



Kanban
University



Kanban System Design (KSD)

Part I of the Kanban Management Professional Credential

Version 2.0.1

Silke Noll

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Yes We
KANBAN



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Kanban System Design

Successful Evolutionary Change for your 21 Century Organization

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Introduction

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Power in Simplicity!



Kanban
CONFERENCES



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Pragmatic, actionable, evidence-based guidance!

Something you can take away and implement next Monday

Kanban Self-Assessment

1. Novice	Curious, no real knowledge, “my boss sent me”
2. Informed	Attended a Lean Kanban conference, watched Kanban videos, or read material about Kanban
3. Practicing	Implemented a Kanban board with my team
4. Practitioner	“Kanbanized” a customer-oriented workflow involving multiple organizational units, with multiple activities, work item types and classes of service
5. Master	Applied #4 to multiple interconnected services in the enterprise, with quantitative feedback loops



What is your purpose
for being here in this
class?

What are your
objectives?

Purpose of this Class

- Take a pro-active, rational and well-communicated approach to continuous improvement
- Achieve higher levels of both internal and external customer satisfaction, sustainably
- Outline a path to increase organizational maturity, including how to overcome resistance to change
- Implement simple and effective cross-boundary coordination
- Use proven tools and methods to increase capability, remove delays, reduce variability, and manage bottlenecks
- Develop an understanding of evolutionary change and avoid the tendency for pushing disruptive, presumptive solutions
- Effectively scale workflow agility without changing job titles, organization structures, or causing other disruptions
- Increase skills and implementation of the 6 general practices of Kanban

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Overview of the Course Modules

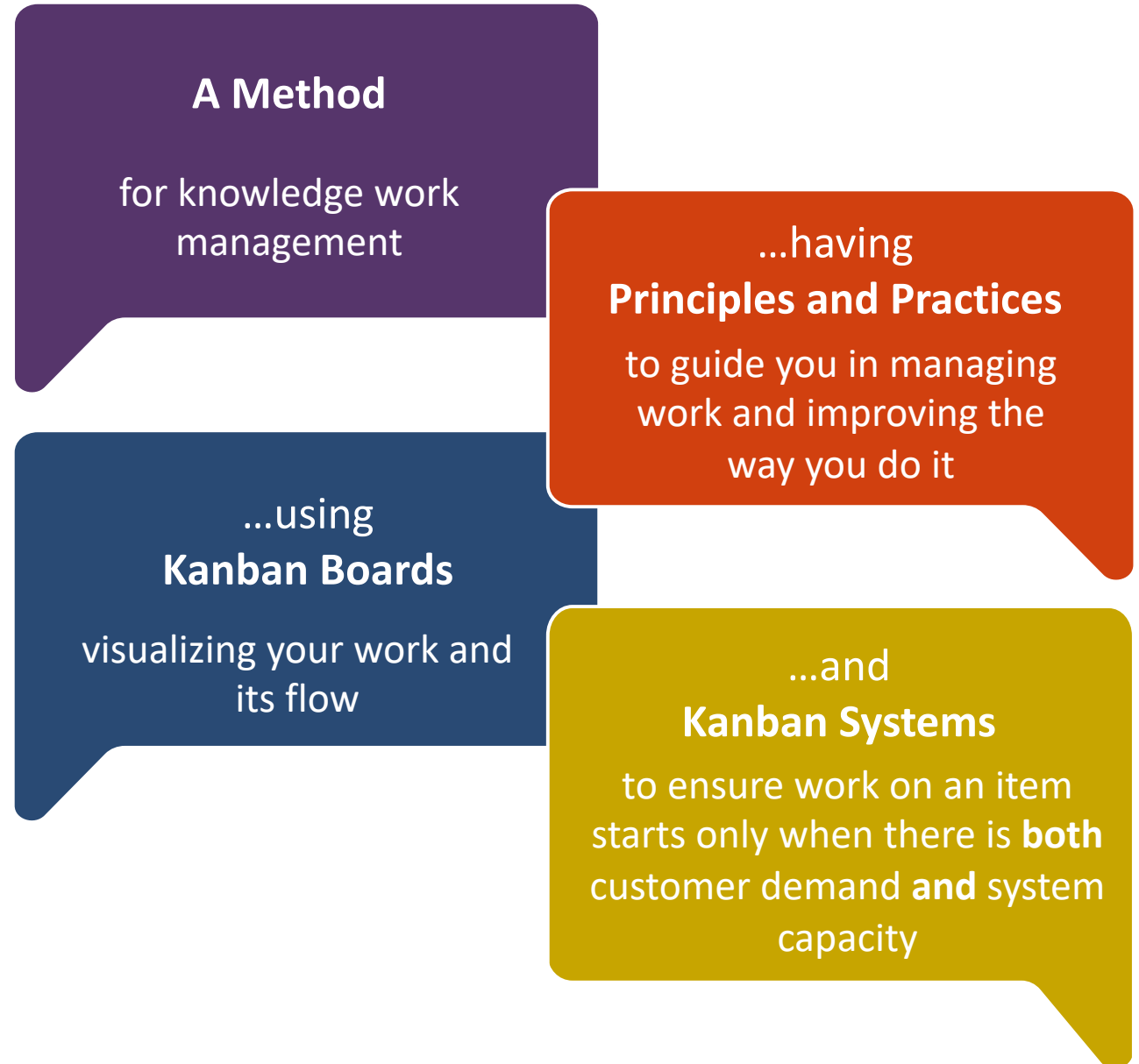
1 Experiencing Flow

2 The Kanban Method

3 STATIK and Case Study

4 Designing a Kanban System

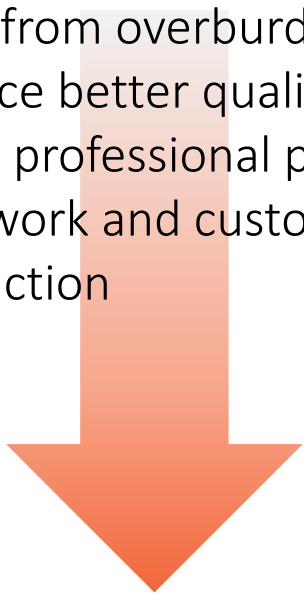
What is Kanban?



Motivation For The Kanban Method (The Kanban Agendas)

Line-Level, Individual Contributors

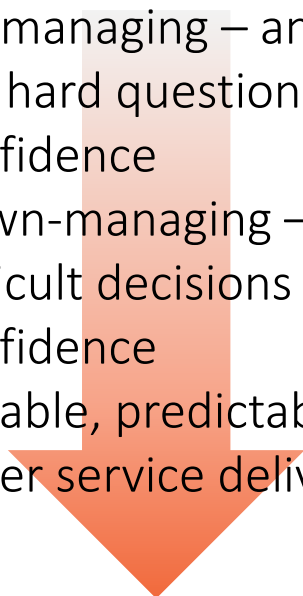
- Relief from overburdening
- Produce better quality
- Take a professional pride in their work and customer satisfaction



SUSTAINABILITY

Mid-Level Management

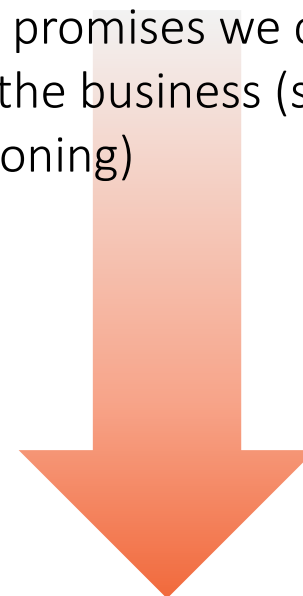
- Up-managing – answer the hard questions with confidence
- Down-managing – make difficult decisions with confidence
- Reliable, predictable, faster service delivery



SERVICE ORIENTATION

Senior-Level Management

- Make promises we can keep
- Lead the business (strategy, positioning)



SURVIVABILITY

Module 1

Experiencing Flow

Run the online simulation here, incl. debrief

- Duration: 3-4 hours

Prerequisites for Module 2

- Work through the worksheet “**Kanban Change and Service Principles**”
- Reflect back on the simulation and take down a few notes: How was that experience? What insights did you gain?
- **Bring your results!**



Module 2

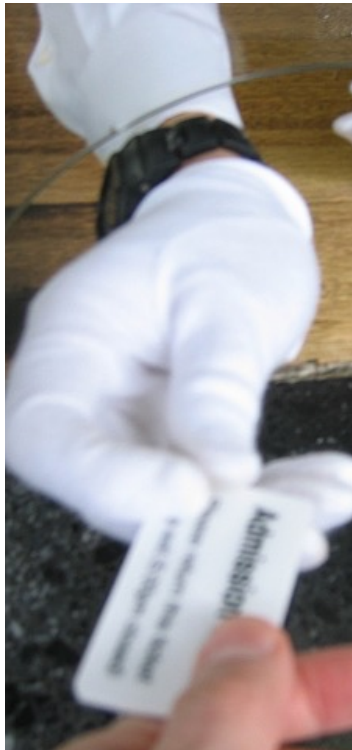
Understanding Kanban

The Kanban Method

かんばん

What does “Kanban” mean?

A Kanban System consists of a quantity of “kanban” (かんばん) signal cards in circulation.



