

# Kanban, Flow and Cadence

Karl Scotland

## Kanban

- Controlled Work

## Flow

- Effective Work

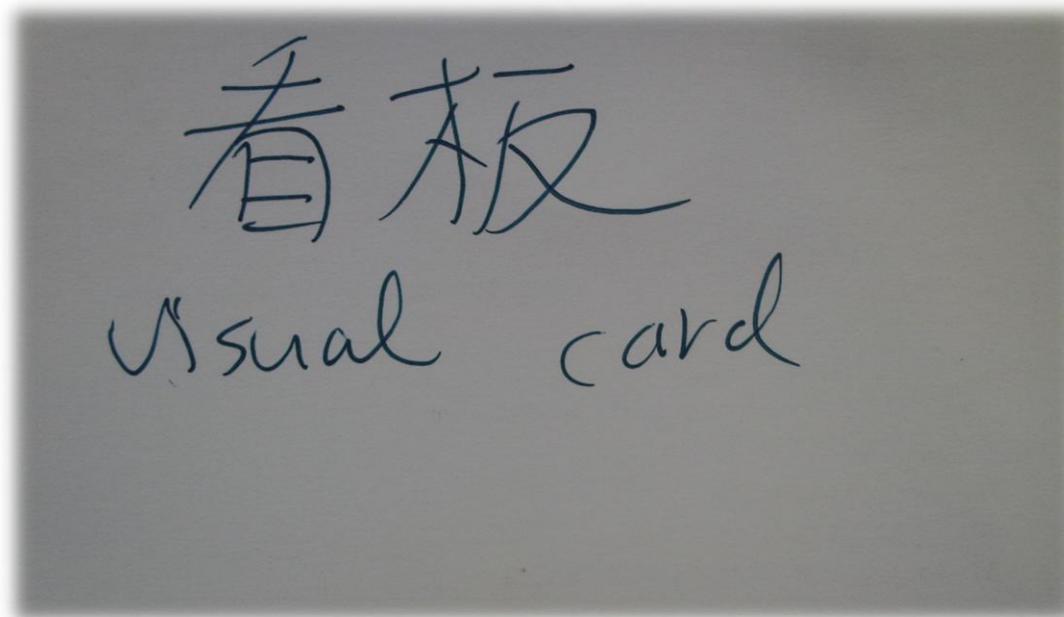
## Cadence

- Reliable Work

# Kanban

## Controlling the Workflow

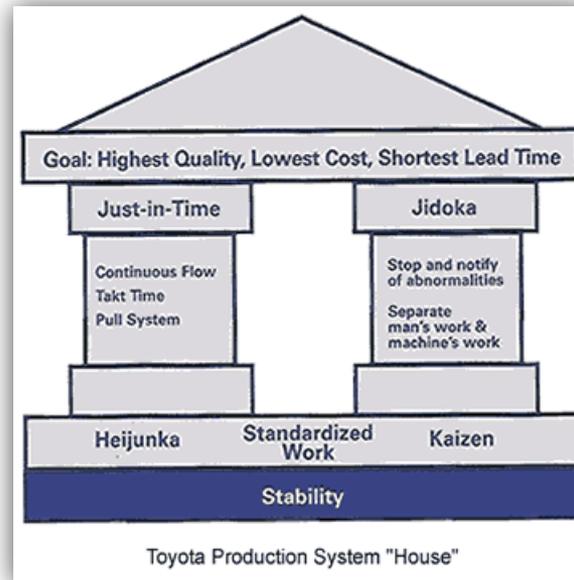
**Kanban** (in kanji 看板 also in katakana  
カンバン, where *kan*, 看 カン, means  
"visual," and *ban*, 板 バン, means "card"  
or "board")



# Toyota Production System

“The two pillars of the Toyota production system are just-in-time and automation with a human touch, or automation. The tool used to operate the system is kanban.”

Taiichi Ohno, Toyota Production System (adopted 1962)

