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Corporate Kanban

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Change Everything by Changing Nothing

Little's Flaw

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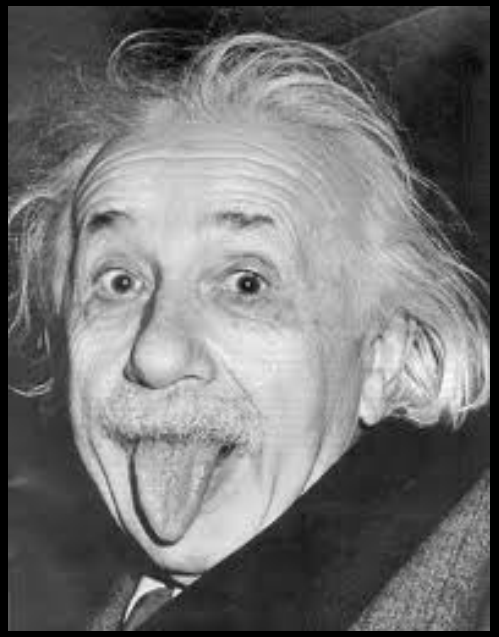
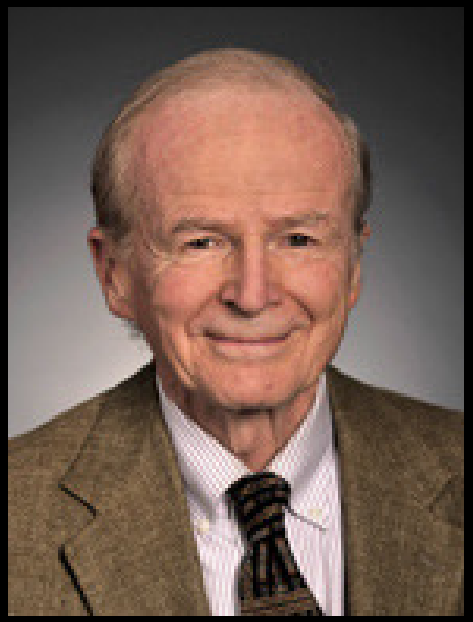
Things we'll talk about tonight

- An introduction to Little's Law
- The assumptions behind Little's Law
- The application of Little's Law for long-term planning

Metrics??





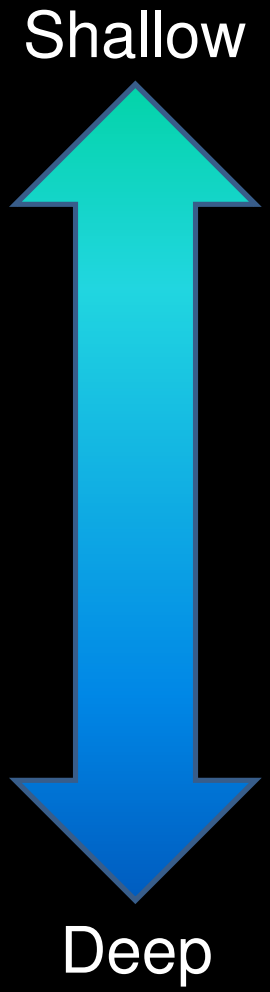
$F = ma$

$E = mc^2$

$L = \lambda W$

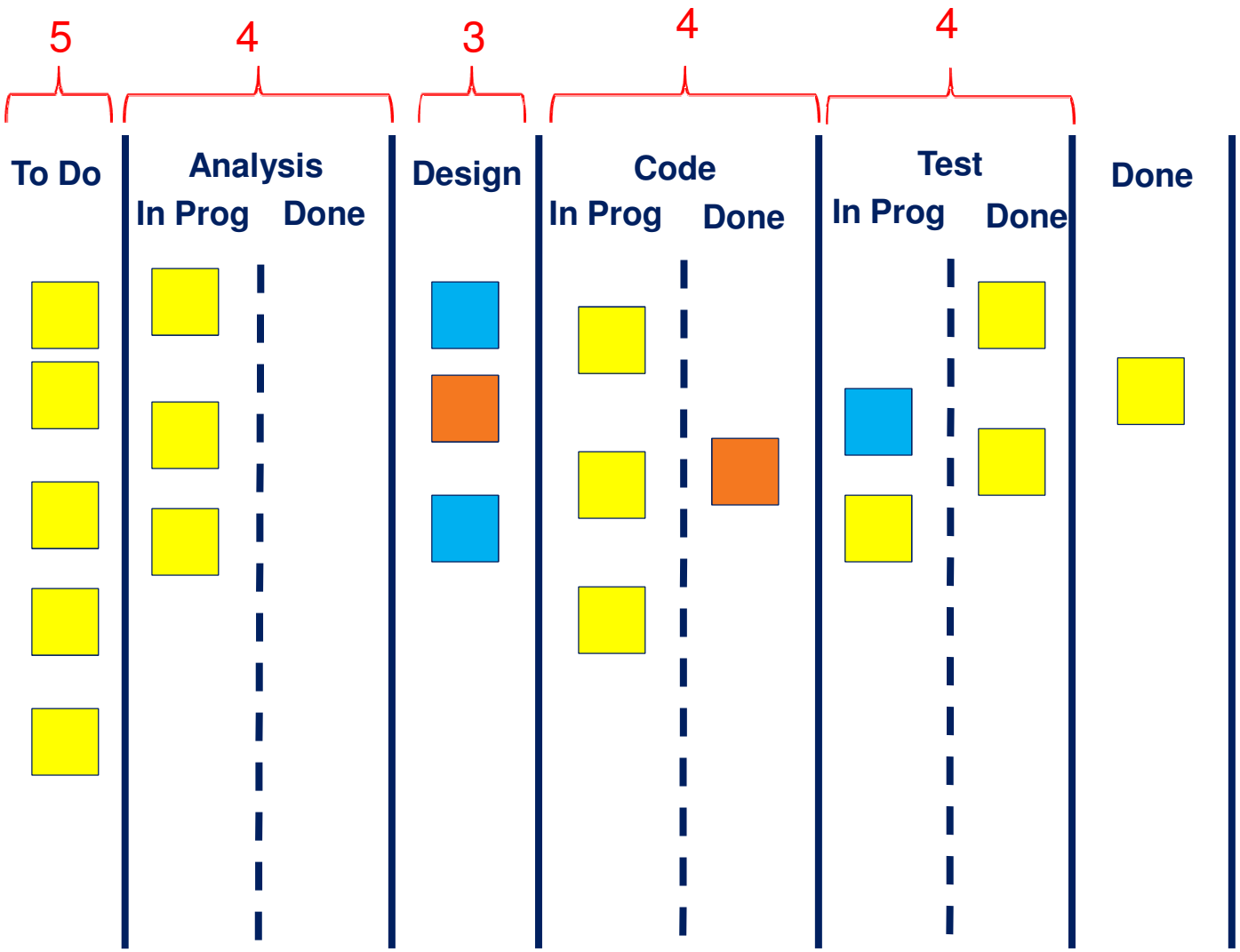
Kanban Core Practices

1. Visualize
2. Limit Work-in-Progress
3. Manage Flow
4. Make Process Policies Explicit
5. Improve Collaboratively (using models)