Kanban Has Two Meanings

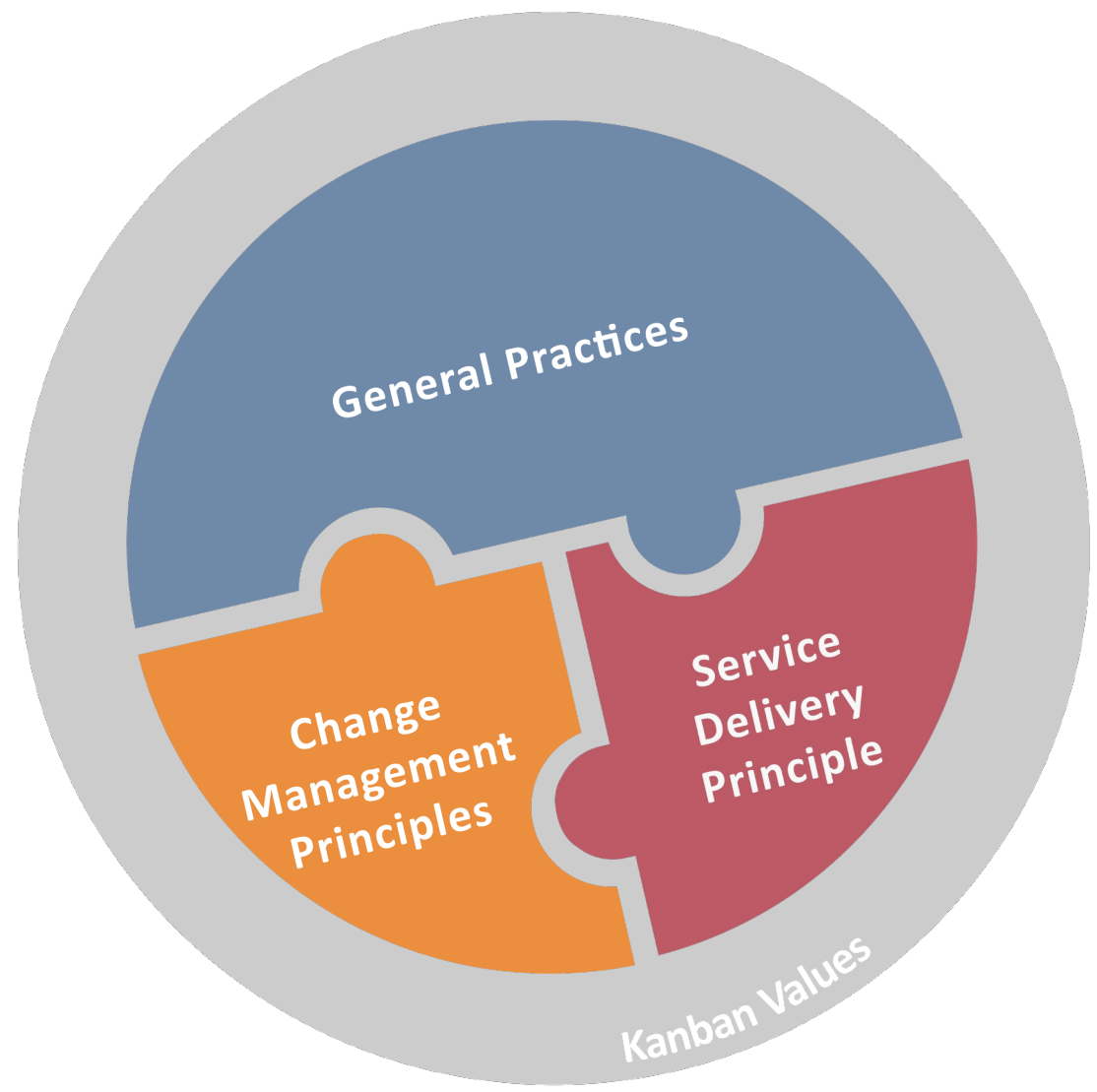
- Kanban has two meanings in Japanese, both meanings are incorporated into the Kanban Method
- Written 看板 in Kanji (Chinese characters), kanban means “sign” or “large visual board”
- Written かんばん in Hiragana (the Japanese alphabet), kanban means “signal card(s)”
- In Chinese, only the 看板 version exists. In Chinese, kanban literally means “looking at the board” (and interpret the cartoon on the book cover very literally), but the method was actually inspired by the signal cards system used in Japan

Exercise: Kanban Myths and Facts

- In groups of 2-5, sort the statements into “Myths” and “Facts”
- Use the virtual workspace areas prepared by your trainer

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Elements of the Kanban Method



Kanban Principles

Change Management Principles and Service Delivery Principles

Review results of worksheet 1

- We now go step by step through your filled worksheets
- Please share findings, examples and new insights



Kanban Method: Change Management Principles



1. Start with what you do now
 - Understanding current processes, as actually practiced
 - Respecting existing roles, responsibilities, and job titles
2. Gain agreement to pursue improvement through evolutionary change
3. Encourage acts of leadership at all levels

What is a Service?

Customer



Has need

Requests a
product or service



Service Delivery

Respond to the need
with a series of
activities



Need fulfilled

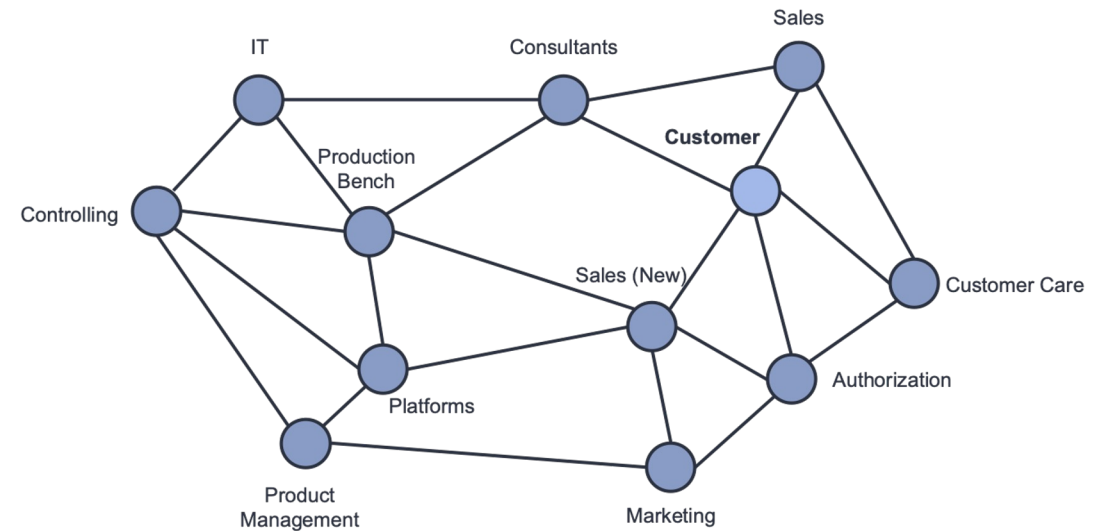
Requestor accepts or
acknowledges delivery

Kanban Method: Service Delivery Principles

Your organization is a network of interdependent services with policies that determine its behavior.

Therefore:

1. Understand and focus on the customer's needs and expectations
2. Manage the work; let workers self-organize around it
3. Regularly review the network and its policies to improve outcomes



Kanban Practices

Applied at a service-oriented Kanban system

Kanban Method: General Practices



Visualize



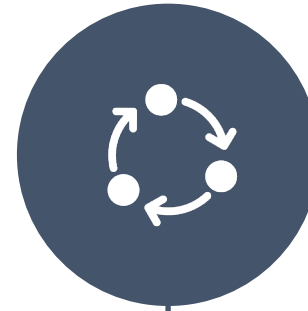
Limit WIP



Manage Flow



Make Policies
Explicit



Implement
Feedback
Loops

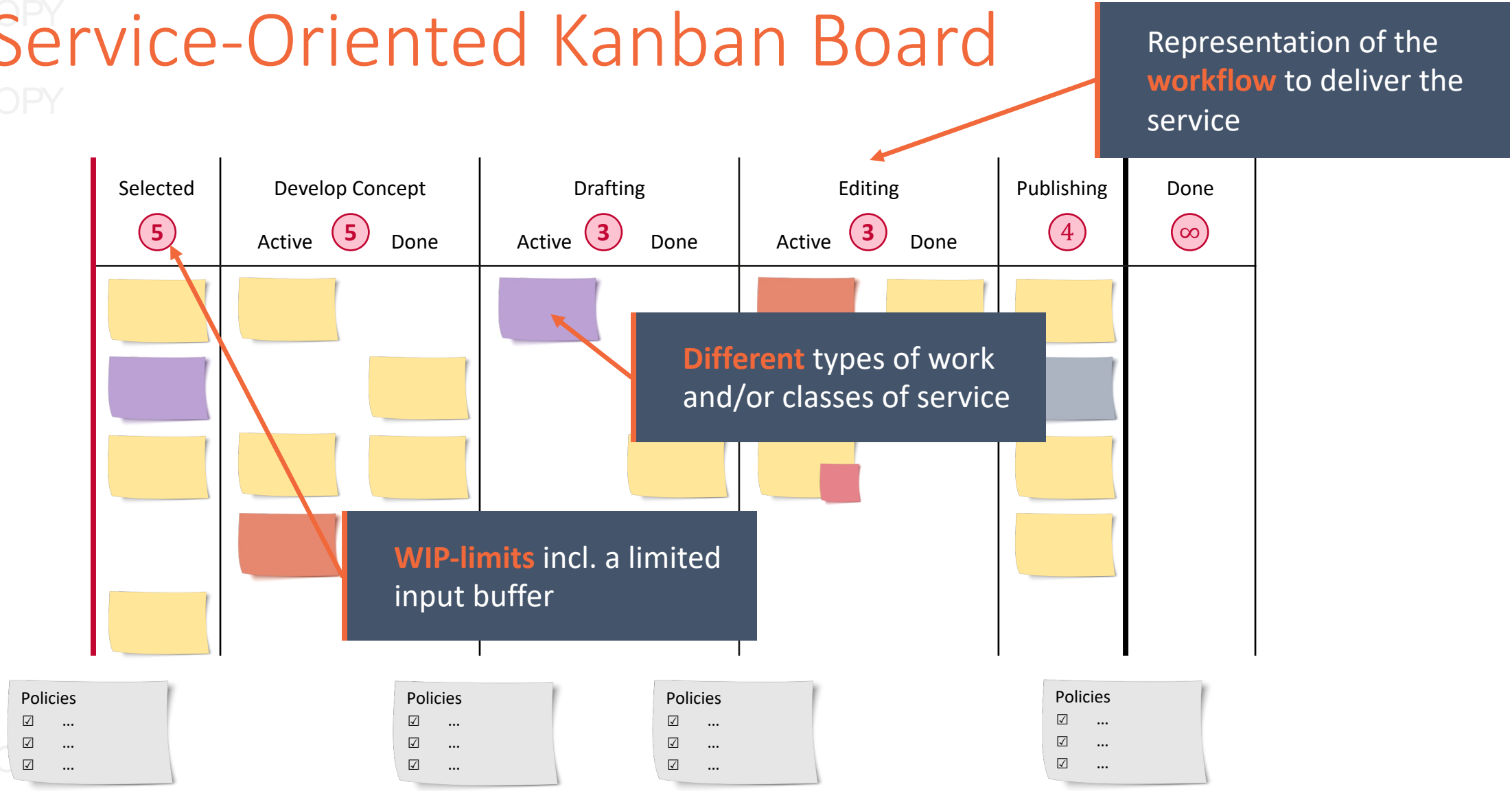


Improve
Collaboratively,
Evolve Experimentally
(using models and the scientific method)

A Kanban board is one way to visualize work and the process it goes through. For a Kanban system, the commitment and delivery points must be defined, and WIP limits must be displayed.