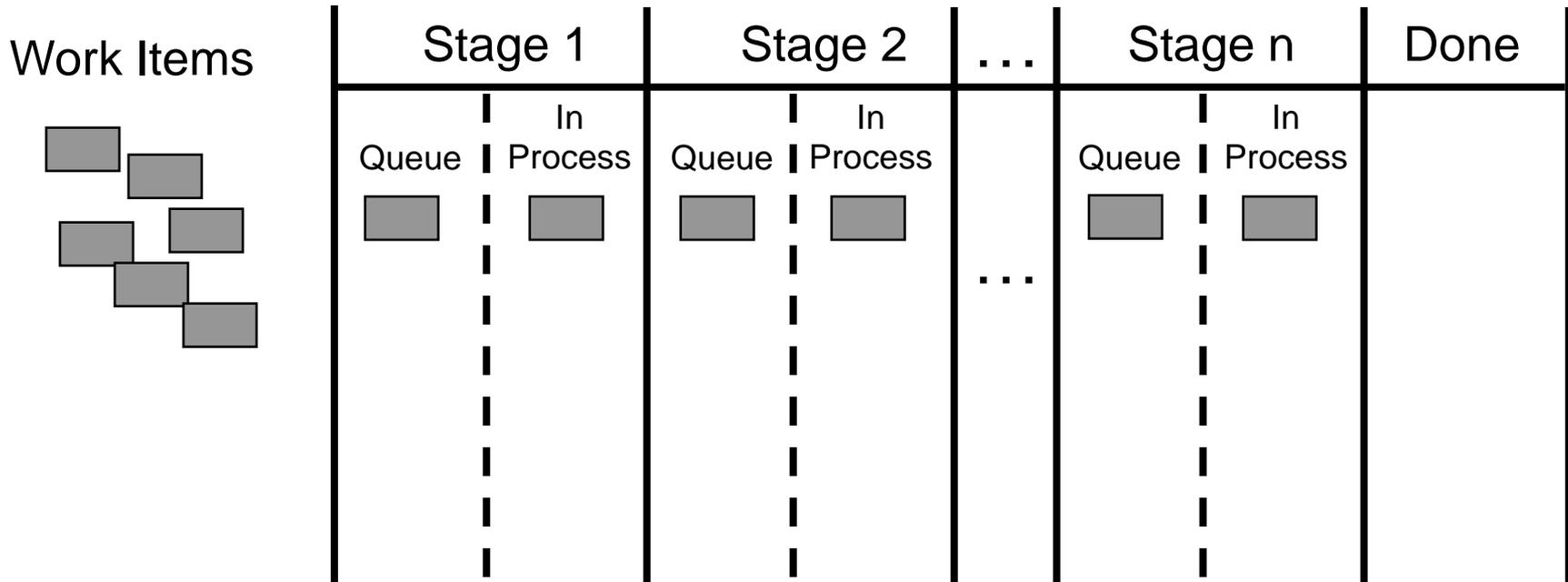


# Heijunka Box (Visual Scheduling)



<http://www.flickr.com/photos/jnywong/2222481466/>

# Kanban Pull



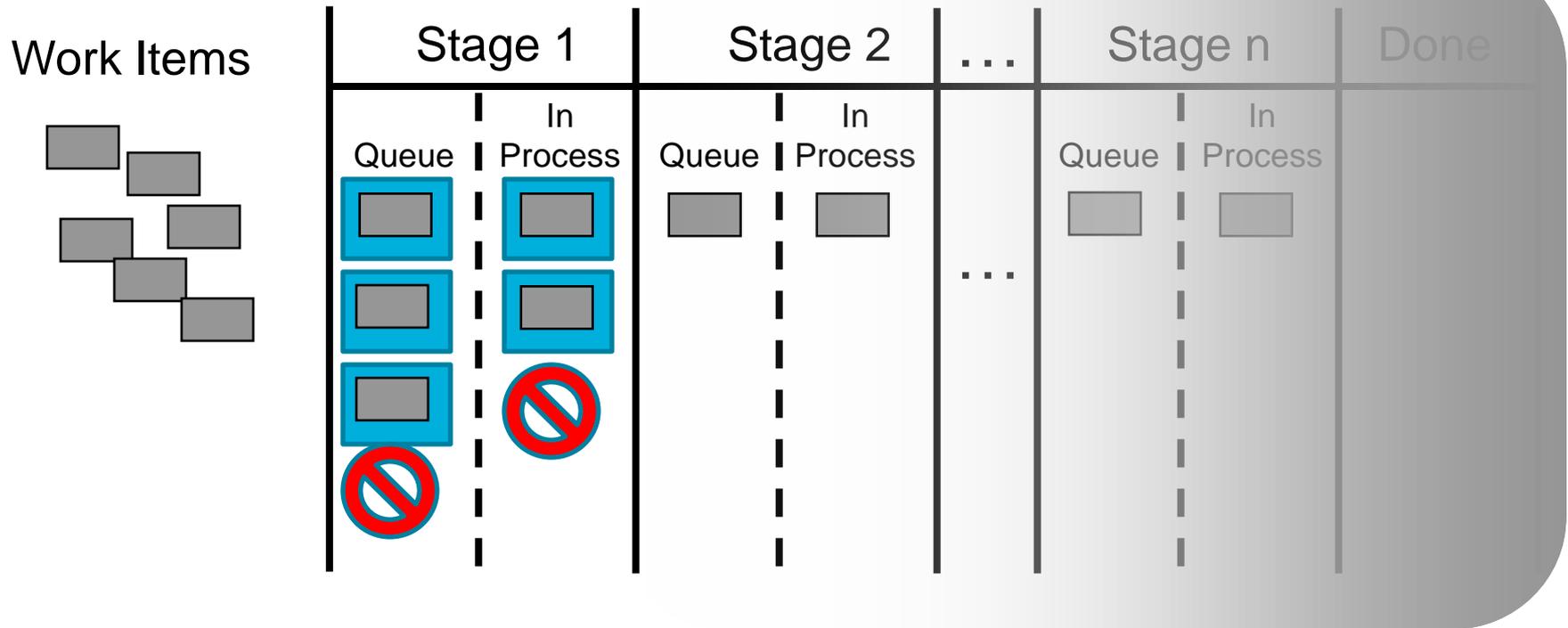
That's it

Except for one more important element

Kanban Limits

- Queue
- WIP

# Kanban Pull – With Limits



# Work In Progress



**Improve  
Productivity**



**Reduce  
Inventory**



**Enhance  
Teamwork**

# Productivity

**EMC<sup>2</sup>**  
where information lives®



## Little's Law for Queuing Theory

$$\text{Total Cycle Time} = \frac{\text{Number of Things in Process}}{\text{Average Completion Rate}}$$

Therefore, to improve cycle time

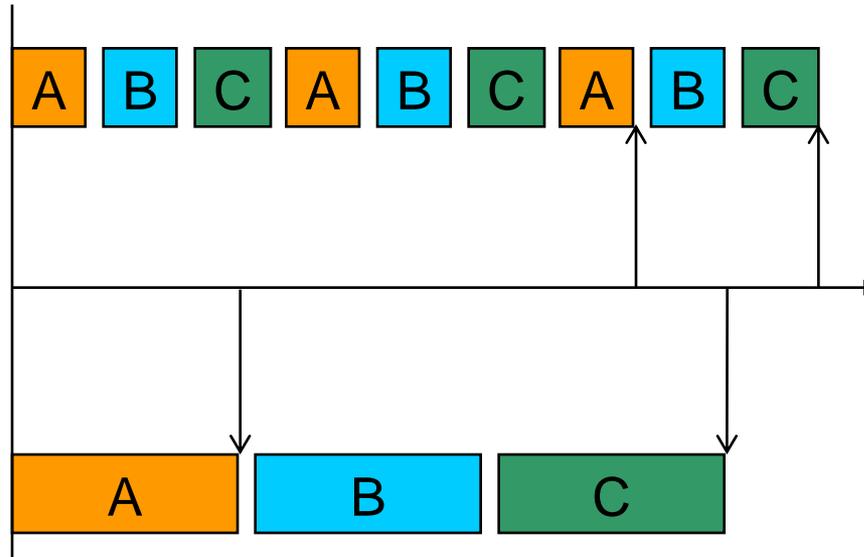
1. Reduce Number of Things in Process
2. Improve Average Completion Rate

## 20% time lost to context switching per 'task'



Gerald Weinberg, Quality Software Management: Systems Thinking

## Sequential yields results sooner



## 3 Projects

- Write the 1st 10 digits in a column
- Write the 1st 10 letters in a column
- Write the 1st 10 roman numerals in a column

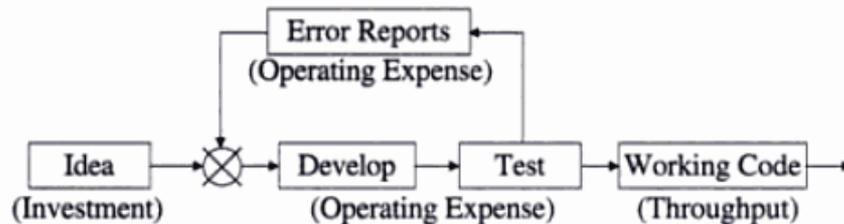
## Sequential (non multi-tasking)

- Column by column

## Parallel (multi-tasking)

- Row by row

## Throughput Accounting



Unit of Inventory = Idea  
Value of Inventory = Investment to Create the Idea  
Investment = Value<sub>Input</sub>  
Value<sub>Output</sub> = Sales Price - Direct Costs  
Value Added = Value<sub>Output</sub> - Value<sub>Input</sub>  
Throughput = Value<sub>Output</sub>

$$\text{Net Profit} = \text{Throughput} - \text{Operating Expense}$$
$$\text{Return on Investment} = \frac{\text{Net Profit}}{\text{Investment}}$$

## Enhances Teamwork

- Team focus on goals that add value not individual tasks

## Encourages Swarming



## What are you going to work on?

1. Work directly on an existing kanban to progress it
2. Collaborate with team members on an existing kanban to remove a bottleneck or constraint
3. Begin working on a new kanban if a slot is available
4. Find some other useful work