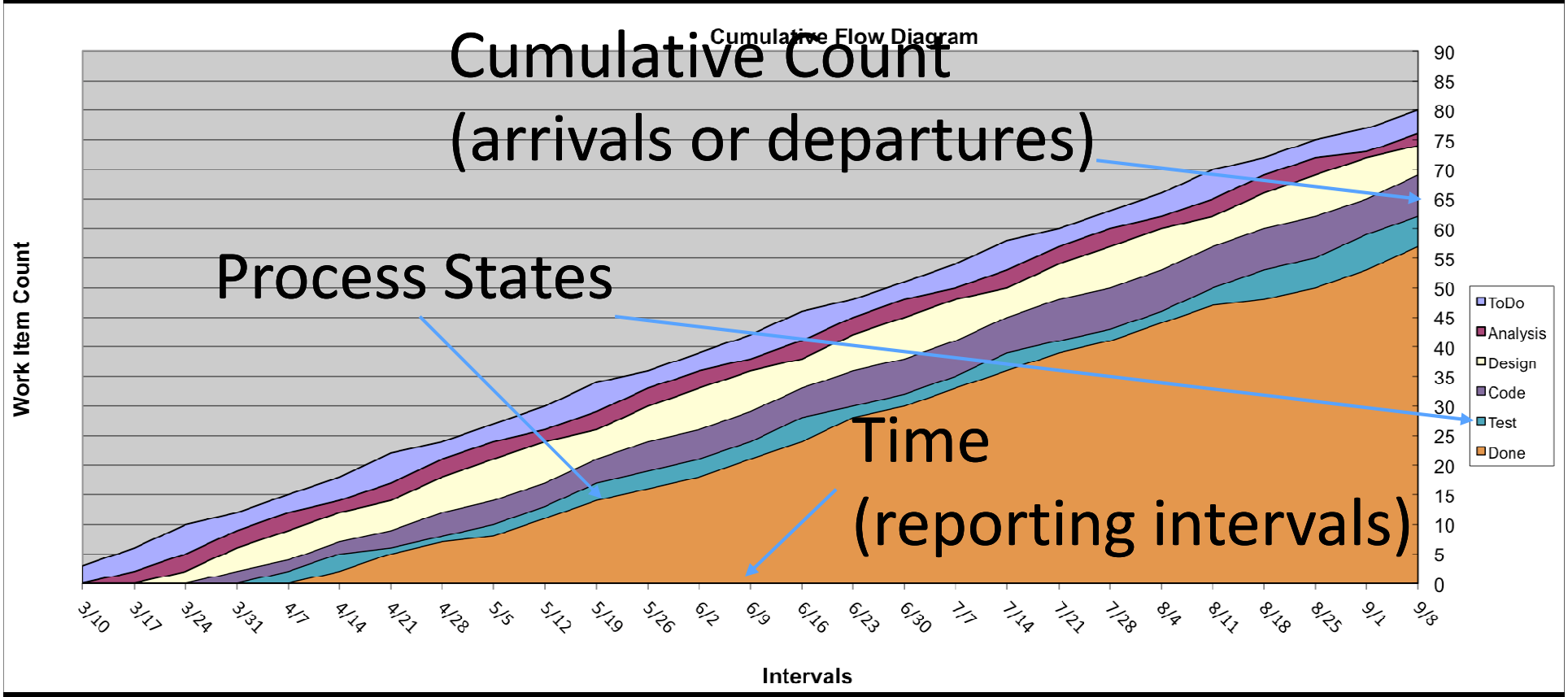


Example Kanban Board

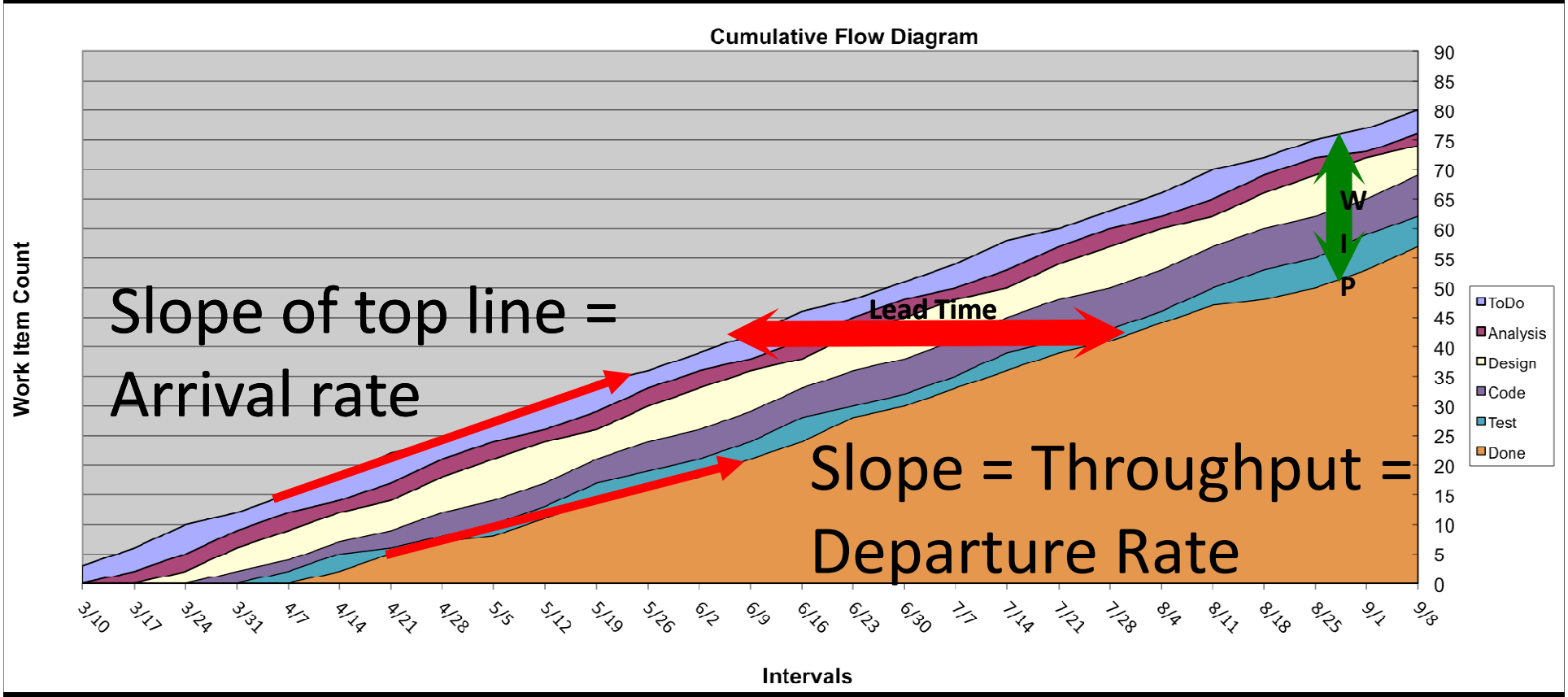
Courtesy Olav Maassen, Xebia



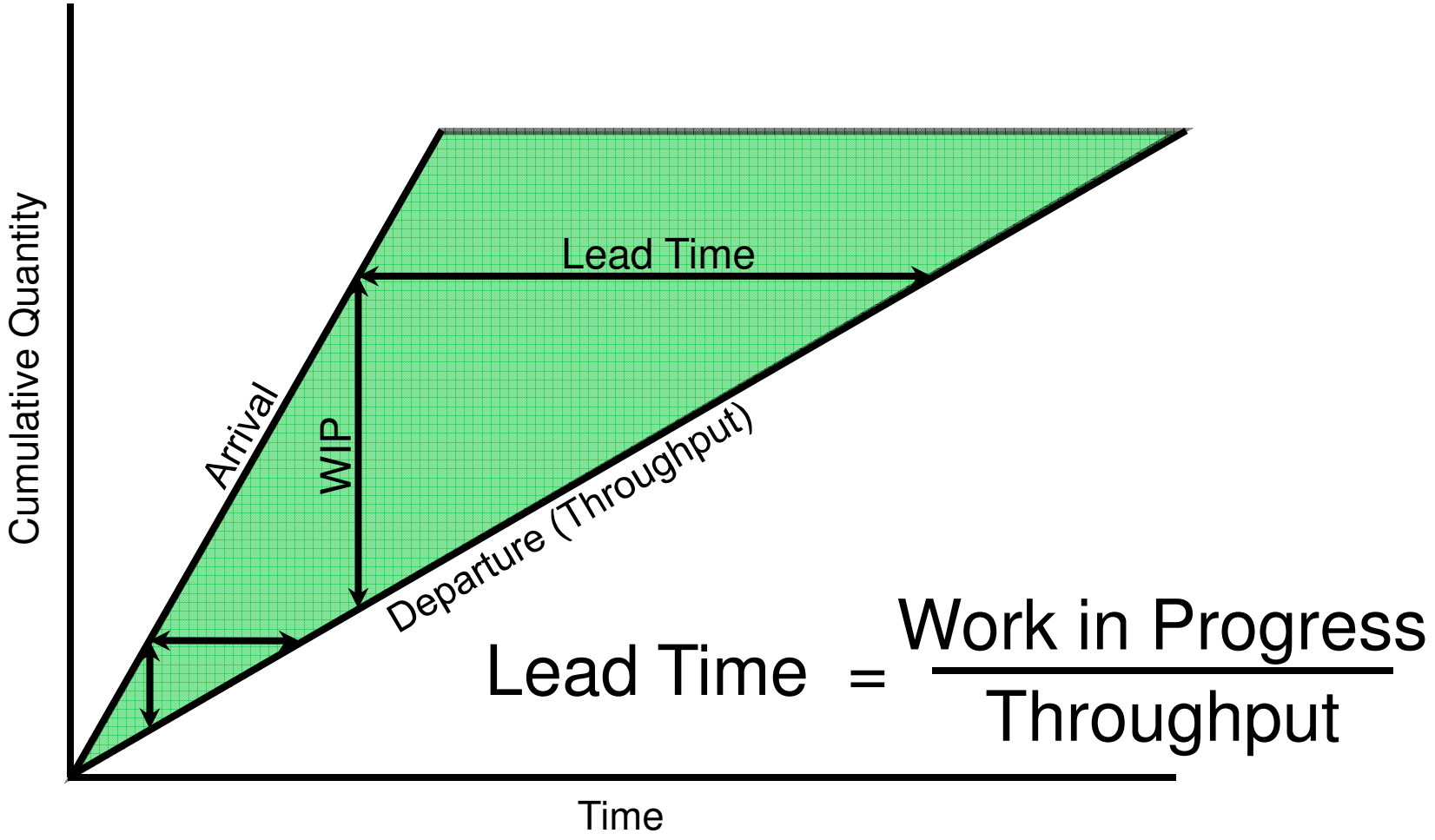
Cumulative Flow Diagram Basics



Properties of CFDs



CFD: Lead Time, WIP, and Throughput



$$\text{Lead Time} = \frac{\text{Work in Progress}}{\text{Throughput}}$$

Little's Law

$$\text{Average Lead Time} = \frac{\text{Average Work in Progress}}{\text{Average Throughput}}$$