Visualize

A Service-Oriented Kanban Board



Outlook: How to Design a Kanban system

- In modules 3 and 4 you learn how to apply STATIK (Systems Thinking Approach To Introducing Kanban)
- Module 4 contains design patterns for boards and tickets and real-world examples

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Introducing and respecting WIP limits changes a “push” into a “pull” system, in which new items are not started until work is completed.

Limit Work in Progress (WIP)

Pull systems

Definition of a Pull system

A system for scheduling and delivering work only when both demand exists, and delivery capacity is available.

In Kanban systems

Kanban systems use WIP limits to represent the available capacity and to signal the need to pull items.

How do Kanban Systems work?

Kanban Systems create signals* to indicate when work should be started

- For example, empty slots or numbers over columns create the signal to start (or not to start) work
- The work item cards are not the pull signals!
- The system limits are designed to ensure:
 - **enough** work is started to maintain continuous working
 - **not too much** work is started to maintain efficient and effective working

* Kanban in Japanese means sign, visual board, or card

The inspiration: A “Kanban Card” from manufacturing

Arrival 10:30	A 1 - 1		Central Plant of Toyota Motors
 Ohashi Foundry	Item Number 53018-60011	Identification	Assembly n° 2
	Item Name Line pressure radiator	Used in Car type FJ (I)	
	Shelf n° 1 - below	21	Box Type Special Capacity of the box 30
Kanban pieces order			

- When parts have been used up, the Kanban Card attached to their container is sent back up the line
- This creates a visual signal that the items are needed
- Kanban Systems inspired the name for the Kanban Method

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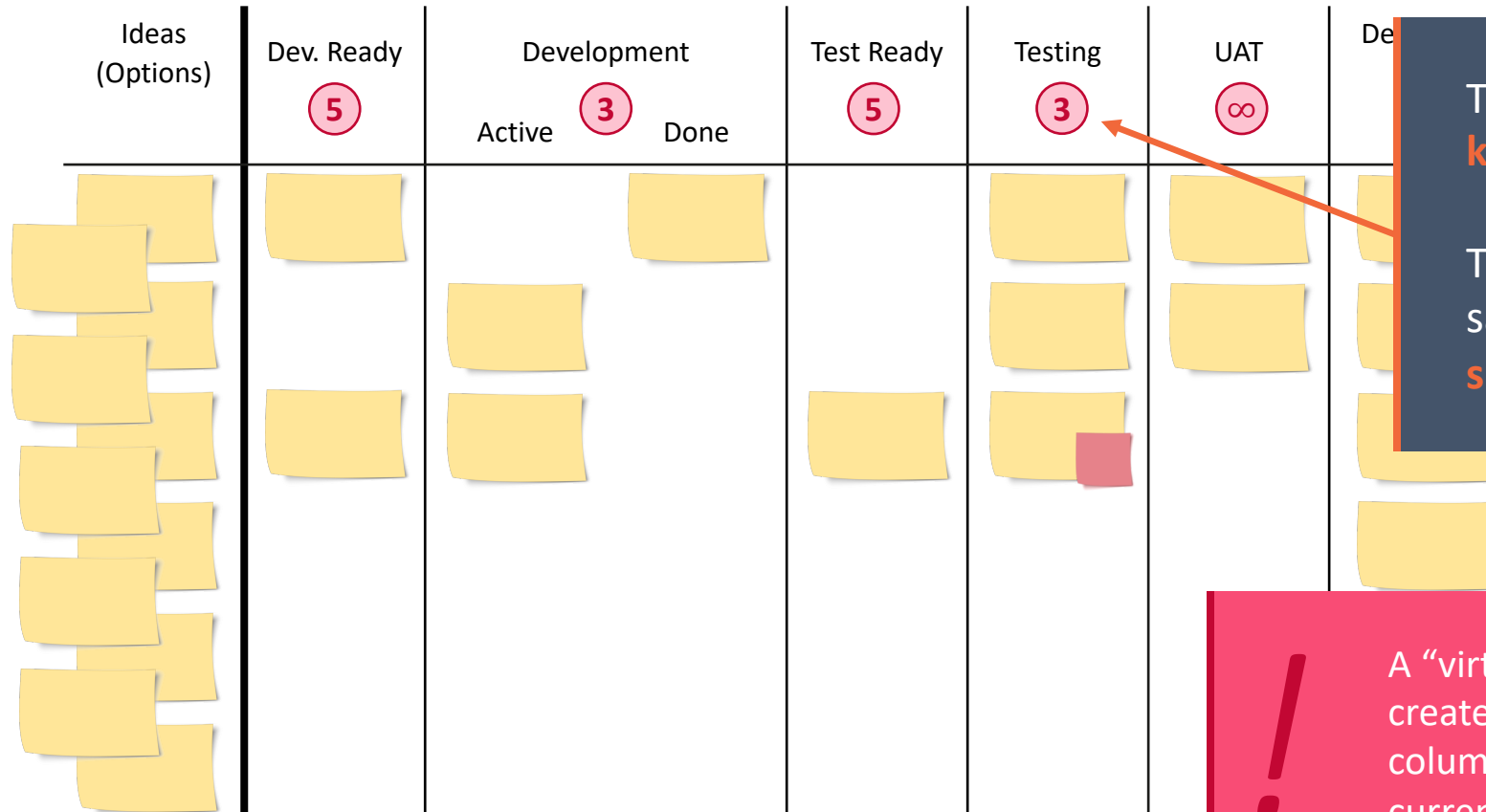
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Declaring a Kanban Quantity is Even Simpler



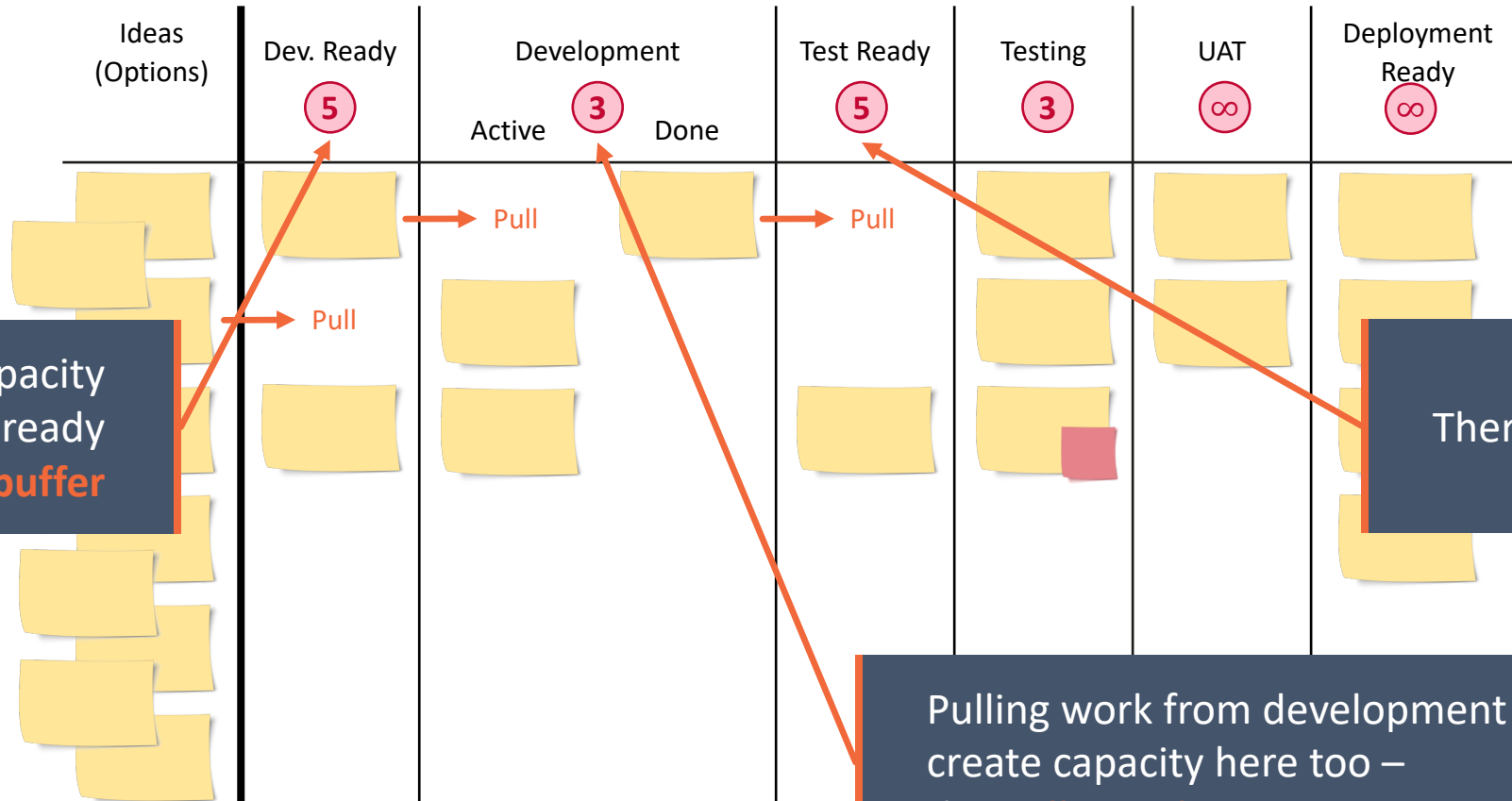
These are the (virtual)
kanban

The **WIP limits** serve the
same function as the
slots



A “virtual kanban” pull signal is
created by subtracting the
column number from tickets
currently in the column

Kanban Systems are Pull Systems



Now we have capacity to **replenish** our ready **buffer**

There is **capacity** here!

Pulling work from development will create capacity here too – the **pull signals move upstream!**

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The flow of work in a Kanban system should maximize the delivery of value, minimize lead times, and be as smooth (predictable) as possible.

