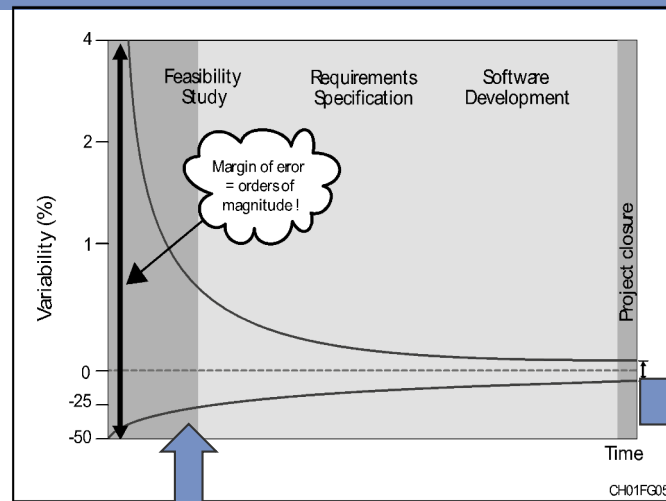
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Accurate measurement:

- end of development

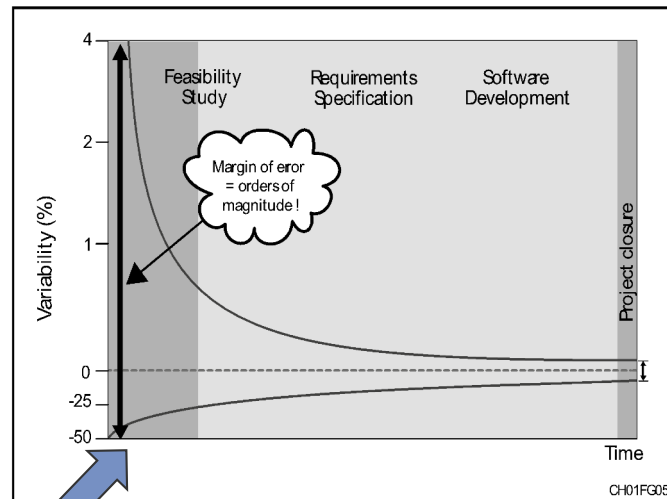
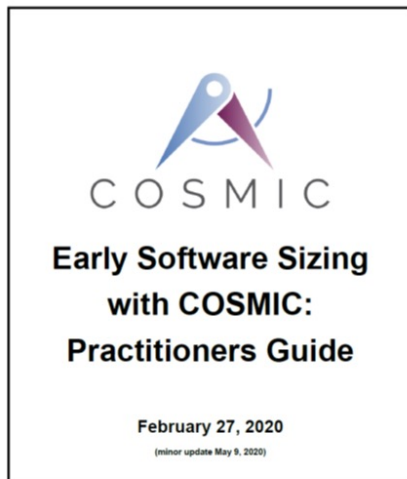
Estimation of size:

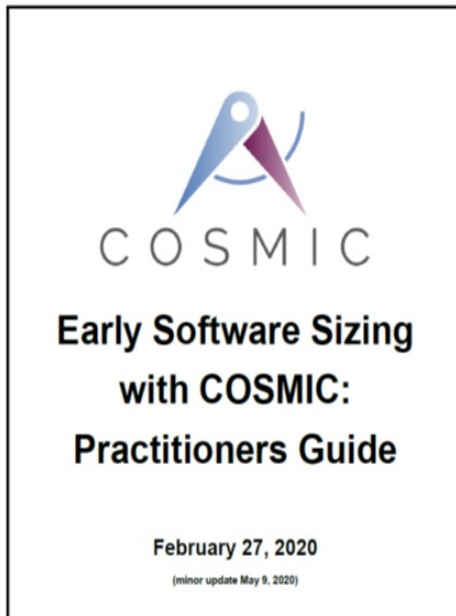
- early phases



Measurement vs Estimation of Size

Estimation of size:
 ➤ early phases





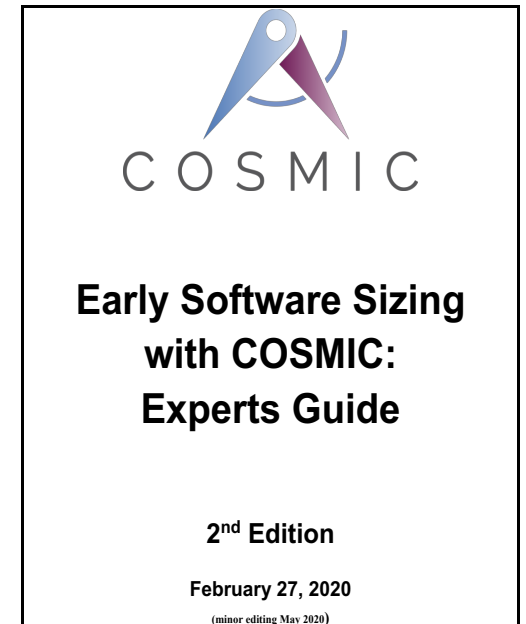
Requirements stage:

1. Average size of functional processes
2. Fixed size classification
3. Equal size bands
4. Average size of use cases
5. Software Iceberg Analogy
6. Functional Patterns



Feasibility stage:

1. Early & Rapid sizing
2. Easy sizing
3. EPCU-Fuzzy logic
4.





Approximate COSMIC size with requirements

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Early sizing techniques presented in this module:

1. Average size of functional processes
2. Fixed size classification
3. Equal size bands
4. Average size of use cases
5. Early & Rapid sizing

1- Average size of functional processes

- From past projects, or from the few detailed FUR of the current project, calculate the average size of new FPs and modified FPs

Average size of	New FP	Modified FP
(in CFP)	8.0 CFP	3.5 CFP

- For the new project to estimate, make a list of required new and modified functional processes, then extrapolate the size with the calculated averages:

	New FP	Modified FP	Total
Number of	20 FP	5 FP	25 FP
Expected size (rounded)	160 CFP	18 CFP	178 CFP

2- Fixed size classification

The application of this technique requires an identification of functional processes in order to classify them by size, which should be calibrated locally.