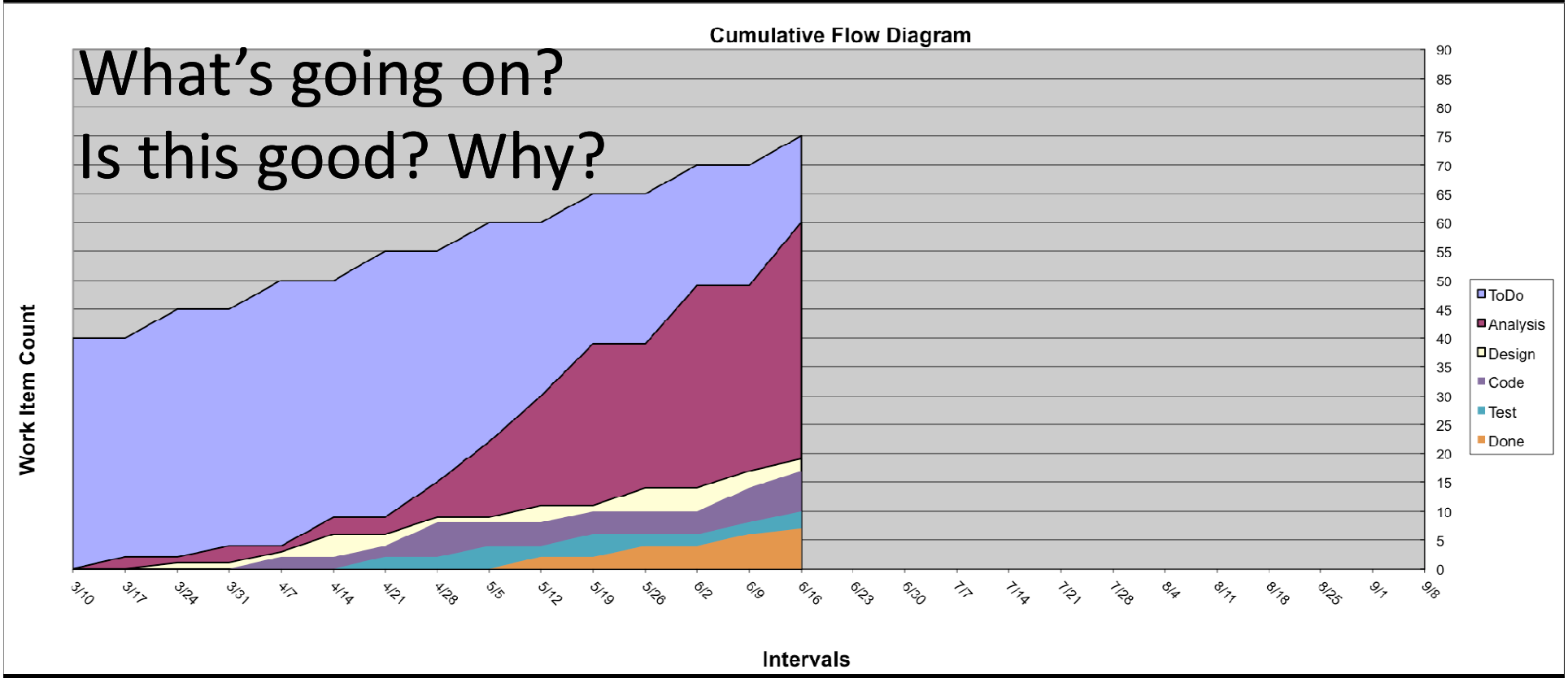
where:

Lead Time = how long it takes one item to go through the system

Work in Progress = how many items are in the system at any time

Throughput = how many items are produced per unit of time

Visualization with CFDs



A short detour for some history

Little's Law was initially stated in terms of arrival rate:

$$L = \lambda W$$

L = the average number of items in the system

W = the average wait time in the system for an item

λ = the average number of items arriving per unit time

Departures—What it does say

$$\text{Average Lead Time} = \frac{\text{Average Work in Progress}}{\text{Average Throughput}}$$

What it doesn't say

$$\text{Average Lead Time} = \frac{\text{Average Work in Progress}}{\text{Average Throughput}}$$

Size of items in WIP

Distribution of Arrival or Departures

How many people working on a given item

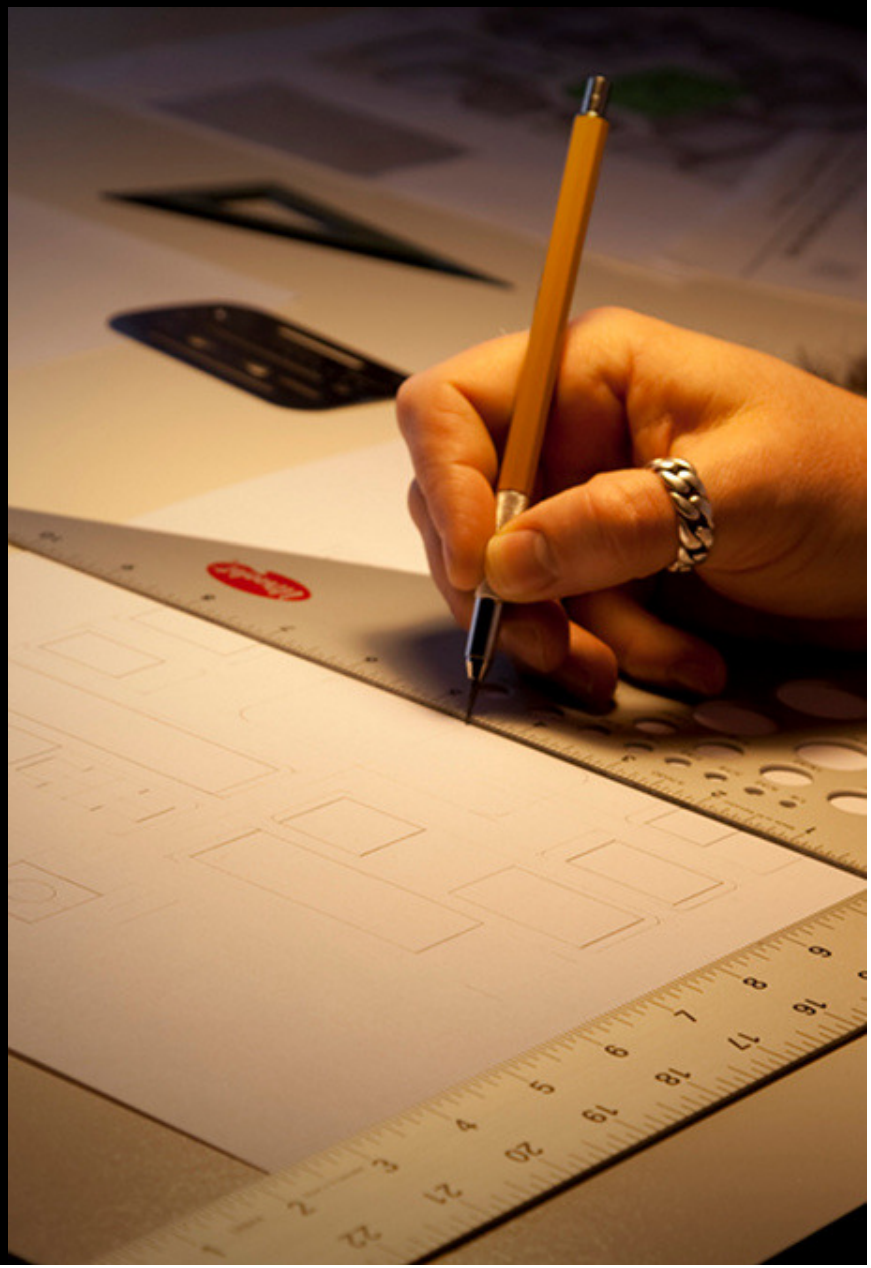
And more!