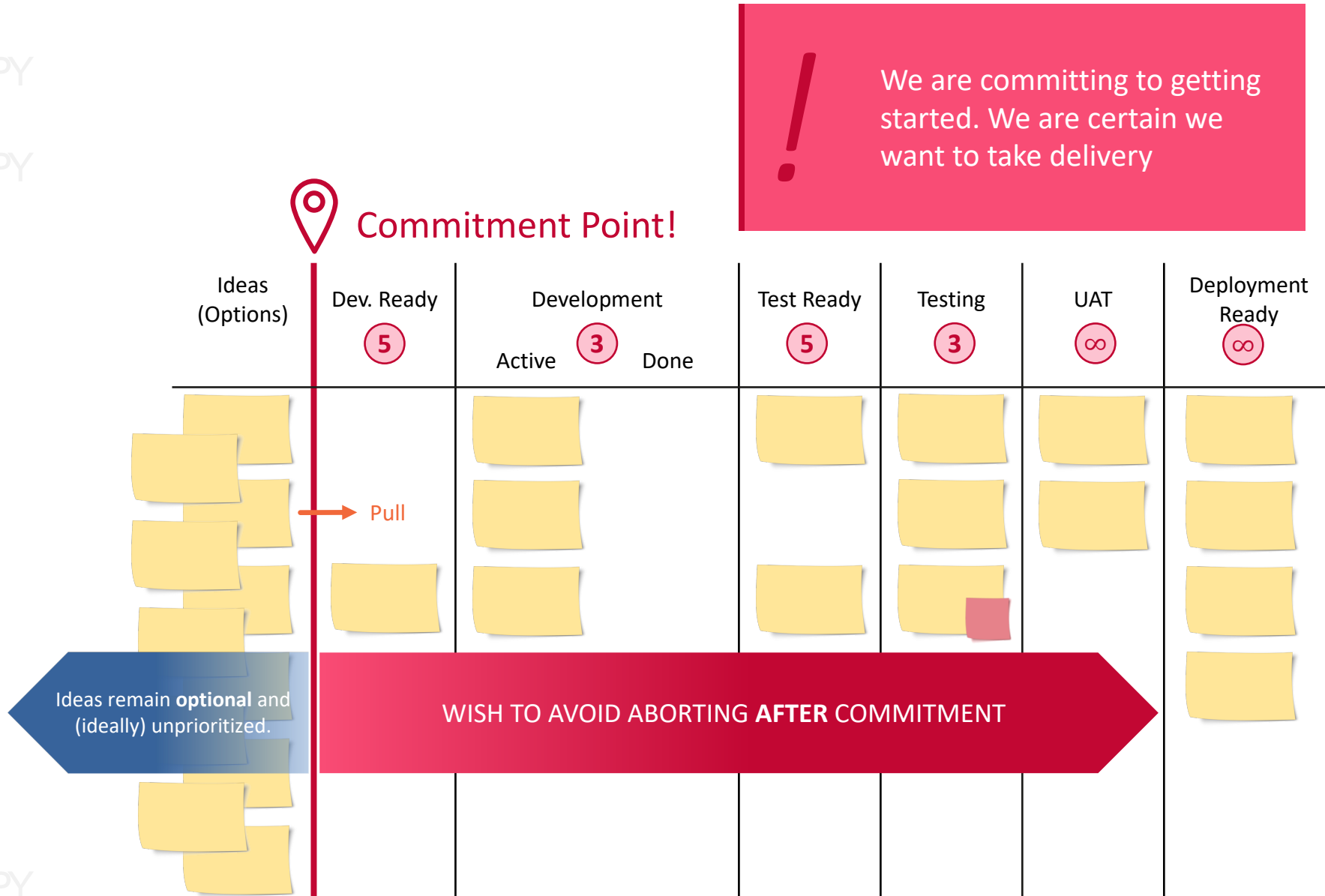
Manage Flow

Options and Commitment



Kanban systems defer commitment. Work items are options, chosen or discarded as late as possible.

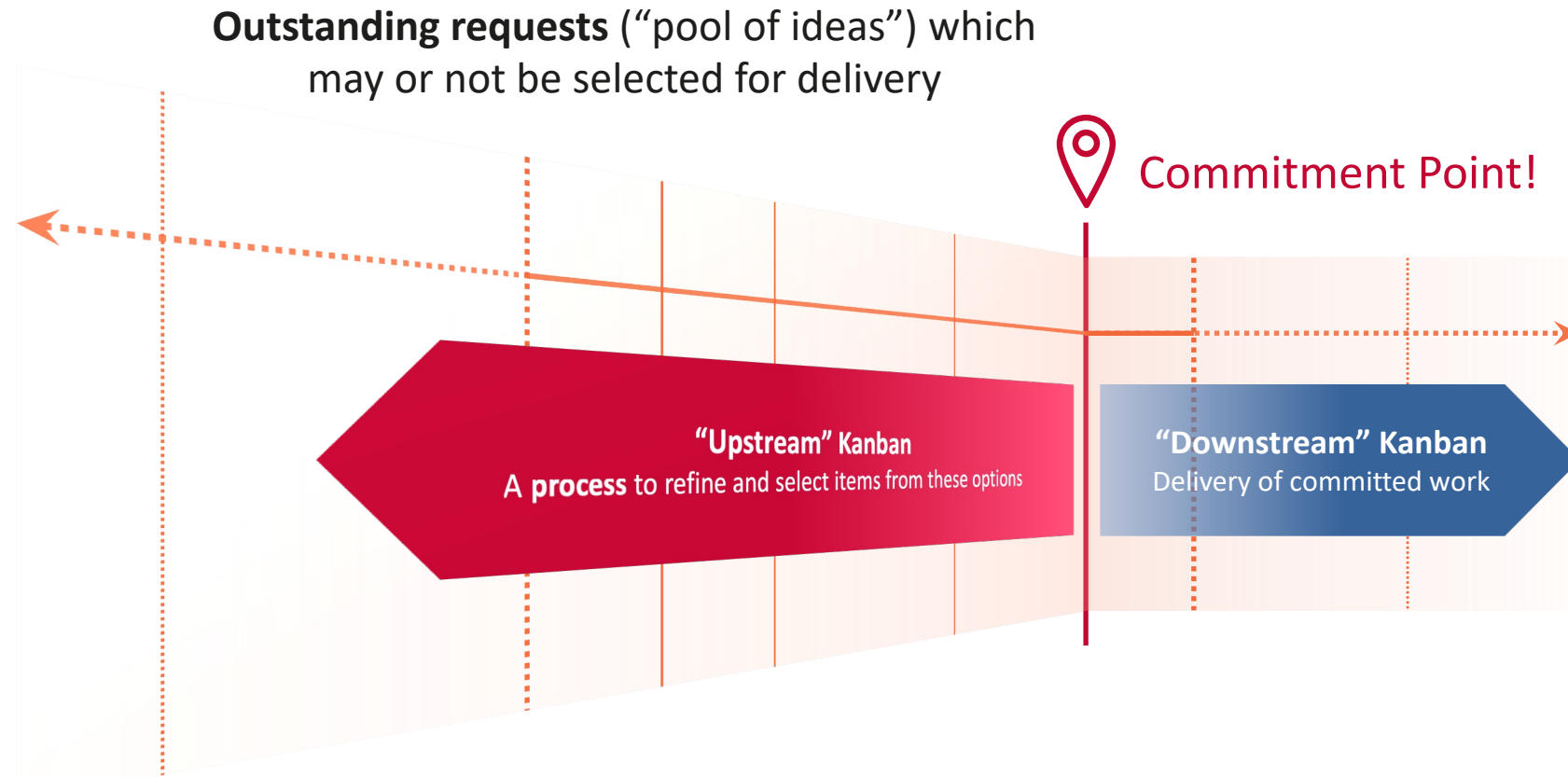
Commitment Is Deferred



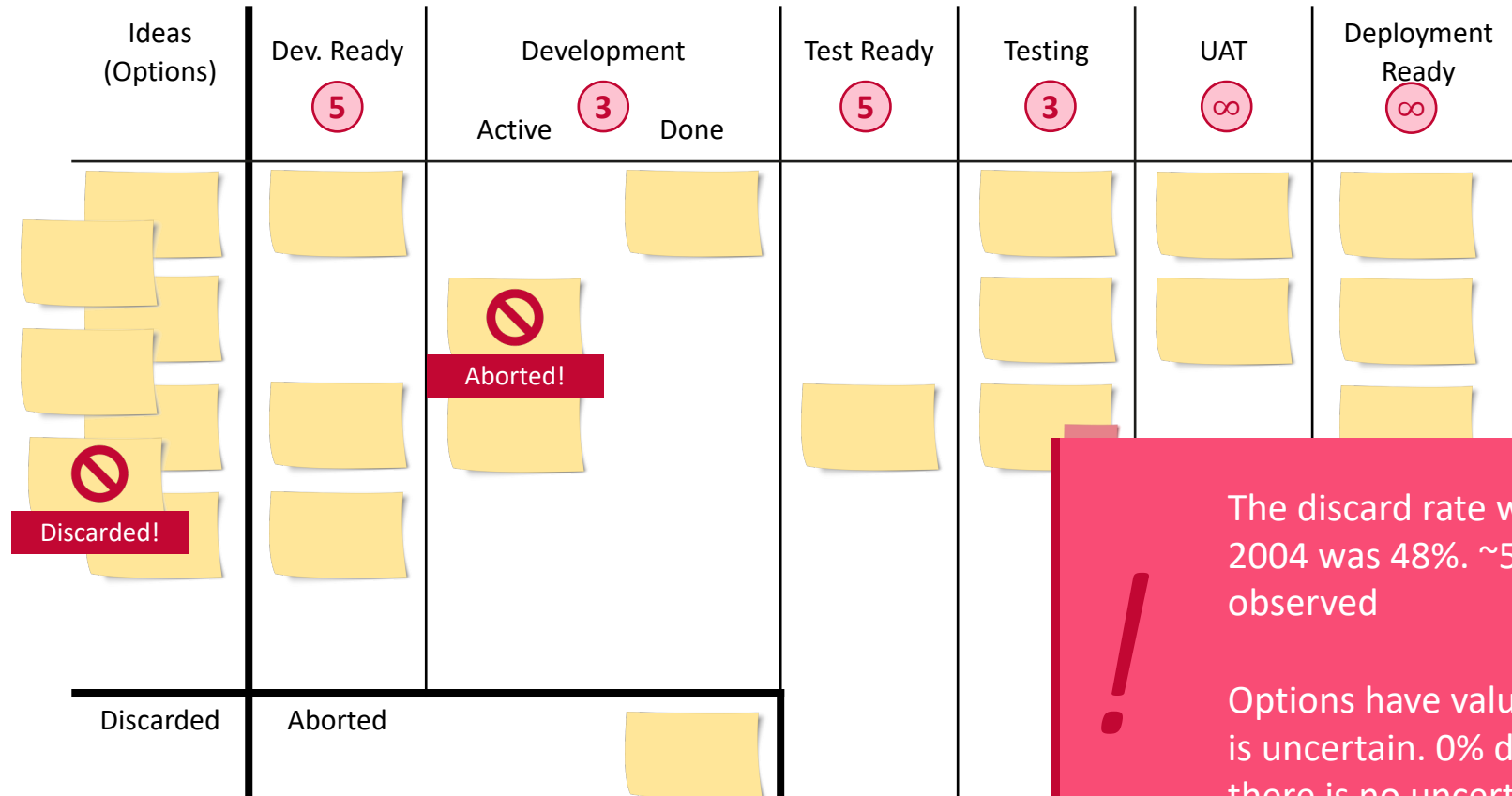
! We are committing to getting started. We are certain we want to take delivery

Ideas remain optional and (ideally) unprioritized.