## Lower priority work...

- Spikes
- Analysis

## Other interesting work...

- Refactoring
- Tool Automation
- Personal Development
- Innovation

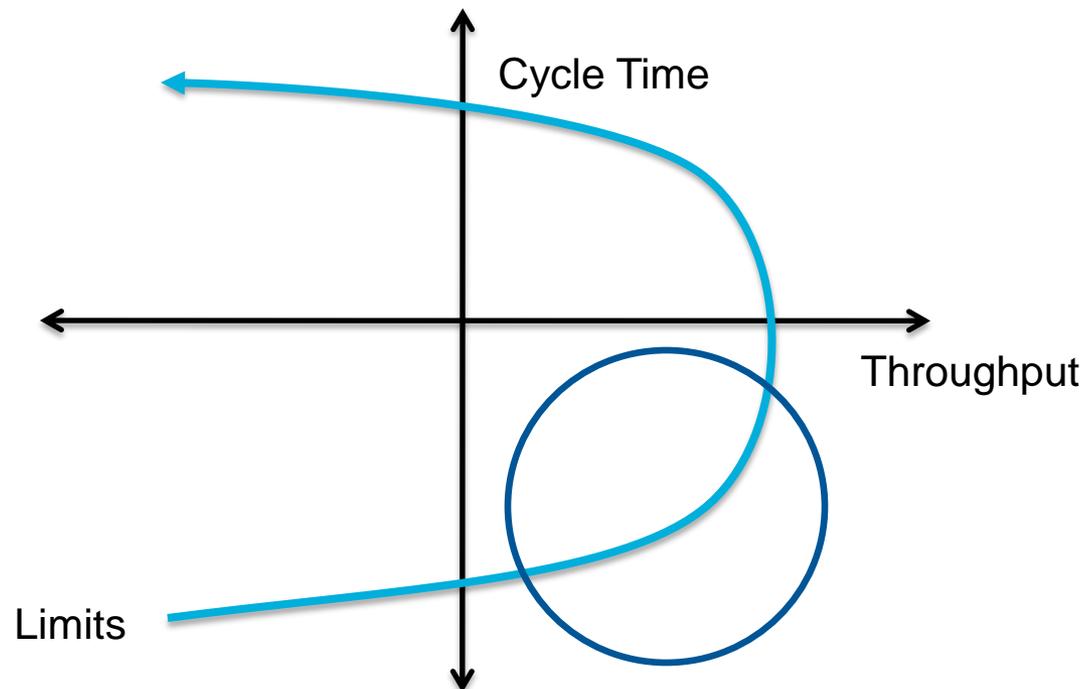
## But NOT

- Anything which will create work downstream

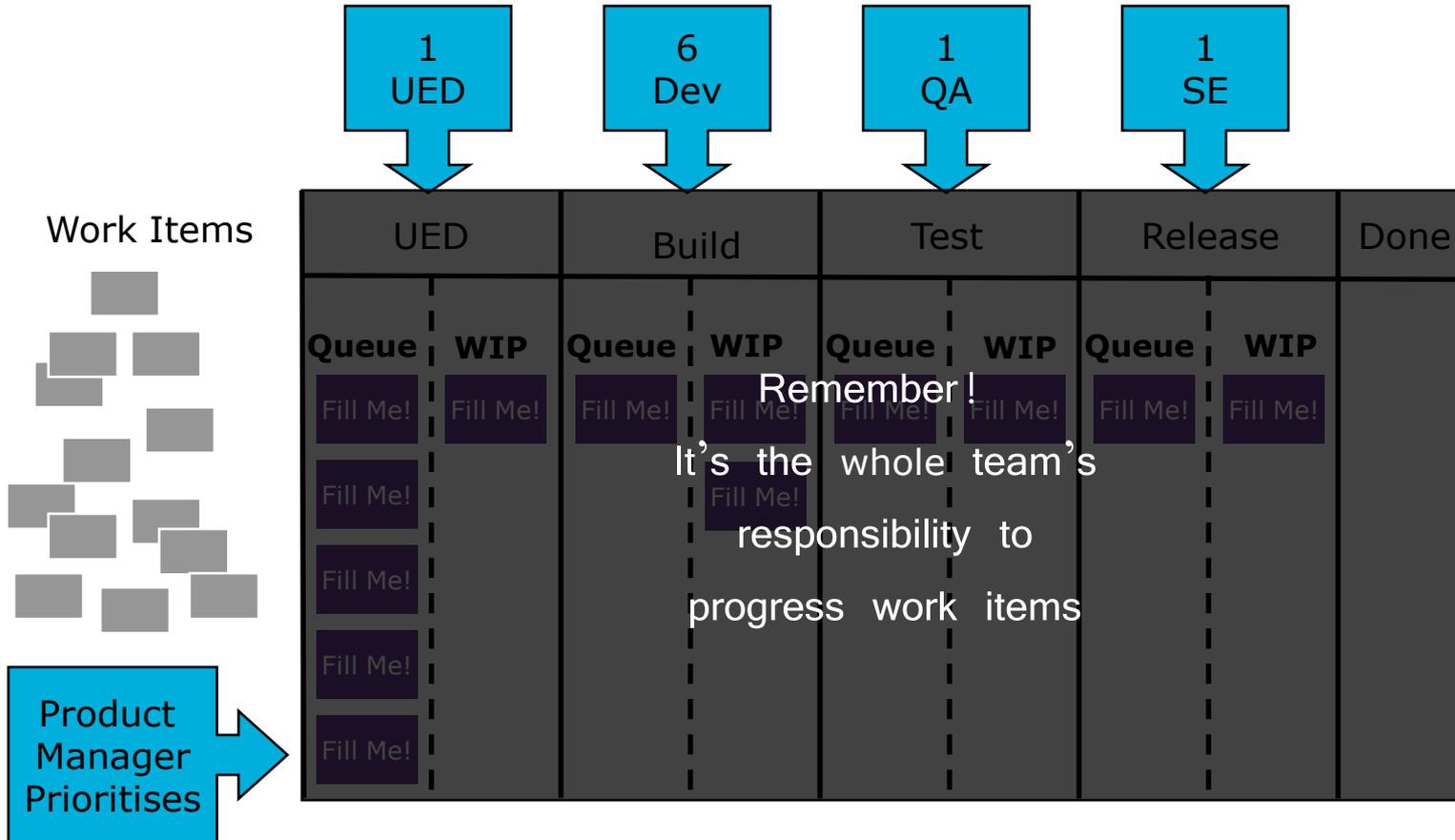
- Depends on type of work and size of team
- Should be adjusted to achieve maximum flow

Queue limits help to keep the flow smooth by:

- Keeping the team busy
- Avoiding premature prioritisation



# Example



## Why Kanban?

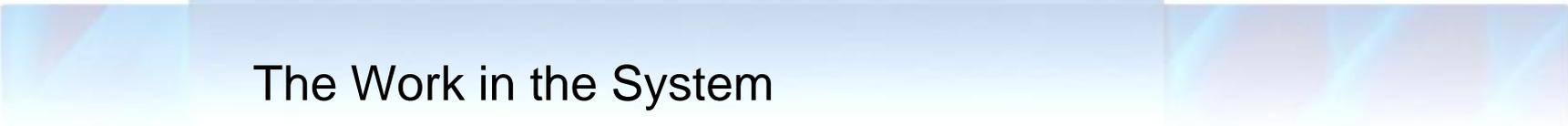
If you spend time managing large, complex backlogs, they could be eliminated

If you find the ceremony of time-boxing interrupts your work they could be eliminated

If estimation is not helping planning, it could be eliminated



Flow



The Work in the System

“In lean enterprises, traditional organizational structures give way to new team-oriented organizations which are centred on the flow of value, not on functional expertise.”

<http://www.poppendieck.com/papers/LeanThinking.pdf>

Moving one piece at a time between stages in a workflow

as opposed to

Moving batches of work between stages in a workflow

“A minimal marketable feature is a chunk of functionality that delivers a subset of the customer’s requirements, and that is capable of returning value to the customer when released as an independent entity”

M Denne & H Cleland-Huang, Software by Numbers

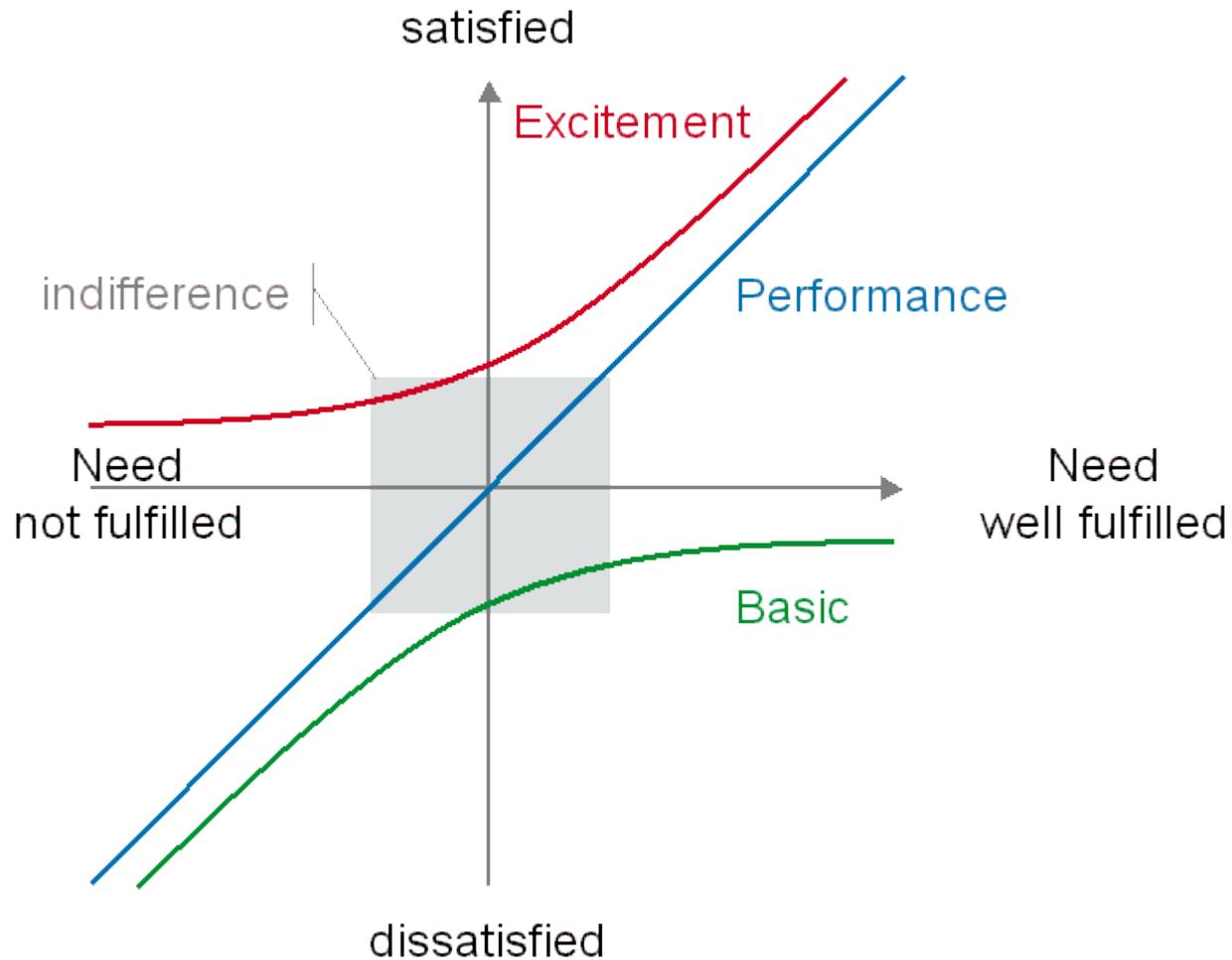
## As small as possible

- Progressive delivery (realise product sooner)
- Reduce feature bloat (the core features are the most important)
- A feature has a cost to a user (added complexity)