LITTLE'S LAW ASSUMPTIONS

Arrivals vs. Departures

Open / Close “Shop” vs. Continuous WIP

Consistent Units

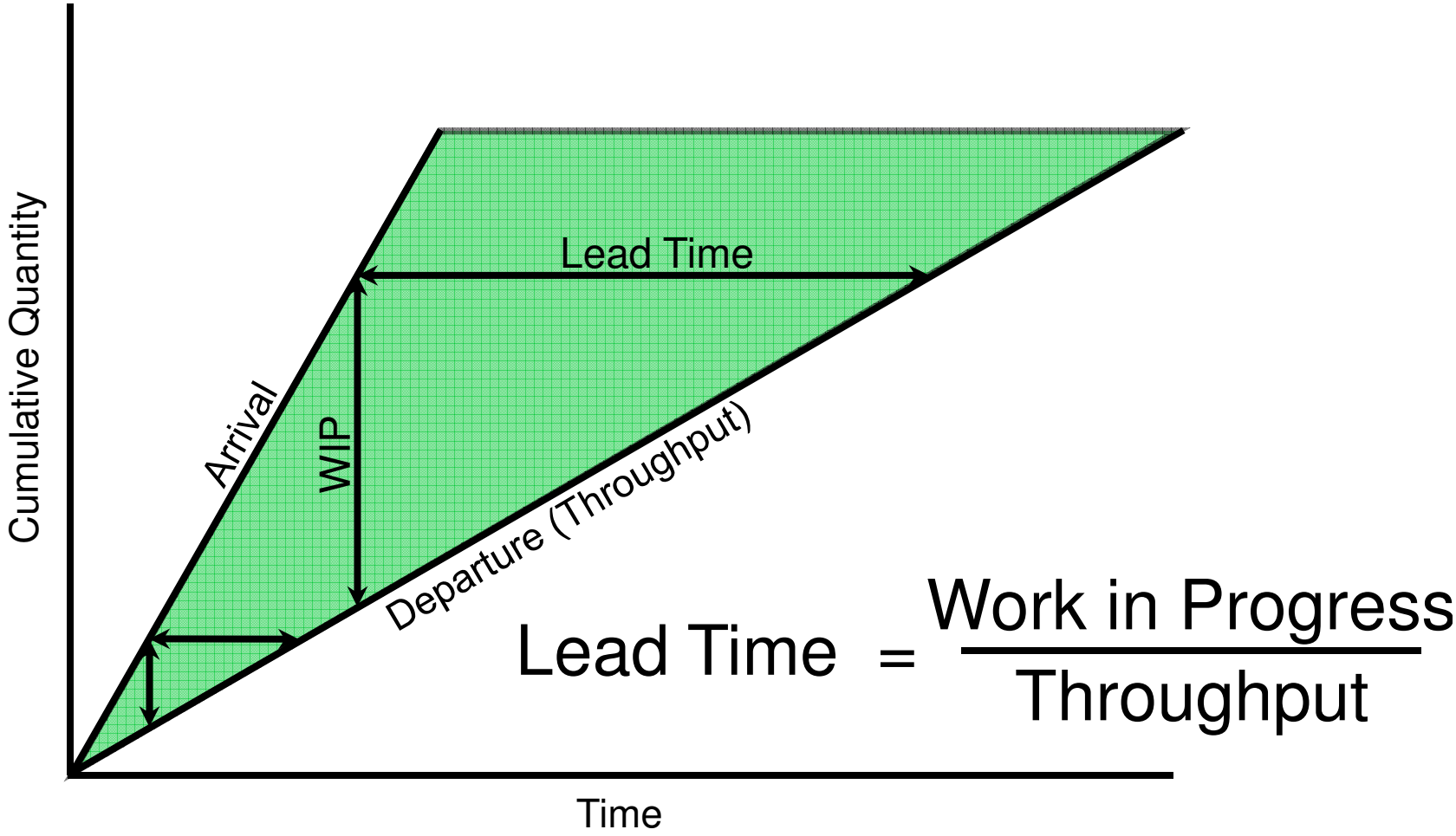


Conservation of Flow

For the time period that the calculation is performed:

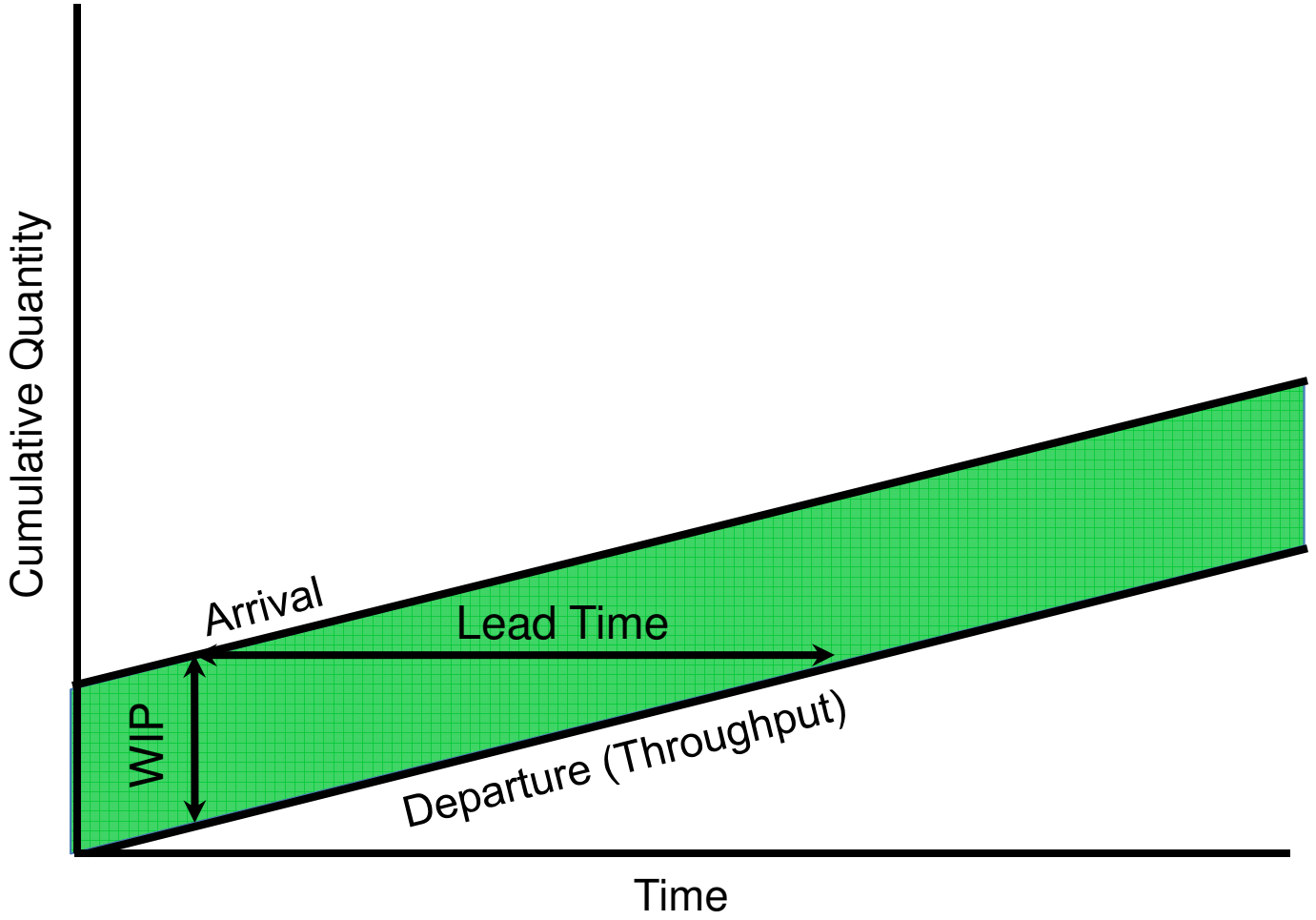
- All work that is started must flow through to completion and exit the system
- Average arrival rate must equal average departure rate