In Front of the Commitment Point ...



Option Discard Rates Are Often High



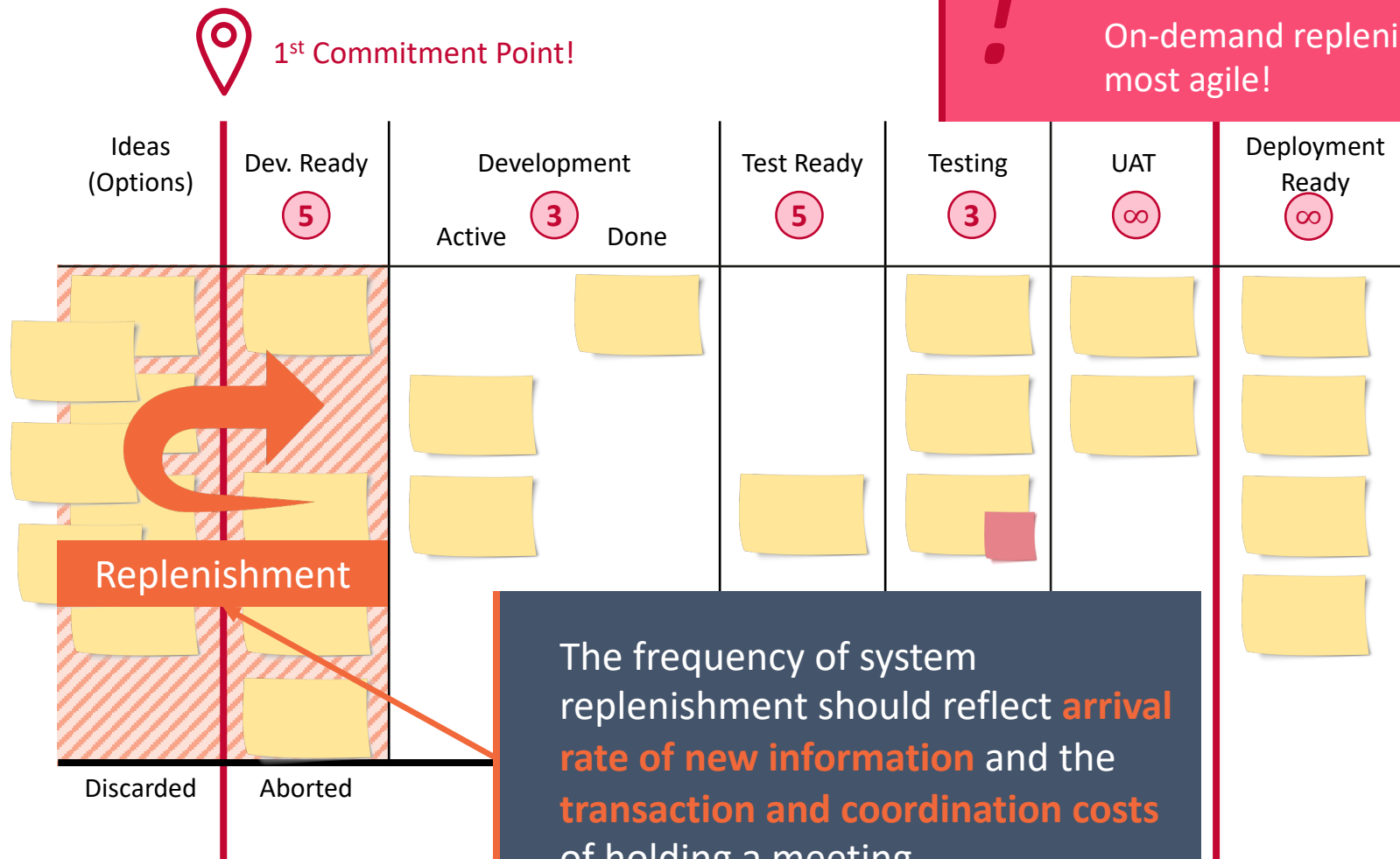
The discard rate with Microsoft XIT in 2004 was 48%. ~50% is commonly observed

Options have value because the future is uncertain. 0% discard rate implies there is no uncertainty about the future

Agility is delivering the right work
at the right time.

Managed replenishment and
delivery options maximize agility.

Replenishment Frequency



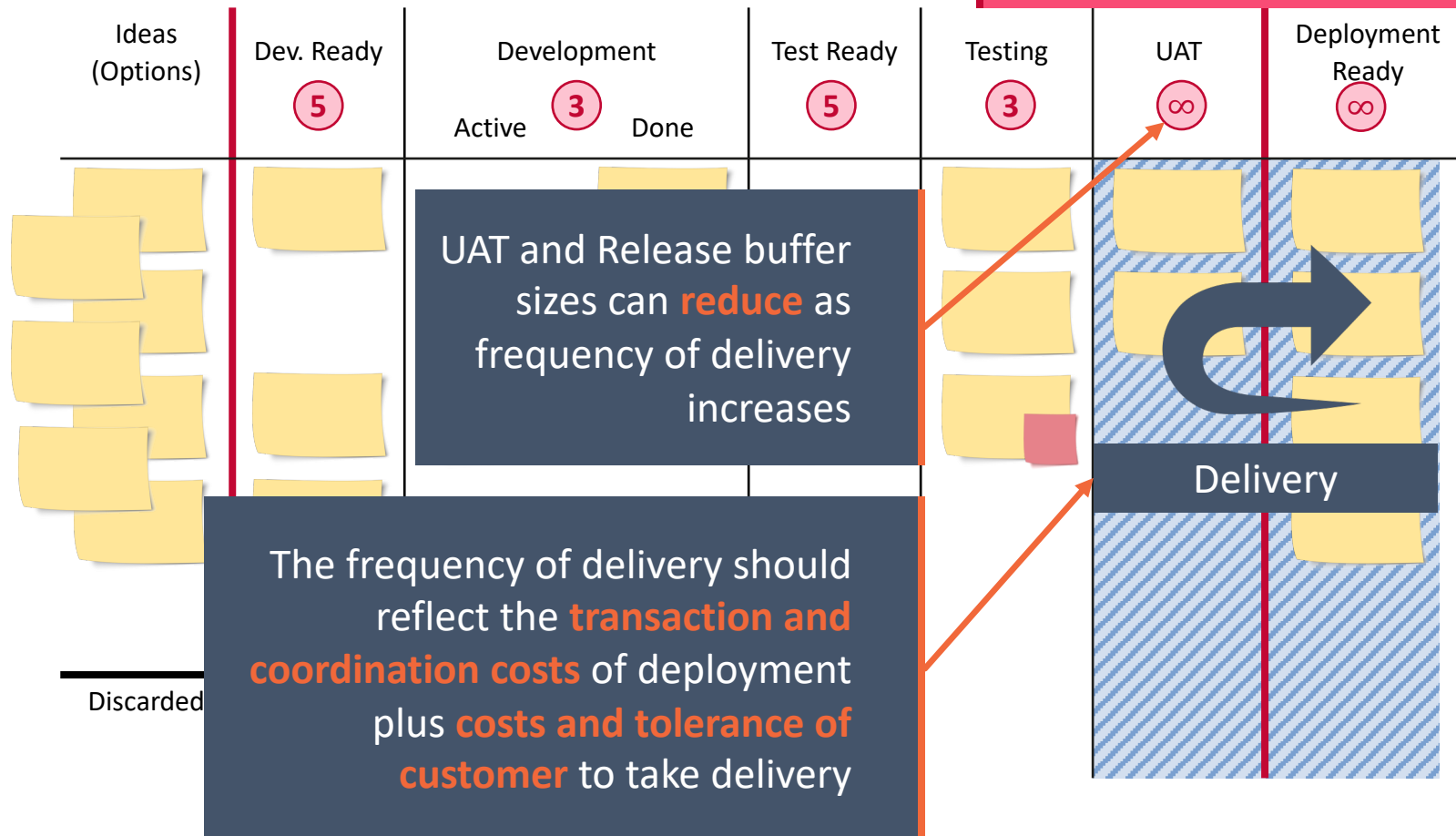
! Frequent replenishment is more agile.
On-demand replenishment is most agile!