I will be able to write an entry  
in our product blog about this  
new feature



# Kano Model



## Table Stakes

- Parity to the competition
- Minimum needed to be in the game

## Differentiator

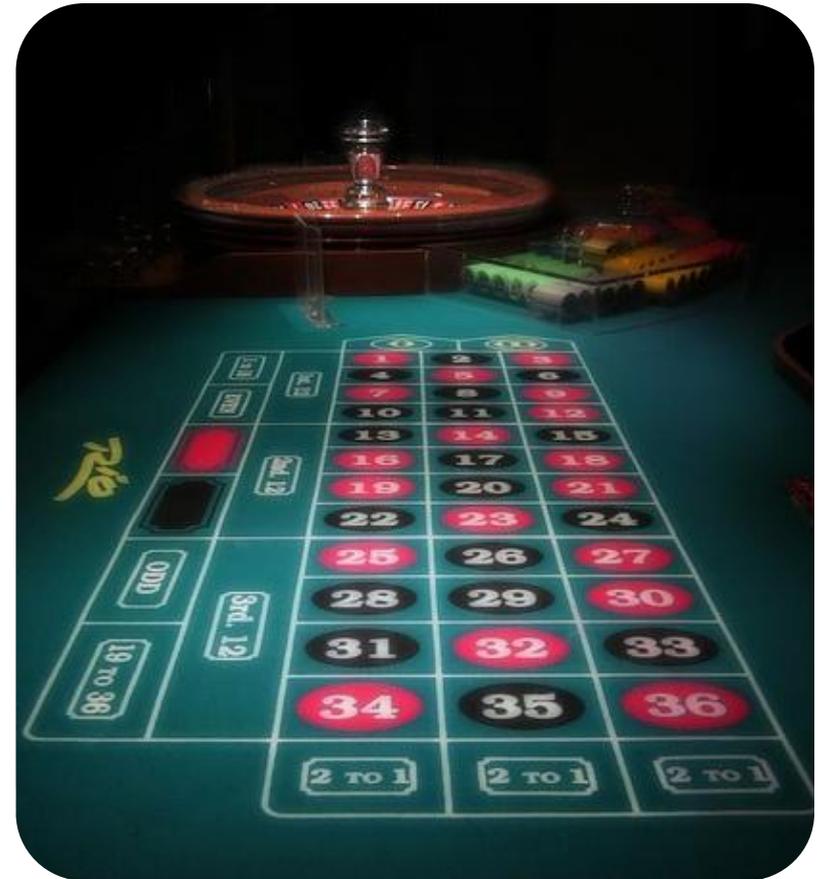
- Differentiates from the competition
- Delights the customer

## Spoiler

- A competitors differentiator
- Raises the bar for parity

## Cost Reducer

- Reduces cost
- Improves the margin



## Distinct, Deliverable, Observable

### Fits the INVEST acronym

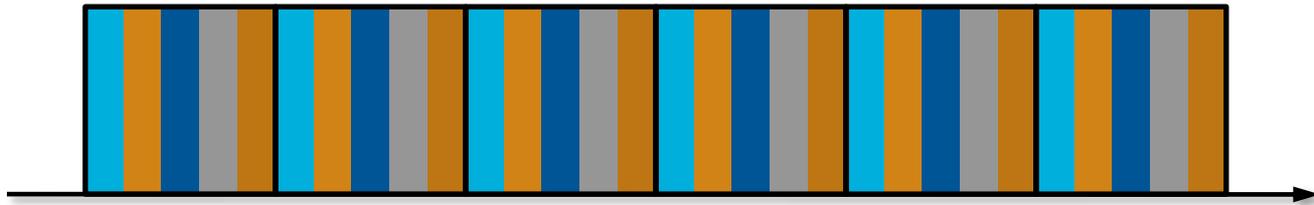
- Independent
- Negotiable
- Valuable
- Estimable
- Sized Appropriately
- Testable

# Large Batch

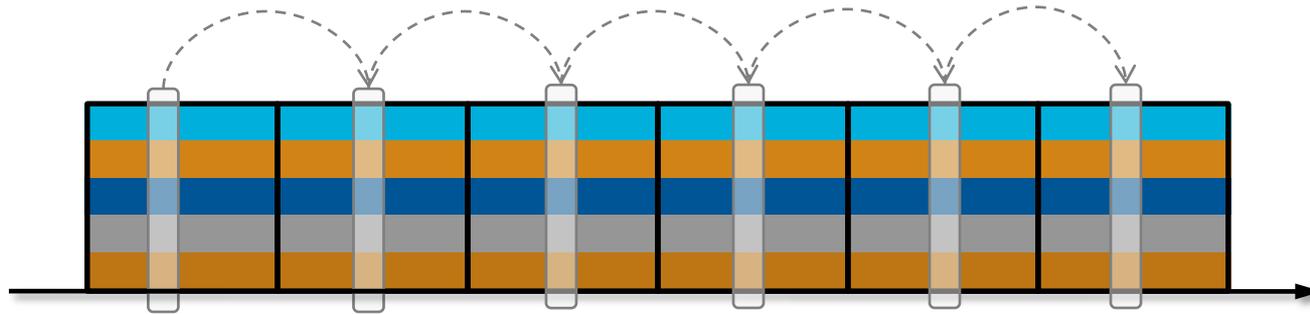


-  Analysis
-  Design
-  Build
-  Test
-  Release

# Smaller Batches

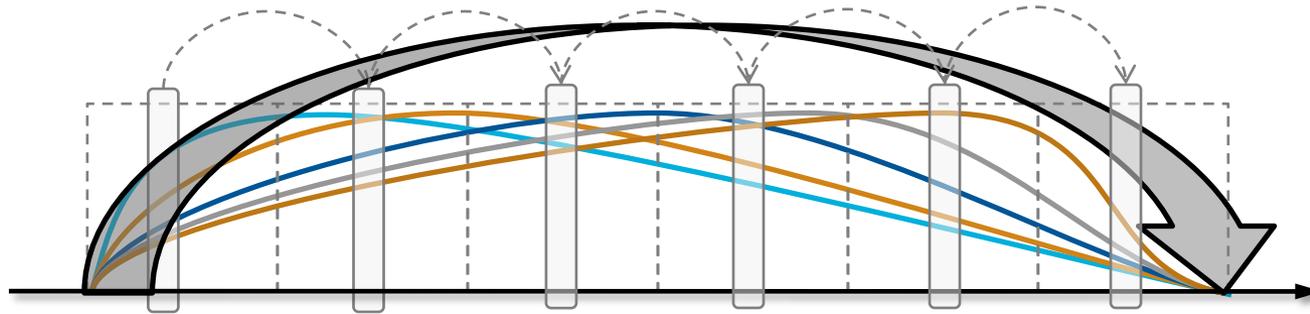


-  Analysis
-  Design
-  Build
-  Test
-  Release

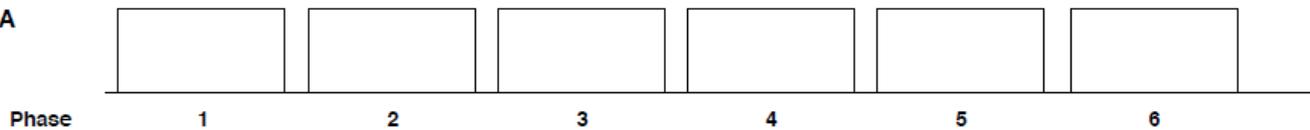


-  Analysis
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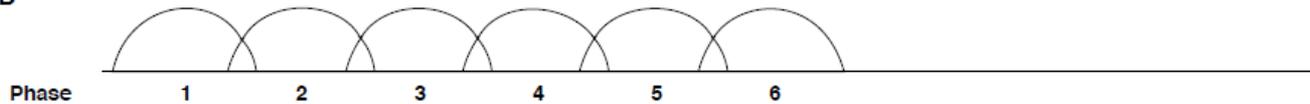
# One Piece Flow