CFD: Lead Time, WIP, and Throughput

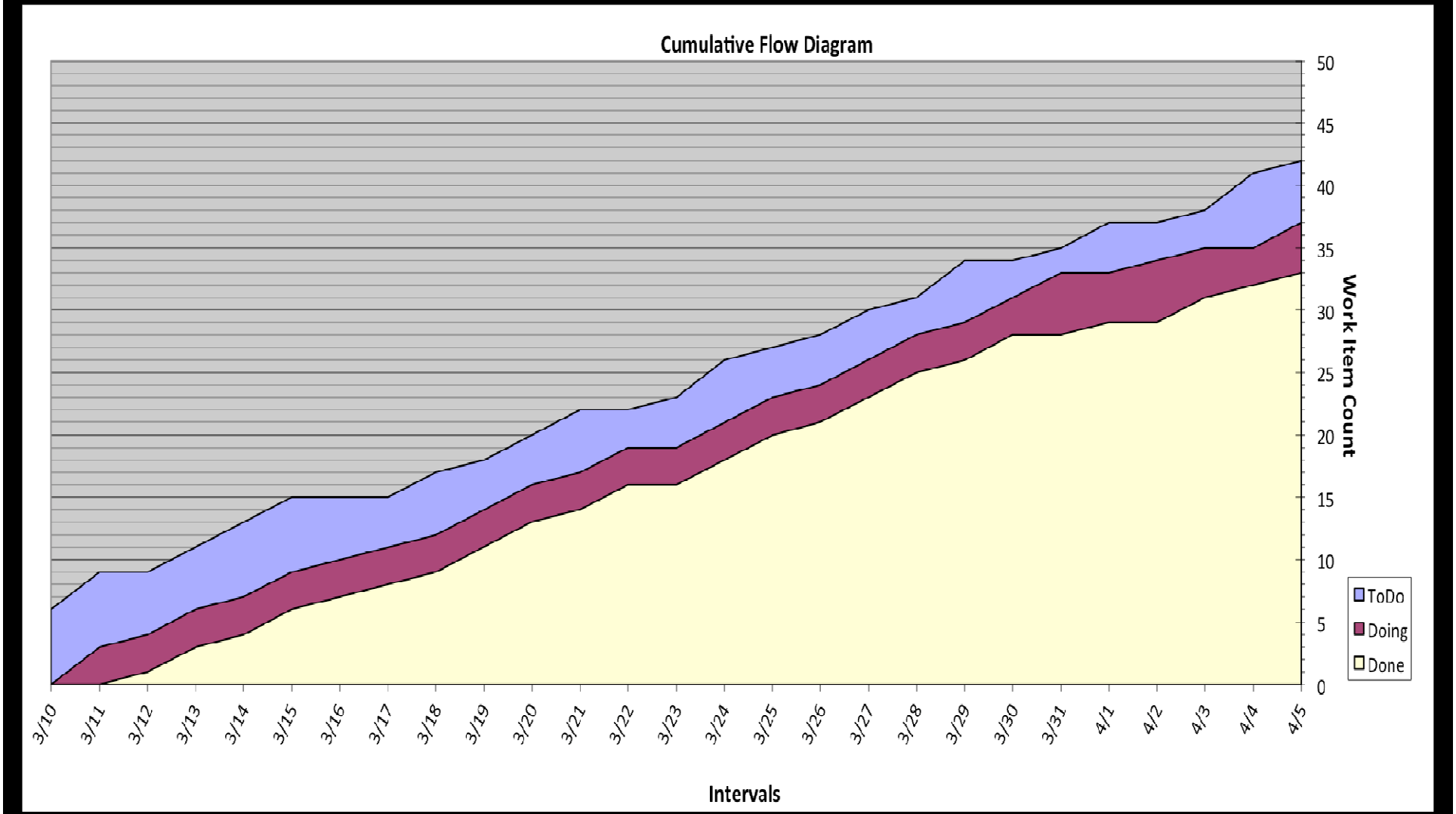


$$\text{Lead Time} = \frac{\text{Work in Progress}}{\text{Throughput}}$$

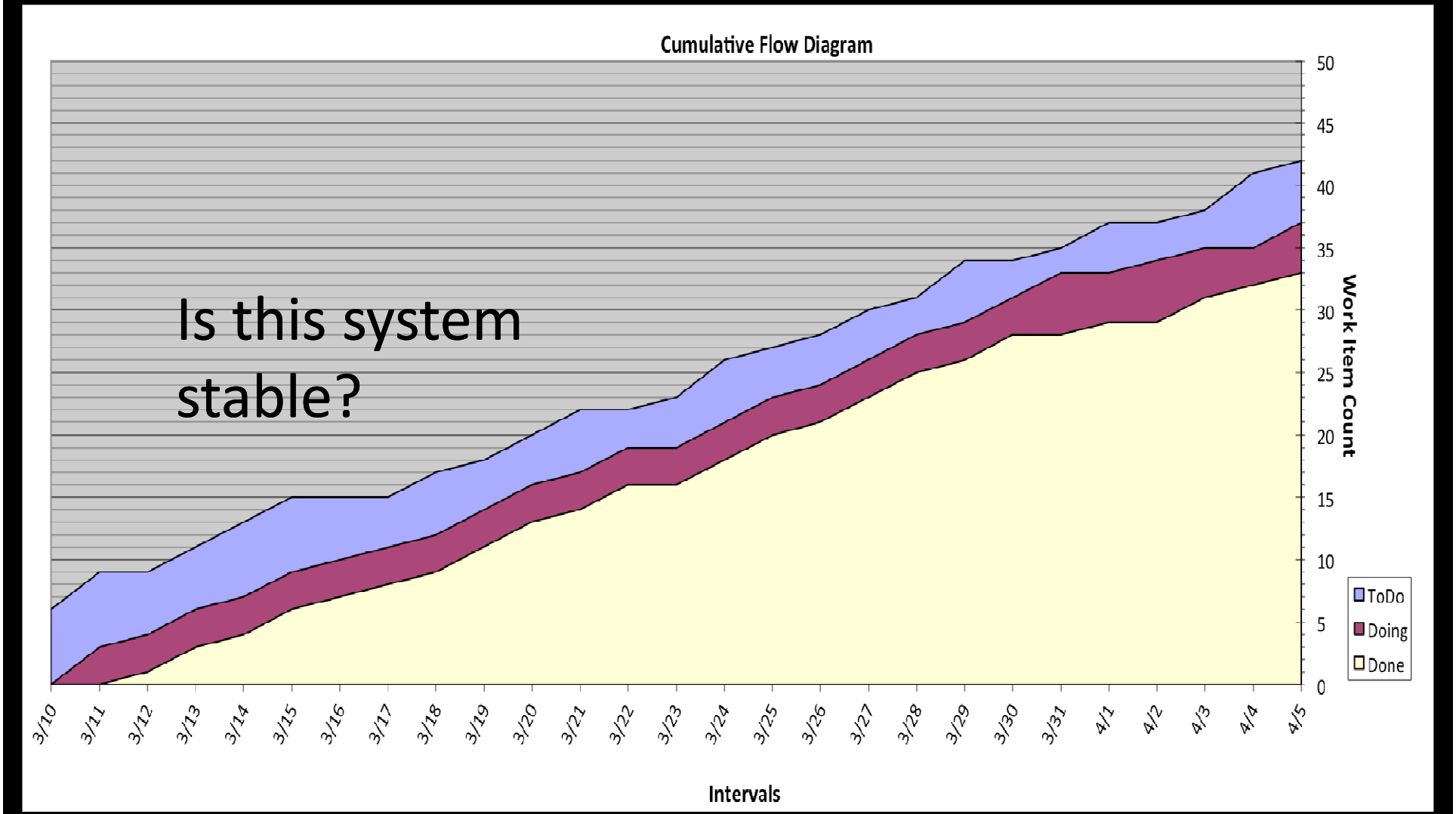
Conservation of Flow in Little's Law



Real World Conservation of Flow



Stable System?


Cumulative Flow Diagram
Is this system stable?
50
45
40
35
30
25
20
15
10
5
0
Work Item Count
ToDo
Doing
Done
3/10
3/11
3/12
3/13
3/14
3/15
3/16
3/17
3/18
3/19