Example with 3 size classes: Small, Medium, Large.

Classification	Size (CFP)	Nbr of DGs
Small	5	1
Medium	10	2
Large	15	3-4

After identifying the number of Small, Medium and Large functional processes in your project, calculate the total approximated number of COSMIC function points (CFP).

3- Equal size bands

The application of this technique requires an identification of functional processes in order to classify them by size. Take a sample of precisely measured FPs, sort them by size, then divide into 3-4 bands of equal size.

Example with 4 bands: Small, Medium, Large and Very Large (n=34 projects):

Band	Average FP Size (CFP)	% of total size	% of #FPs
Small	4.8	25%	40%
Medium	7.7	25%	26%
Large	10.7	25%	19%
Very large	16.4	25%	15%

After identifying the number of Small, Medium, Large and Very Large functional processes in your project, calculate the total approximated number of COSMIC function points (CFP).

4- Average size of Use Cases

- A Use Case (UC) may be refined into one to several Functional Processes (FP)
 - **Local calibration** might determine that a (locally-defined) UC comprises, on average, 3.5 functional processes, each FP of an average size = 8.0 CFP
 - In that case, the average size of a UC, according to this local definition, is $3.5_{\text{FP/UC}} \times 8.0_{\text{CFP/FP}} = 28$ CFP per Use Case
- To approximate the project size, apply this average on the number of Use Cases

5- Early & Rapid technique (1 of 2)



Type	Level	Ranges / COSMIC Equivalent	min CFP	most likely	max CFP
Functional Process	Small	1 - 5 Data movements	2.0	3.9	5.0
	Medium	5 - 8 Data movements	5.0	6.9	8.0
	Large	8 - 14 Data movements	8.0	10.5	14.0
	Very large	14+ Data movements	14.0	23.7	30.0
Typical process	Small	CRUD (Small/Medium processes) CRUD + List (Small processes)	15.6	20.4	27.6
	Medium	CRUD (Medium/Large processes) CRUD + List (Medium processes) CRUD + List + Report (Small processes)	27.6	32.3	42.0
	Large	CRUD (Large processes) CRUD + List (Medium/Large processes) CRUD + List + Report (Medium processes)	42.0	48.5	63.0
General process	Small	6 - 10 Generic FP's	20.0	60.0	110.0
	Medium	10 - 15 Generic FP's	40.0	95.0	160.0
	Large	15 - 20 Generic FP's	60.0	130.0	220.0
Macro process	Small	2 - 4 Generic GP's	120.0	285.0	520.0
	Medium	4 - 6 Generic GP's	240.0	475.0	780.0
	Large	6 - 10 Generic GP's	360.0	760.0	1,300

i.e. per business object

i.e. Module

i.e. App.

5- Early & Rapid technique (2 of 2)

Similar to fixed size classification:

- By analyzing the functional processes already measured, we get an idea of the number of FPs and the size per business object
 - Do we have a CRUD (3, 4 or 5 functional processes) or a report (one functional process)?
 - Examples:
 - Only one primary data group of a small CRUD → Use 15.6 CFP.
 - A report most often uses more than one data group → 6.9 CFP.
- Note: for a CRUD, the expression is often 'manage <business object>', while for a report the expression is simply 'list or report on <business object>'.

How to select which technique to use (1 of 2)

- Is there a list of functional processes?
 - If **yes**, then the candidate techniques are:
 - Average size of functional processes
 - Fixed size classification, or
 - Equal size bands
- Is there a meaningful sample of requirements?
 - If **yes**,
 - Average Size of Functional Processes, or
 - Equal size bands
 - Otherwise:
 - Fixed size classification

How to select which technique to use (2 of 2)

- Is there only a list of use cases?
 - If **yes**,
 - Average size of use cases, or
 - Early and rapid COSMIC Approximation (typical process)
- Can the number of functional processes be approximated by looking at use cases ?
 - If **yes**,
 - we can go back to the Fixed size classification
 - If **not**, can we estimate the approximate size of the use cases (small, medium or large)?
 - If **yes**, Early and Rapid COSMIC Approximation
 - If **not**, estimate the size by asking whether the overall process is small, medium or large.

Overview of the described techniques for the requirements stage

Technique	Strength	Weakness	Area of application
Average Functional Process.	Easy to use.	Domain dependent.	
		Requires sampling.	Same as sample.
Fixed Size Classification.*	Easy to use.	Domain dependent.	
	Scaling factors are documented.	Assigning a class to an FP is subjective.	Size classification must fit the software.
Equal Size Bands.	Easy to use.	FPs need to be classified correctly.	Business and real-time embedded.
	More bands lead to a more accurate approximation.	Bands must be significantly far enough apart.	Skewed distribution of FPs.
		Requires sample dataset.	
Average size of Use Cases.*	Easy to use when Use Cases are standardized.	Functionality assigned to a Use Case can vary.	Standardized UCs.
		Scaling factor is a product of two factors that contain estimation.	
		Requires sample dataset.	Same as sample dataset.

Exercise

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With a requirements document that you know, it is suggested that you use 2 techniques:

- A) Average size of functional processes or
- B) Early & Rapid COSMIC approximation

Technique A will be more accurate if you have the list of functional processes.

You can take inspiration from the values at the level of Typical Processes if you only have the list of use cases.



C O S M I C