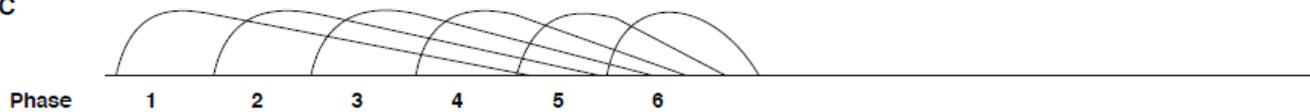
Type A



Type B



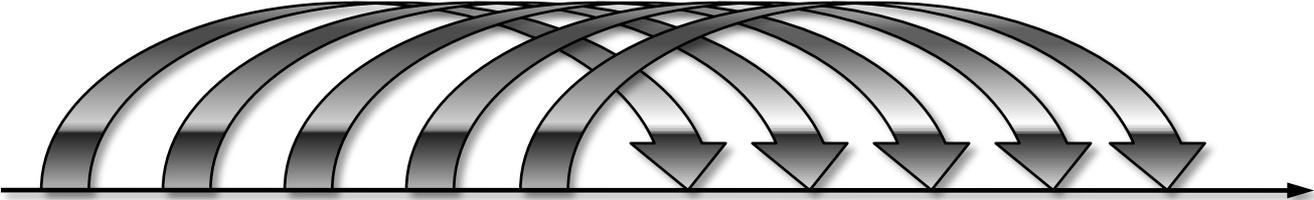
Type C



-  Analyze
-  Design
-  Implement
-  Demonstrate
-  Reiterate

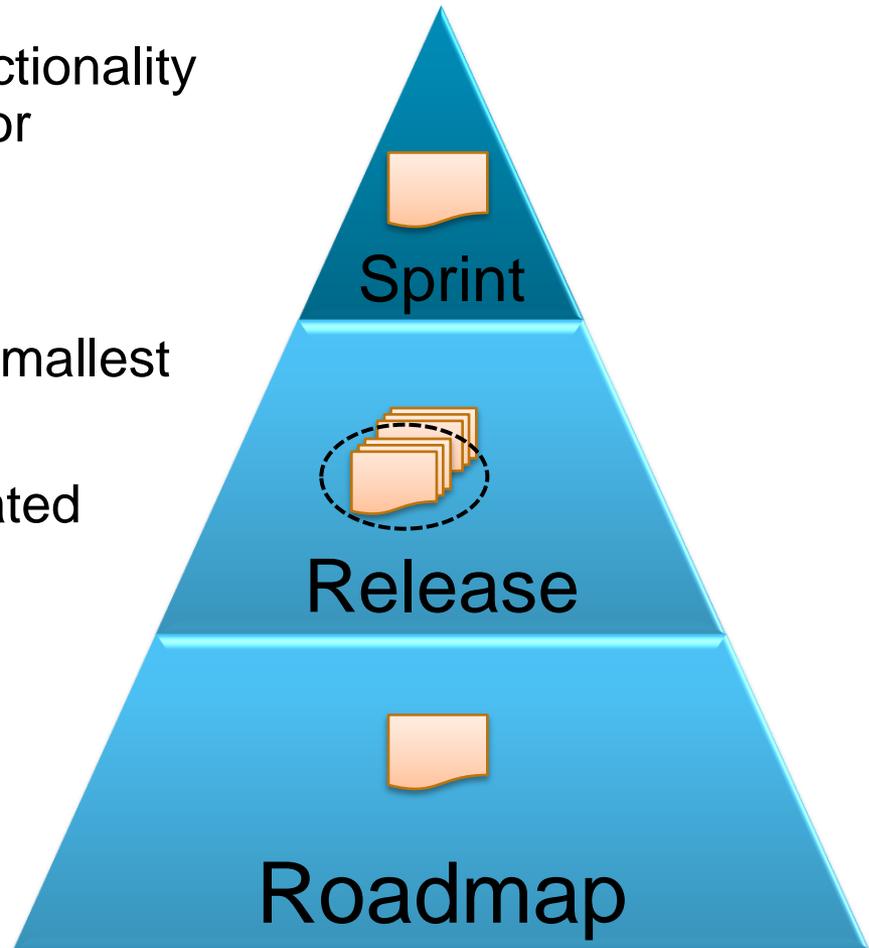
The New New product Development Game, Hirotaka Takeuchi and Ikujiro Nonaka