3/20
3/21
3/22
3/23
3/24
3/25
3/26
3/27
3/28
3/29
3/30
3/31
4/1
4/2
4/3
4/4
4/5
Intervals

Stability Part I: Consistent total WIP

The total Work in Progress must be roughly equal at the beginning and the end of the time interval for the calculation

Stability Part II: Average age of WIP

The average age of WIP should neither be increasing or decreasing

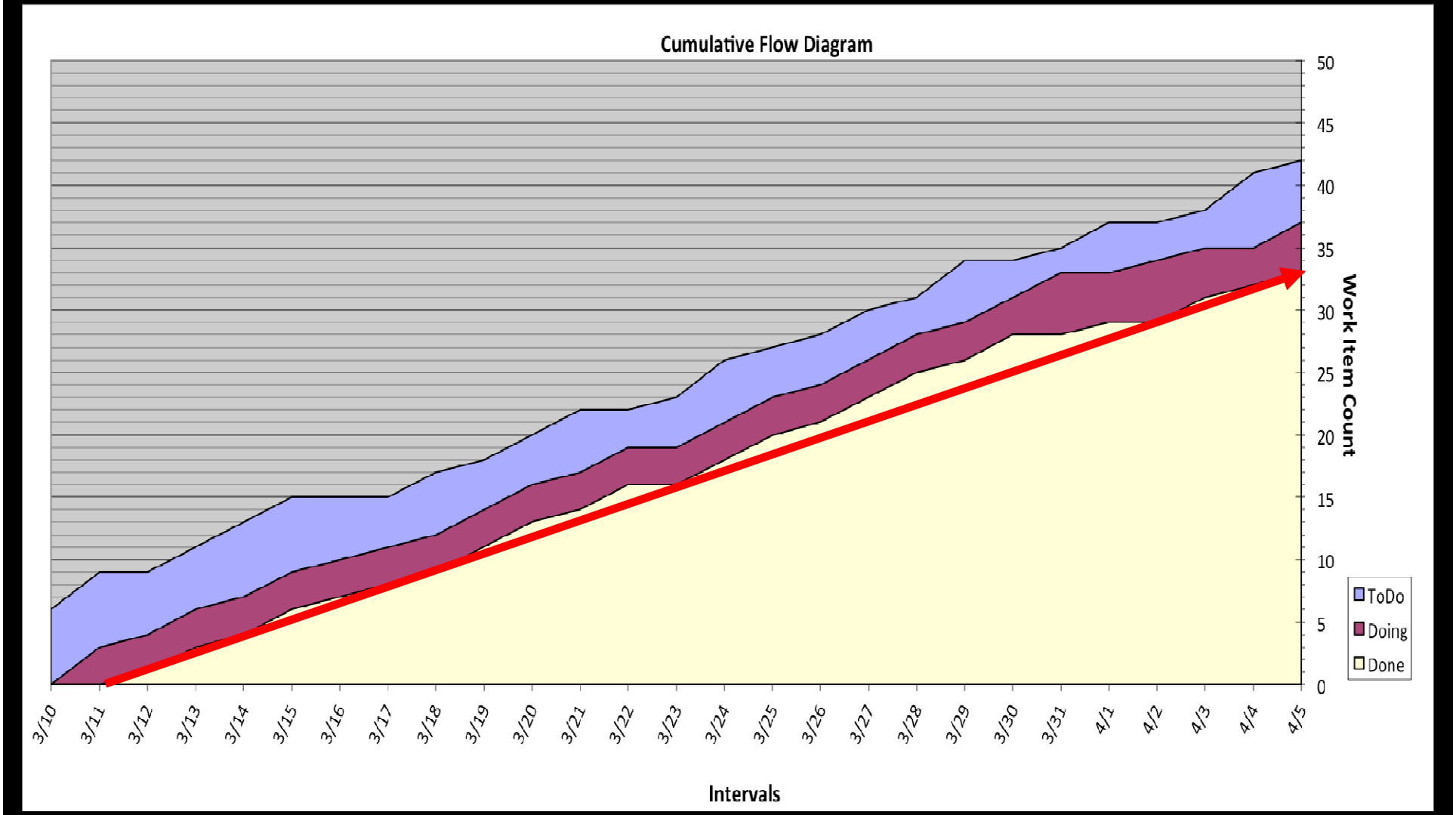
Does this suggest a specific queuing approach?