The frequency of system replenishment should reflect **arrival rate of new information** and the **transaction and coordination costs** of holding a meeting

Delivery Frequency

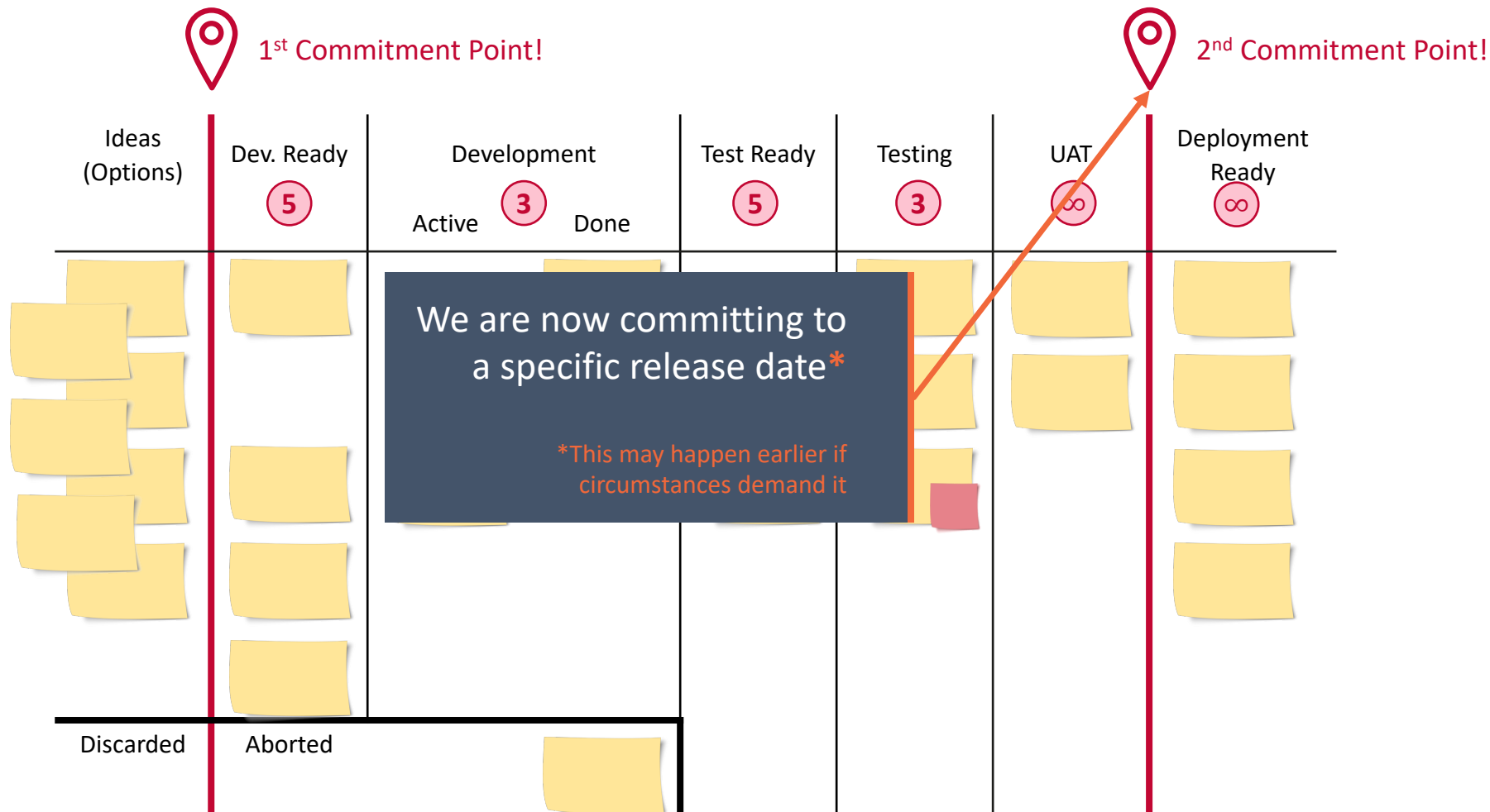
 1st Commitment Point!

 Frequent delivery is more agile
On-demand delivery is most agile!



! Kanban enables 2-Phase Commit

Deferred Delivery Commitment



Core Kanban Metrics and Charts

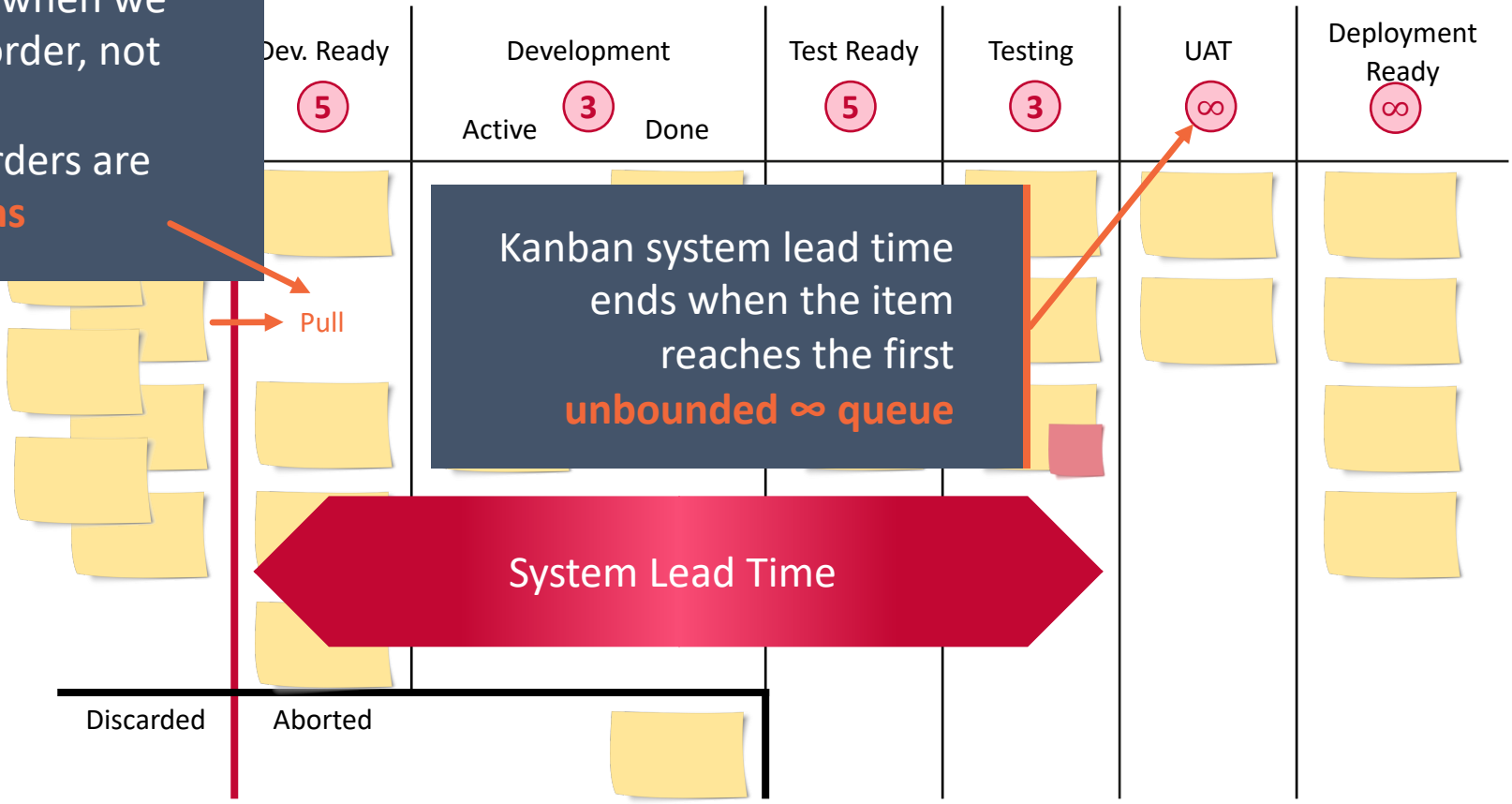
How can we measure and understand the behavior of flow-based systems?

- In your group, collect as many metrics (things to measure) as possible that are helpful to understand the behavior of a Kanban system
- You have 3 minutes 😊