# Continuous Flow

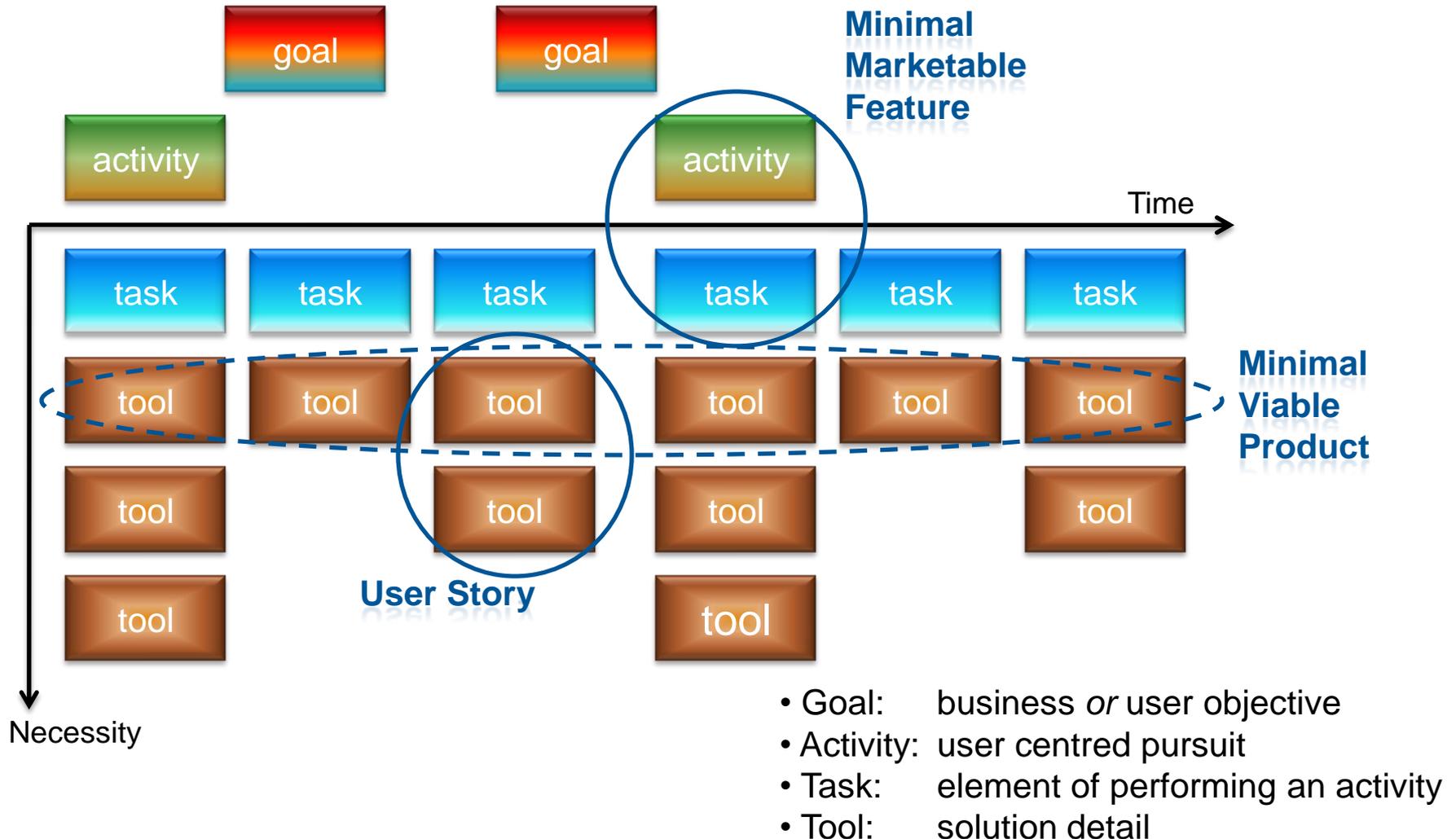


# The Backlog Iceberg

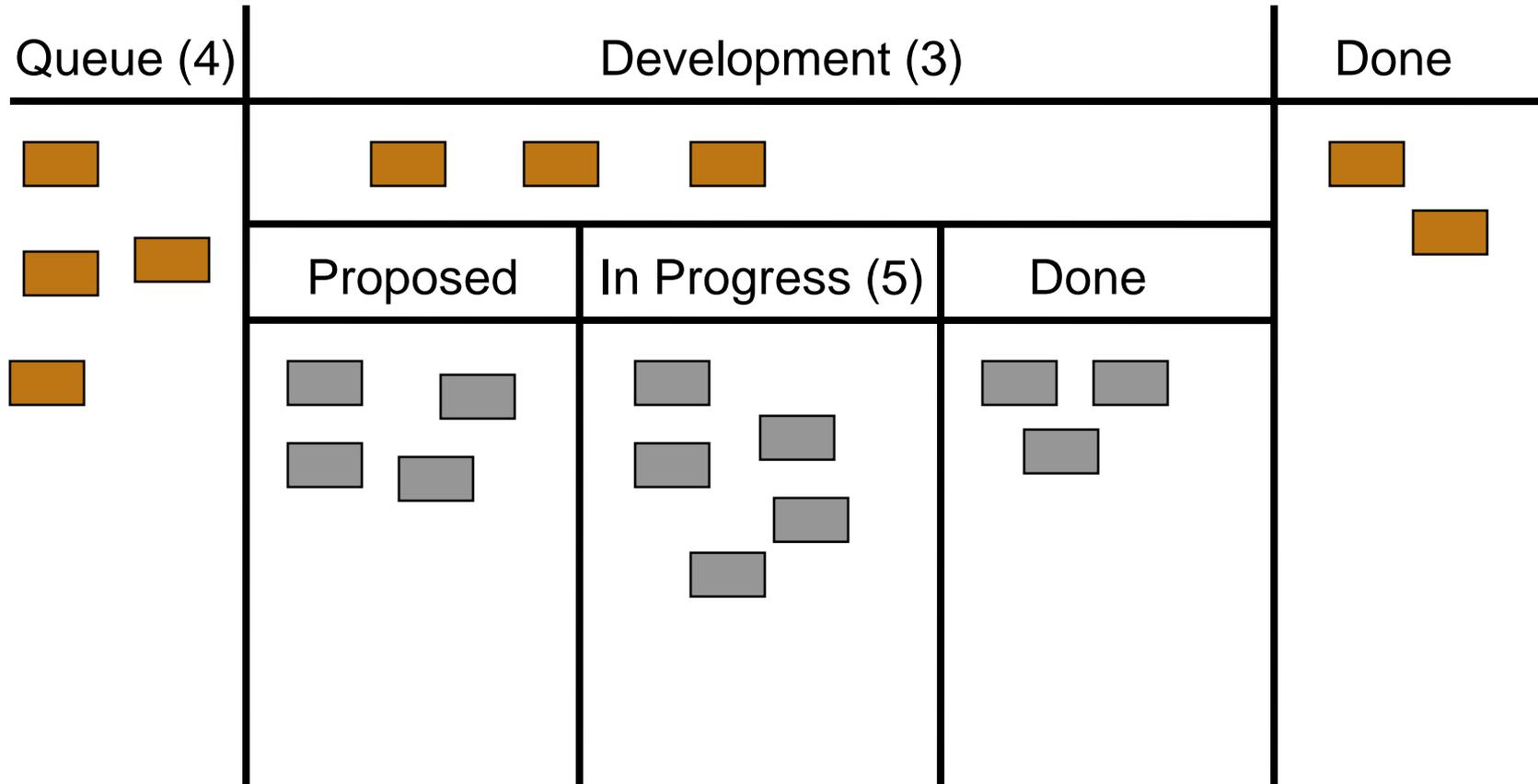
- Story – a description of desired functionality told from the perspective of a user or customer
- Minimal Marketable Feature – the smallest valuable set of Stories in a Theme
- Theme – a collection of smaller related Stories
- Epic – a large Story



# The Backlog Map

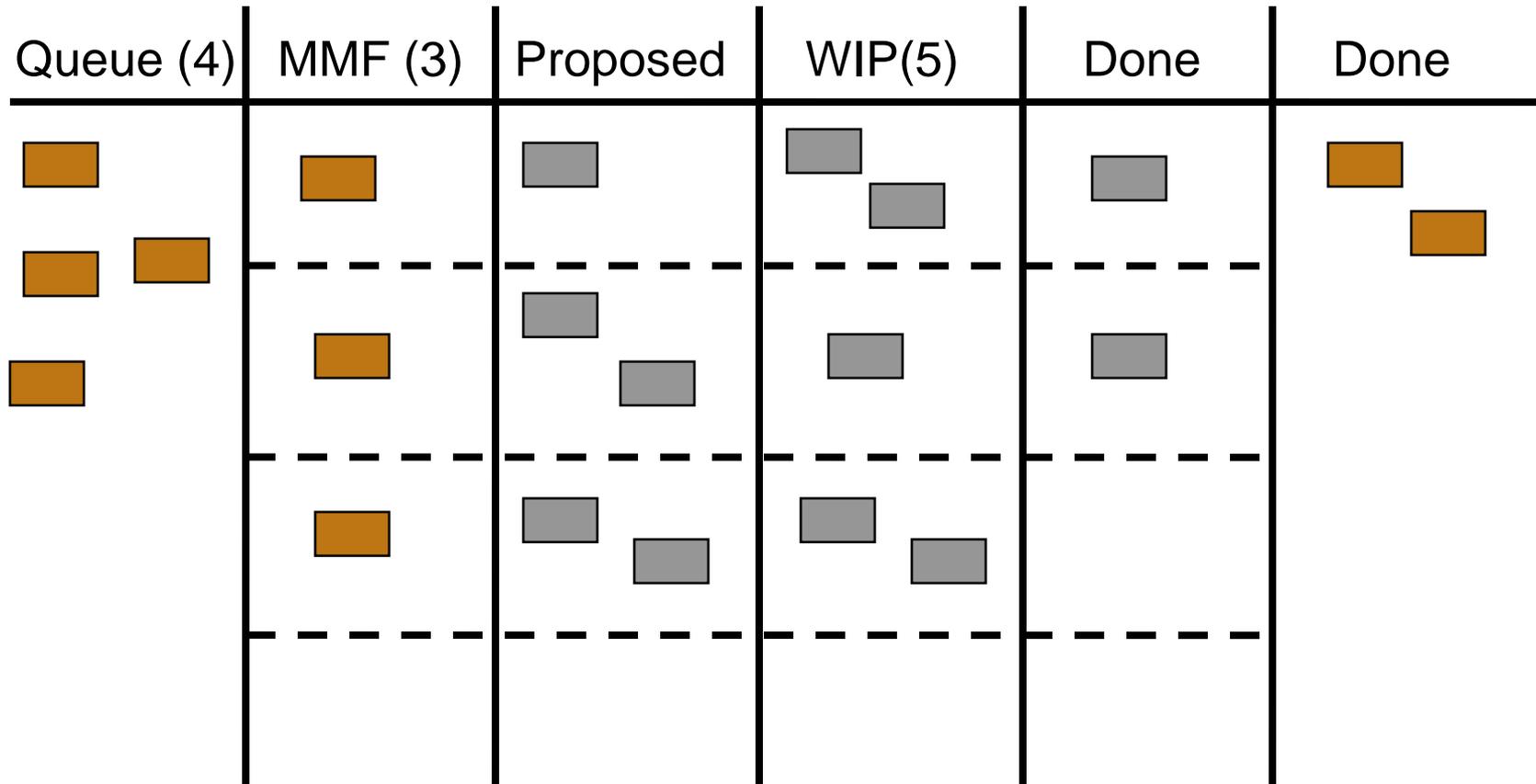


# Two Tier Kanban - 1



 MMF  User Story

# Two Tier Kanban - 2



 MMF  User Story

## Why Flow?

If you struggle to break down functionality into time-box sized increments, then you could just focus on larger MMFs.

If you deliver frequent User Stories, but struggle to deliver business value, then you could focus on delivering larger MMFs.



Cadence

Commitment and Reliability

“If the team isn’t estimating or planning with fixed time-boxes, how can it make reliable commitments?”

Anonymous(es)

“A regular cadence, or ‘heartbeat,’ establishes the capability of a team to reliably deliver working software at a dependable velocity. An organization that delivers at a regular cadence has established its process capability and can easily measure its capacity.”

<http://www.poppendieck.com/pipeline.htm>

twitter

@marick Iteration-based agile is like a metronome where we seek feedback at every tick, Kanban is like a drummer who feels the rhythm



*06:59 PM November 28, 2008 from Syrinx in reply to marick*



**andypalmer**

Andy Palmer

- Input (Planning/Prioritisation)
- Output (Release)
- Review
  1. Stop the Line for special cause problems
  2. Monthly Retrospectives with Operations Reviews for common cause problems
  3. Quarterly Value Stream Mapping to re-assess the whole value stream
- Operational

- Throughput - the amount of output of a process in a given period of time
- Cycle Time - the length of time to complete a process

$$\text{Throughput} = \text{WIP} / \text{Cycle Time}$$

Throughput allows forecasting of future capability

Cycle Time allows appropriate prioritisation

## Cycle Time becomes an SLA with the business

- *“When we agree to take on a work request, we intend to deliver it within n days”*

<http://leansoftwareengineering.com/2007/09/10/striking-a-different-bargain-with-the-business/>

