

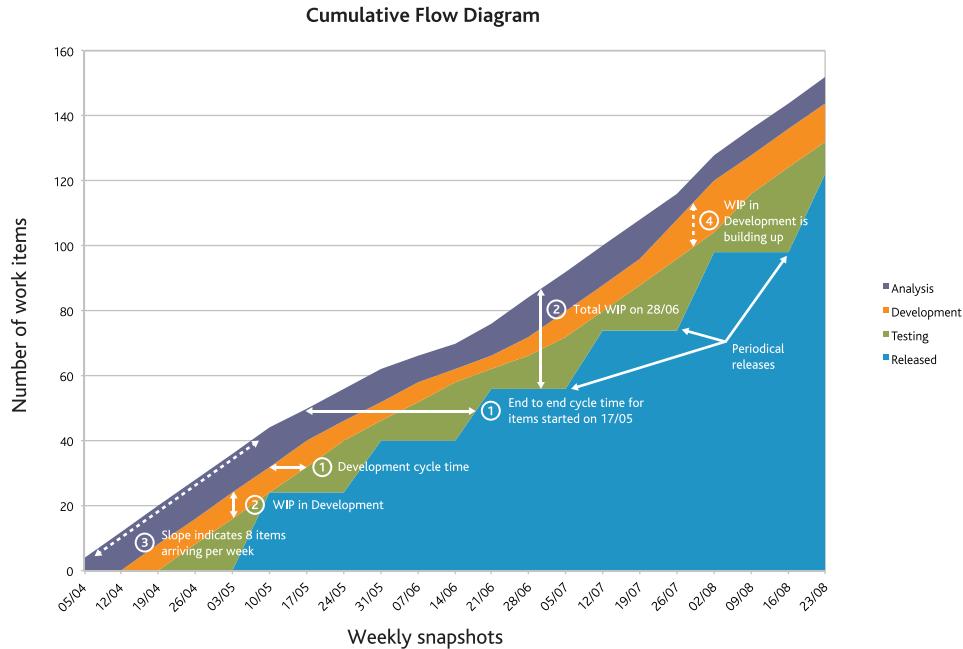


# CUMULATIVE FLOW DIAGRAMS

A Cumulative Flow Diagram (CFD) is a representation of the quantity of work in different states (often representing steps in the development process) over a period of time.

It is a visualisation tool that synthesises valuable information about work in progress, queues and cycle times. A team can use a CFD to track the progress of a delivery stream and identify how the work flows through the system. In particular, a team can use a CFD to detect problems with the flow of work early and tackle these accordingly.

A CFD is a stacked area graph. Time is represented on the horizontal axis and cumulative quantity of work in different states on the vertical axis.



The graph above presents a simple CFD and demonstrates how different aspects of flow can be assessed:

- ① A horizontal cross-section of the diagram presents the time elapsed across the development cycle. Thus, a CFD diagram can be used to measure and monitor the evolution of cycle times (cycle time of a step of a process, a set of steps of the process or the full end to end cycle time).
- ② A vertical cross-section of the diagram represents the amount of work in a given state at a specific date. Therefore, a CFD diagram can be used to measure and monitor the evolution of the work in progress, i.e. the length of the queues (per step of the process, per a set of steps or across all the process steps).

Outcome

Function

Benefit

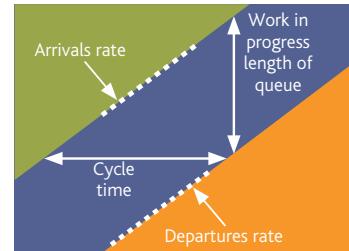
Who

Scaling Factors

Difficulty



- ③ The slopes give you a view of the arrival rate and the departure rate of the work items (see diagram to the right) between different states. When there is a smooth flow of work, arrival and departure rates are equal.
- ④ A large variation of the 'width' of a 'lane' indicates that the arrival rate is not equal to the departure rate and may indicate various problems:
  - When a lane widens, there may be a bottleneck: either tasks are not being completed, or the next step of the process cannot absorb the incoming work.
  - When a lane narrows, there may be 'starvation': the previous step cannot process tasks quickly enough to supply this step.



## Implementation

### Prerequisite

The team needs to understand their actual workflow and the different states a work item can be in. This information needs to be recorded at regular intervals for all states, perhaps daily. This can be done through regular snapshots of a Kanban board, for example.

To build a Cumulative Flow Diagram:

1. Take a large piece of paper, or alternatively create a spreadsheet.
2. Record the data in a table similar to that shown below where:
  - each column represents a snapshot date
  - each row represents a different state a work item can be in
  - a cell contains the number of items in the relevant state at the specified time.

	05/04	12/04	19/04	26/04	03/05	10/05	17/05
Released	0	0	0	0	0	24	24
Testing	0	0	0	8	16	0	8
Development	0	0	8	8	8	8	8
Analysis	4	12	12	12	12	12	10

3. Create a stacked area graph.

If you want to learn more, consider reading:

*The Principles of Product Development Flow* by Donald Reinertsen