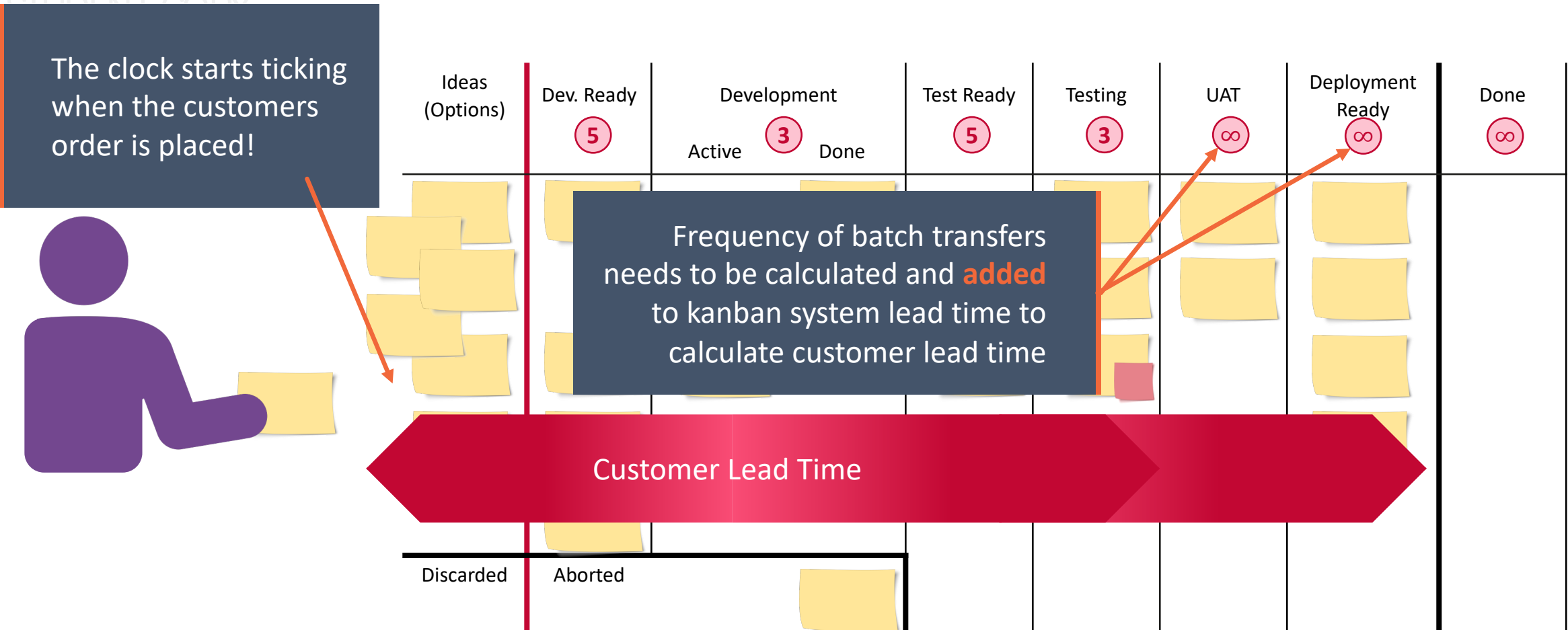


Metric Definition: Kanban System Lead Time

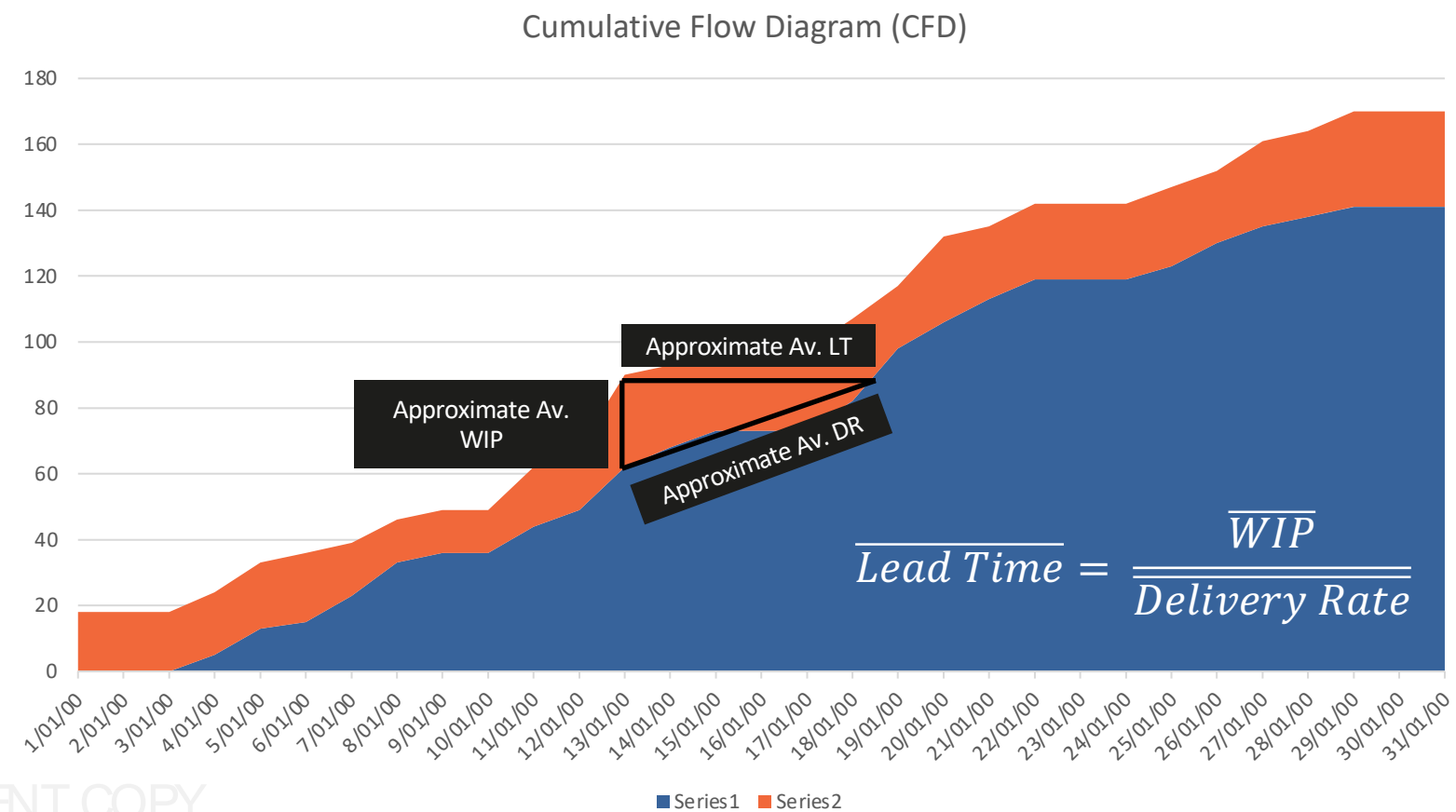
The clock starts ticking when we **accept** the customers order, not when it is placed!
Until then, customer orders are merely available **options**



Metric Definition: Customer Lead Time



Little's Law – a Relationship of Averages

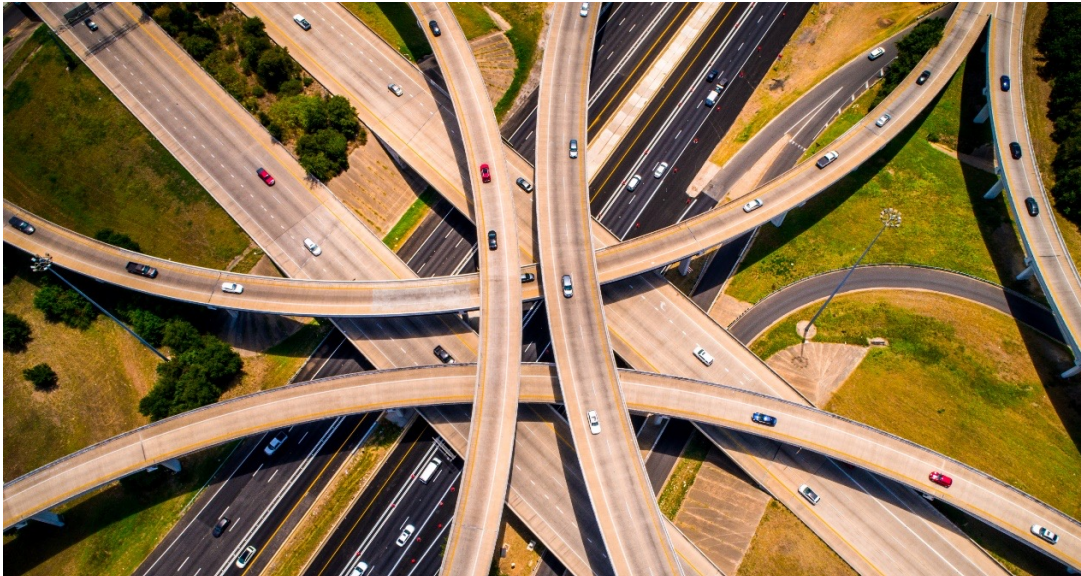


Assumes that the system is not “trending” over the period of averaging. The number of items entering and leaving system must be similar, and the average “age” of items in progress must not be increasing or decreasing

In spite of this restriction, the formula has proven its usefulness in many circumstances for understanding **how flow systems behave as WIP changes.**

Introduction: Flow Efficiency

Where would you prefer to travel? How fast and smooth will your travel be?



Few delays



Traveling time largely determined by delays

Flow Efficiency

$$\text{Flow Efficiency} = \frac{\text{Work Time}}{\text{Lead Time}}$$

- Flow efficiency measures the share of total lead time which is spent actually adding value (or knowledge)
- Work time is the sum of all the times during which a work item is actively being worked on
- Work time excludes wait times caused by delays
- The higher the flow efficiency, the less delays

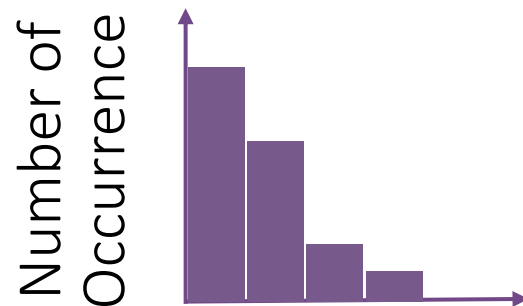
Summary: Key Metrics to Understand System Behavior

Lead Time	System Lead Time/Customer Lead Time – time it takes to fulfill requests
Delivery Rate	Completed items per unit of time – measures completion rate
Flow Efficiency	Work time over lead time
Failure Demand	Self-demand caused by a failure to do something or do something right for the customer
Initial Quality	Escaping defects that will generate future failure demand
Blockers	Reasons or conditions that prevent work from progressing, and their impact
WIP Levels	Number of items in the system overall or in certain stages
Discard/Abort Rates	Items that were discarded before or aborted after the commitment point

Basics Metrics

Distribution (Histogram)

- Shows actual lead time capability
- Helps determine SLA expectations



Classes of Lead Time
e.g., 1-3 days

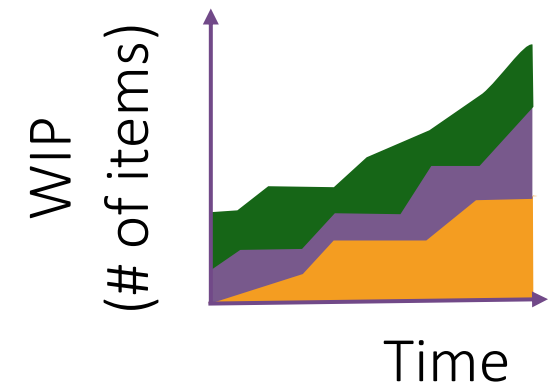
Run Chart

- Shows lead time or throughput over time
- Checks for trends and impact of system changes



Cumulative Flow Diagram

- Shows WIP levels over time
- Shows demand, WIP, approximate average lead time, and delivery rate capabilities



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A process expressed as workflow and policies creates constraints in action, is empowering within constraints, and results in emergent characteristics that can be tuned by experiment.

Make Policies Explicit

How to Make Policies Explicit

- This is a seemingly simple yet very powerful practice!
- Make sure policies are
 - Sparse (only a few of them)
 - Simple
 - Well-defined
 - Visible
 - Always applied
 - Readily changeable
- **Tip:** When going through a Kanban system design workshop with STATIK (see modules 3 and 4), make notes of decisions and standards made throughout. They will form the basis for your initial policies!