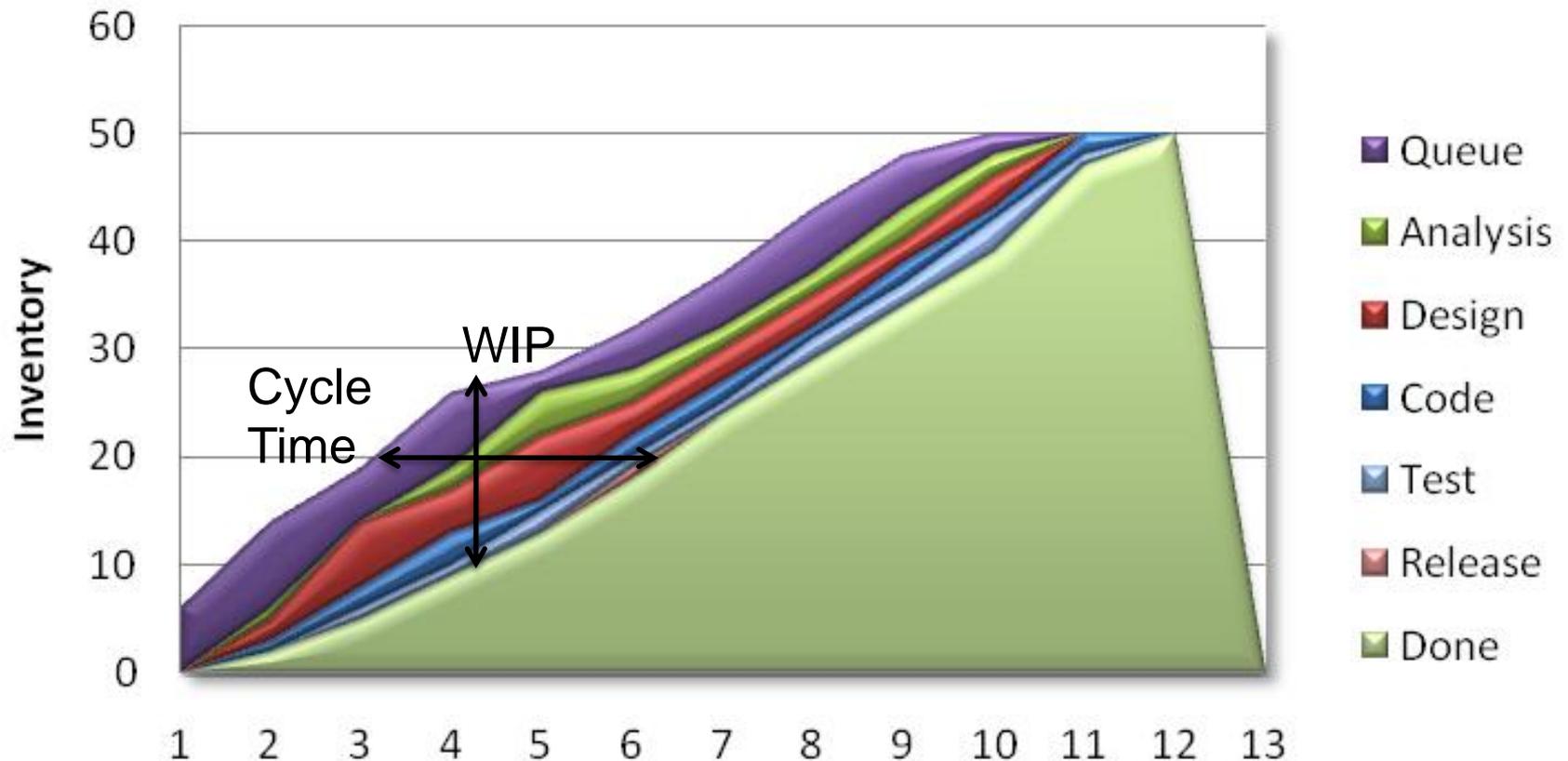
May need to size and/or classify MMFs where there is variation

Due Date Performance (DDP) is the percentage of MMFs delivered with the SLA

- Forecast quarterly goals and objectives
- Prioritise MMFs to meet those goals and objectives
- Release regularly
- Build trust that the team is working to its full capacity