- FIFO?
- First In First Served?
- First In Mostly First Served?

So What??

Long term planning/projections

- If our average lead time is 10 days and our WIP is 10 items, what is our average weekly throughput?
- If we know our average throughput is 5 items per week, how long will it take to complete a project of 100 items?
- If we know our average throughput is 5 items per week, how many items should we plan for in a 10 week project?


Cumulative Flow Diagram
50
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3/10
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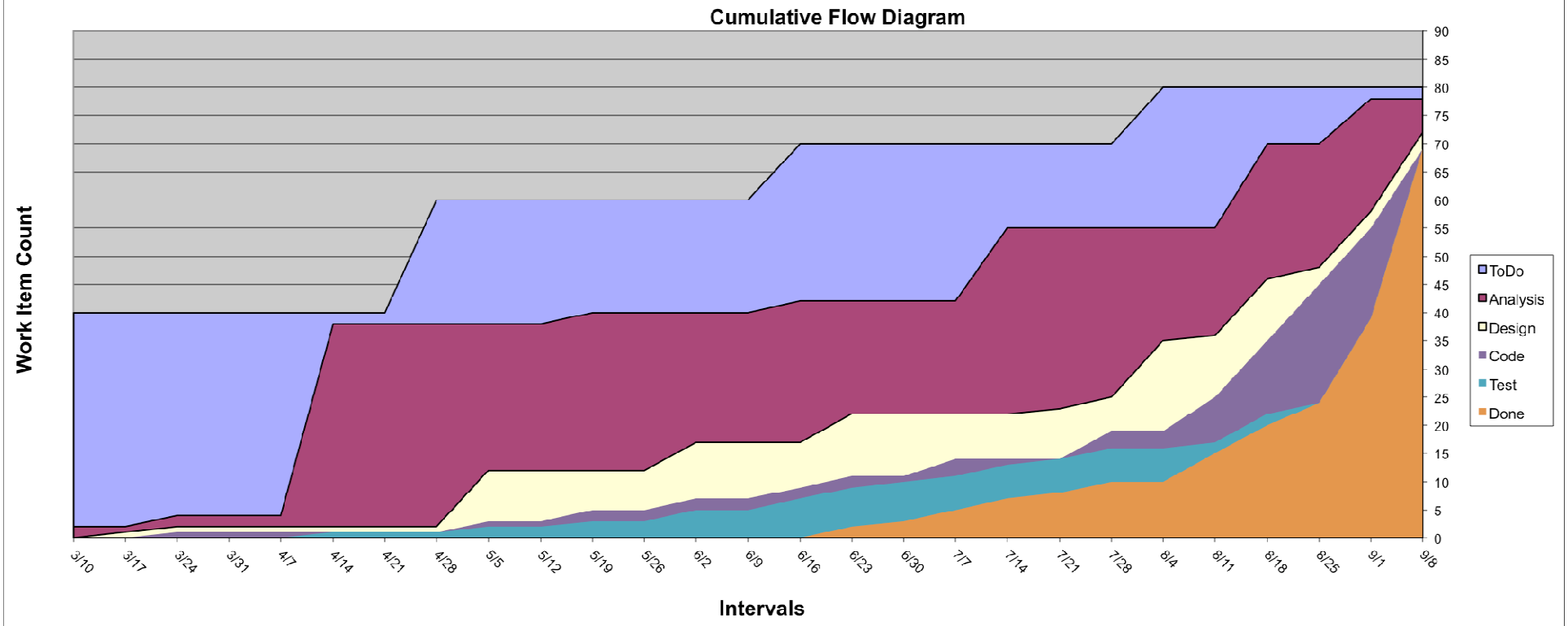
3/12
3/13
3/14
3/15
3/16
3/17
3/18
3/19
3/20
3/21
3/22
3/23
3/24
3/25
3/26
3/27
3/28
3/29
3/30
3/31
4/1
4/2
4/3
4/4
4/5
Intervals


Cumulative Flow Diagram
Work Item Count
Intervals
ToDo
Analysis
Design
Code
Test
Done
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
3/10
3/17
3/24
3/31
4/7
4/14
4/21
4/28
5/5
5/12
5/19
5/26
6/2
6/9
6/16
6/23
6/30
7/7
7/14
7/21
7/28
8/4
8/11
8/18
8/25
9/1
9/8

A word about predictability

- Predictable does not mean deterministic
- Little's Law works, but it is still an average.

Want to learn more?

Little's Law Paper:

http://web.mit.edu/sgraves/www/papers/Little's%20Law-Published.pdf

Online getKanban game:

http://getkanban.corporatekanban.com

Frank Vega's blog at: http://www.vissinc.com/

Boston Kanban Training:

July 26-27 (visit corporatekanban.com for info)

Questions?

THANK-YOU!

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