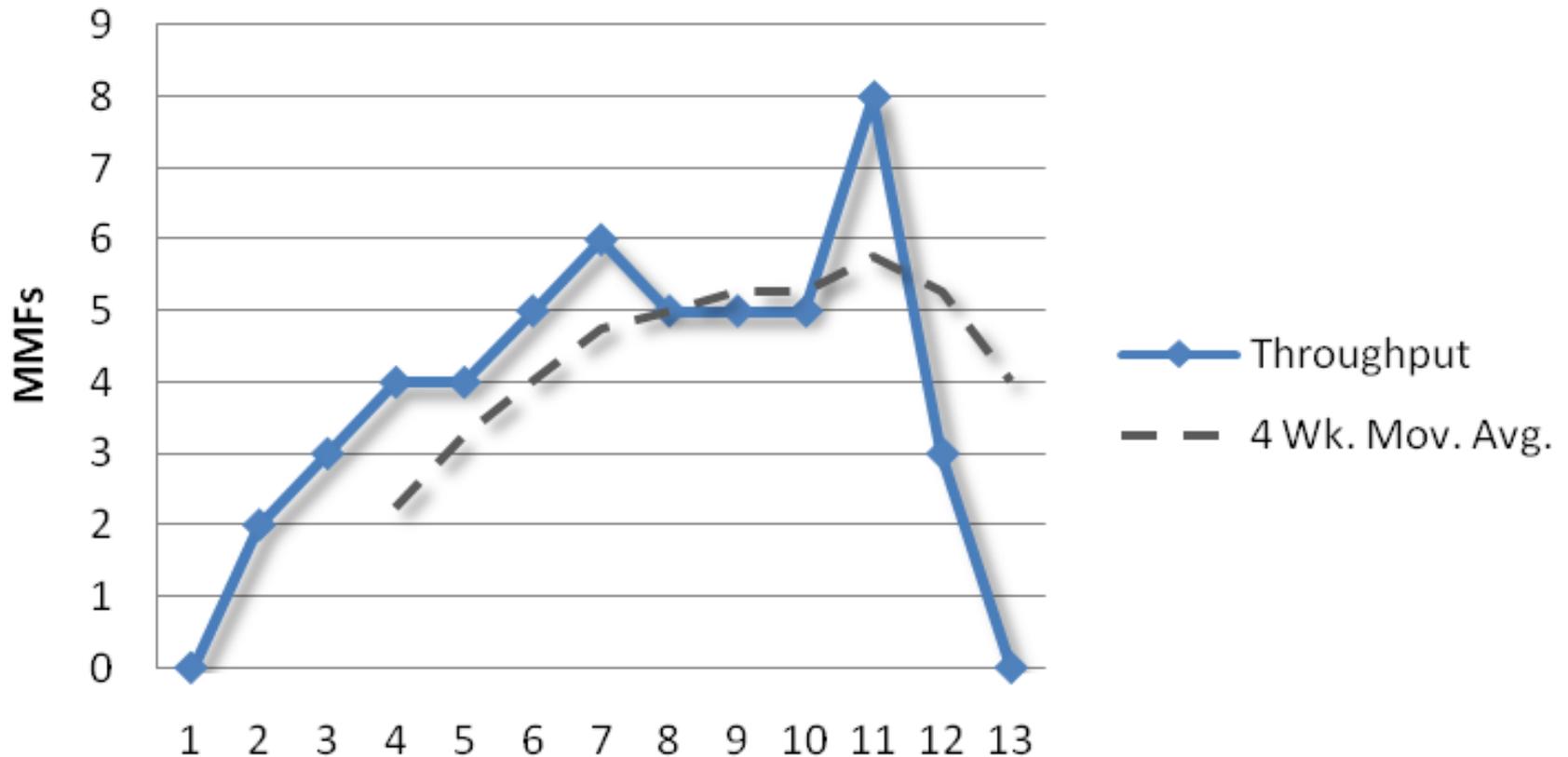
# Cumulative Flow Diagram

## Cumulative Flow



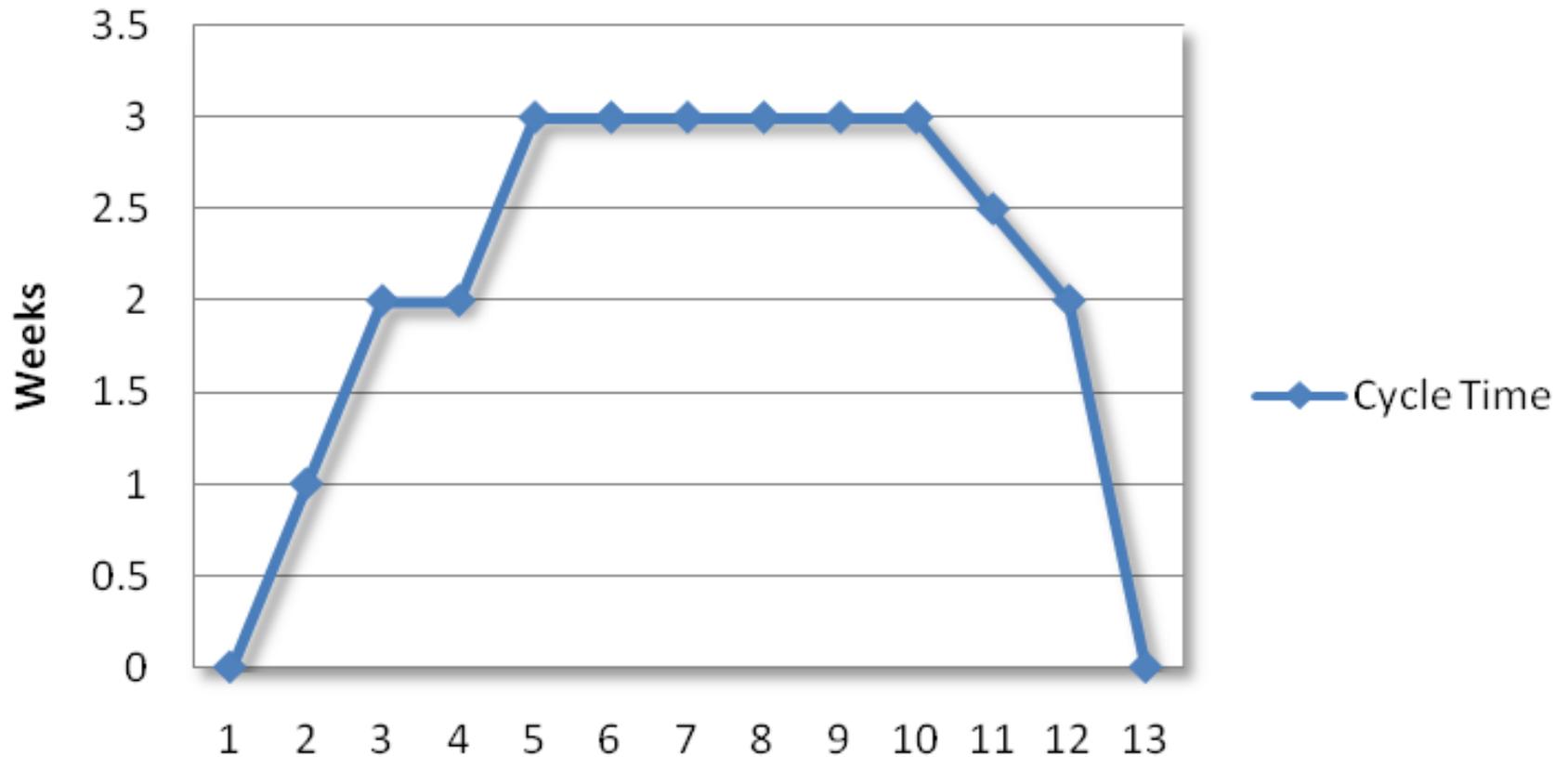
# Throughput Chart

## Throughput



# Cycle Time Chart

## Cycle Time



## Why Cadence?

If you find the time-box ceremonies too restricting, or unproductive, then they can be de-coupled to allow a more natural rhythm

If your estimation and planning is not accurate or reliable, then it can be replaced with measurements to forecast capability



# Summary



## Setup

- The system includes a cup of Raw Material tokens, several workers in a row, and a cup for Finished Goods.
- Each worker has a fair die.
- Place 6 tokens between each worker

## Game

- Worker 1 removes tokens from the cup according to the number of dots rolled on the die. The tokens are moved to a point between Worker 1 and Worker 2. Worker 2 rolls the die and moves tokens from between Worker 1 and Worker 2 to between Worker 2 and Worker 3. Then number processed is the maximum of the number rolled and the number of tokens available (WIP) at that location

## Process

- Play the game for ten days. Each worker will roll the die once each day.
- Record the final amount of Finished Goods and Work in Process



## Setup

- The system includes a cup of Raw Material tokens, several workers in a row, and a cup for Finished Goods.
- Each worker has a fair die.
- Place 6 tokens between each worker

## Game

- On day 1, the last worker moves the tokens into the finished goods cup according to the roll of the dice. The next to last worker rolls and tries to replenish the WIP before the last worker to its Kanban level of 6.
- Sometimes the next to the last worker will be short and will have to make up the shortage on future days. Sometimes the next to the last worker will roll a high number and could exceed the Kanban level. Don't allow the Kanban level (WIP between two workers) to go above 6 tokens.

## Process

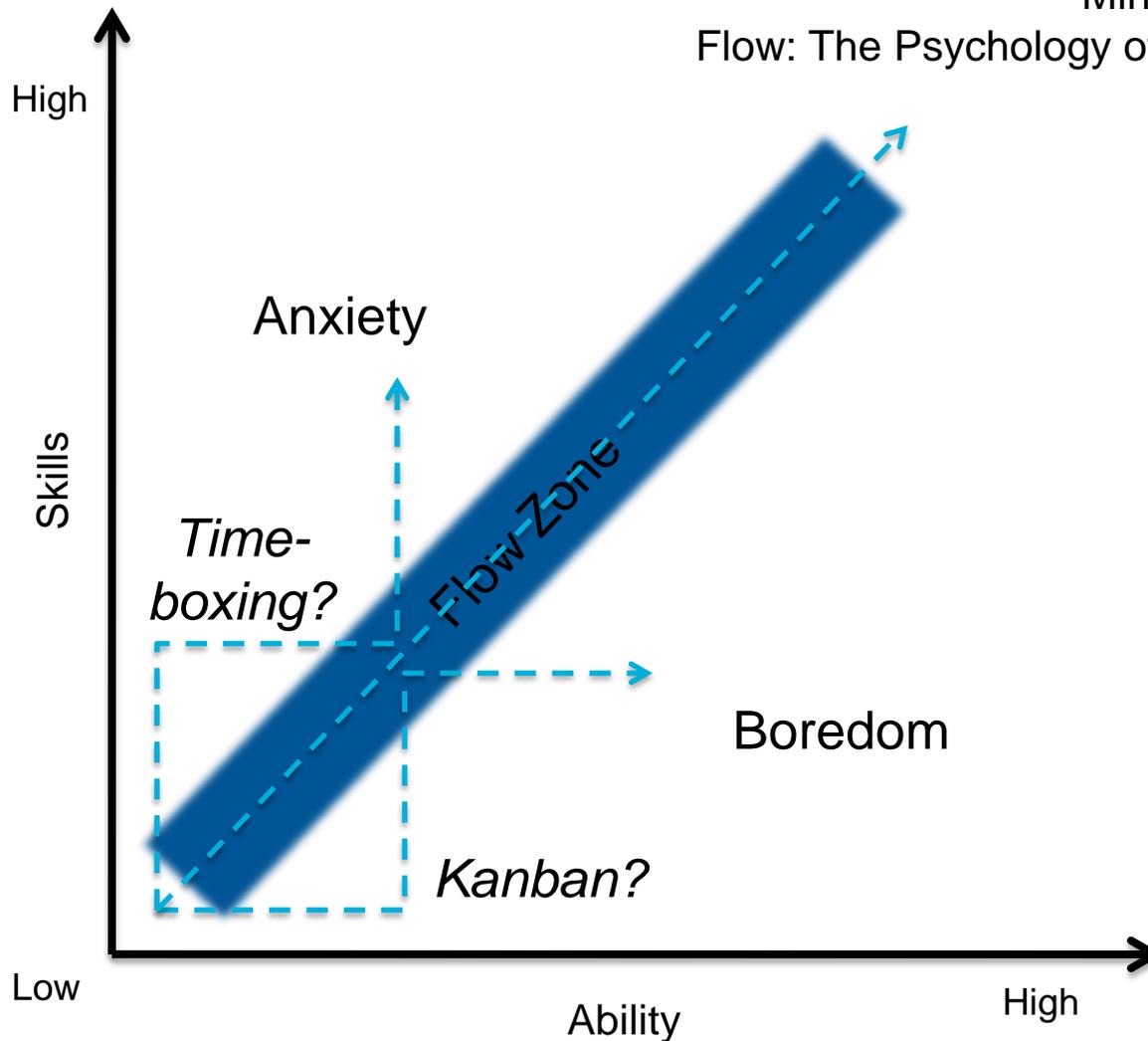
- Play the game for ten days. Each worker will roll the die once each day.
- Record the final amount of Finished Goods and Work in Process

### How did the two processes compare?

- Finished Goods?
- Work in Process?
- Throughput?

### Any other observations?

Mihalyi Csikszentmihalyi,  
Flow: The Psychology of Optimal Experience



Kanban is an alternative, not a replacement

However, rather than focusing on being Agile which *may* (and *should*) lead to being successful, Kanban focuses on becoming successful, which *may* lead to being Agile.

Therefore, Kanban can sit on top of any existing process



Thank You

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<http://availagility.wordpress.com>

<http://groups.yahoo.com/group/kanbandev/>

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