Examples of Policies in Kanban Systems

- WIP Limits (at different levels)
- Capacity allocation^(*)
- Pull criteria / Exit criteria (for when a work item can exit a state)
- Definition of Ready for implementation (at the Commitment Point)
- Replenishment policies: How does new work get selected
- Standards / definitions of work item types, lanes on the board, ticket colors, ticket layout, etc.
- Classes of service for defining how categories of items are treated in a system

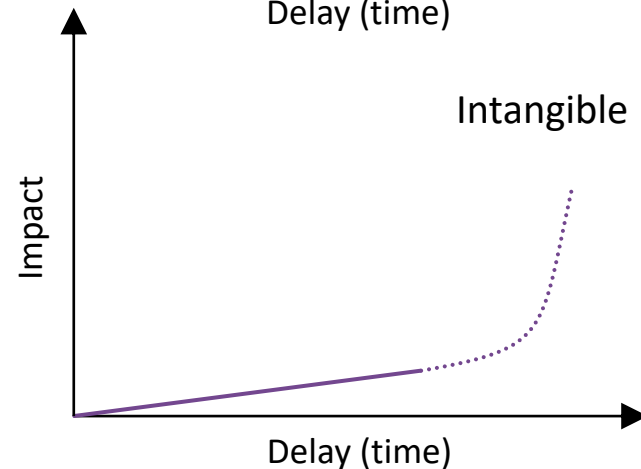
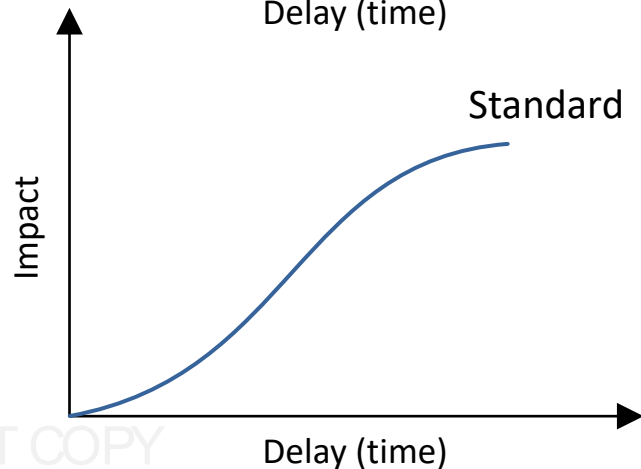
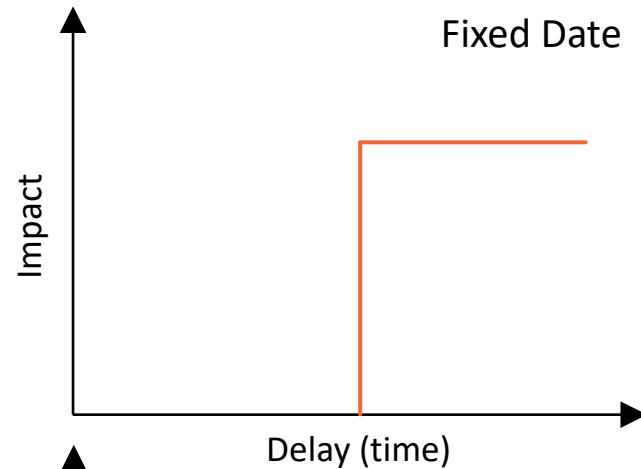
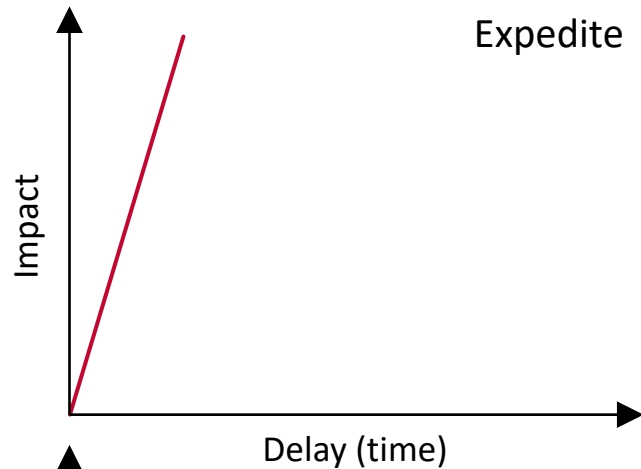
(*) Will be explained further in the KSI class.

Classes of Service (CoS)

Defines how this category of items is treated in the system. A set of policies is defined that apply to certain work type(s).

- Recognize different kinds of customer expectation
- Treat of work items in a differentiated manner to better manage lead times and risks – be able to respond at reasonable cost
- Can impact order of selection and delivery - qualitative categories before any quantitative ranking
- Make explicit both internally and externally
- Can be indicated with colors, shapes, stickers, swim lanes, etc.
- ...forming the basis for reliable commitments to stakeholders!

Classes of Service Archetypes Based on Impact of Delay



“What will happen if you don’t finish the work item at that time?”

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Feedback loops are an essential part of any controlled process and are especially important for evolutionary change.

Kanban defines specific feedback opportunities called “cadences”.

Implement Feedback Loops

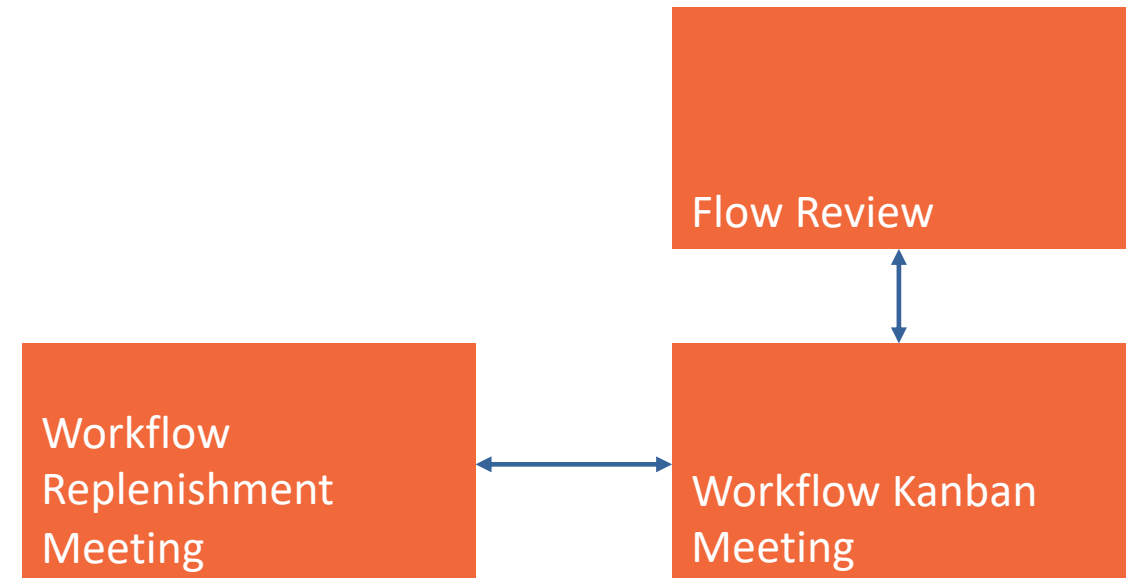
Feedback loops to run and improve a service

- Which feedback mechanisms do you know from your experience to manage and improve a service?



Feedback Loops to Manage and Improve a Service

- The suggested core cadence for one service:
 - Workflow Replenishment Meeting
 - Workflow Kanban Meeting
 - Flow Review
- Recurring events should happen with a regular frequency
- The specific frequency is a contextual design choice



Cadences of a Service-Oriented Kanban System

Cadence	Purpose
Workflow Replenishment Meeting	Allow the service team(s) to select work requests and refill the Next-to-Start column so that they do not run out of work for the next period
Workflow Kanban Meeting	Involve the service teams in a collaborative conversation about the status of the work, queues between stages of the workflow and problems that affect the flow of work
Flow Review	Develop an initial quantitative understanding of the delivered service, facilitating work planning, and improving predictability

Workflow Replenishment Meeting



Allow the service team(s) to select work requests and refill the Next-to-Start column so that they do not run out of work for the next period.



- Observations resulting in changes to behavior or policies at Replenishment Meetings
- Policy changes / portfolio changes

- Decisions regarding what to pull
- System changes (to Kanban Meeting)



Leads or representatives of the teams involved in the workflow



Make sure the requested work is clearly defined
Consider technical aspects and dependencies between service teams



Weekly,
see arrival rate
of info



20 - 30 mins

Replenishment on Demand or at Regular Events

- Lower maturity organizations struggle with on-demand replenishment; they are helped by predictable, regularly scheduled events; weekly or bi-weekly replenishments are common
- On-demand system replenishment may be possible where coordination effort is low and business owners are (almost) instantly available

Workflow Kanban Meeting



Involve the service teams in a collaborative conversation about the status of the work, queues between stages of the workflow and problems that affect the flow of work.



- Commitments
- Decisions about new initiatives and capacity allocation
- Policy changes

- Shared understanding of how to best to flow current work
- Improvement suggestions



Immediate service group or team doing the work (4-50 people)



Scope: End-to-end workflow of a service
The identified issues are resolved after the meeting by team members with relevant knowledge and skills



Weekly, depending on coordination cost



10-20 mins

How to Run a Workflow Kanban Meeting

- One person facilitates
- **“Walk the board” from right to left:** Go through the tickets from right (most close to completion) to left (most recently started)
- Remember to **manage work, not workers!**
- The facilitator may solicit a status update on a ticket or simply ask if there is any additional information that is not on the board yet
- More mature organizations may only discuss blocked items, and not discuss every ticket on the board
- There will be a discussion of pullable tickets in “Done” queues. Which ticket should be pulled next and by whom?

Flow Review



Develop an initial quantitative understanding of the delivered service, facilitating work planning and improving predictability.



- Progress and system capability data from Kanban Meeting and tracking system
- Actions from Risk Review

- Defined actions to improve capability
- Communication of decisions



(parts of the) service delivery team, optionally team leads



Compare current capability with defined target conditions
Discuss possible improvement actions



Twice a month 30 min



Typical Data Prepared For a Flow Review

- **Distribution of the demand** per work type
- **Range of blocker time** per blocker cause
- **Range of defect and rework time** per cause
- Work items with **high age**
- Averages and distributions of:
 - **Customer lead time** per type of work
 - **Arrival rate** of the demand
 - **Throughput** per type of work for a period
 - **System lead time** per type of work

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Kanban is fundamentally an improvement method. It starts from the organization as it is now and then pursues continuous and incremental improvement.

Improve
Collaboratively,
Evolve
Experimentally

Evolutionary Change

- Improve collaboratively
 - Everyone involved in working with the system shares responsibility to work at the system!
 - Create an environment for people to feel safe to suggest improvements
- Evolve experimentally using models (E.g., Little's Law, Theory of Constraints)
- And the scientific method
 - Acquiring knowledge involving careful observation
 - Formulating hypotheses
 - Experimental and measurement-based testing of deductions
 - Refinement of the hypotheses based on the experimental findings
- The Kanban Systems Improvement class will cover this practice in much more detail

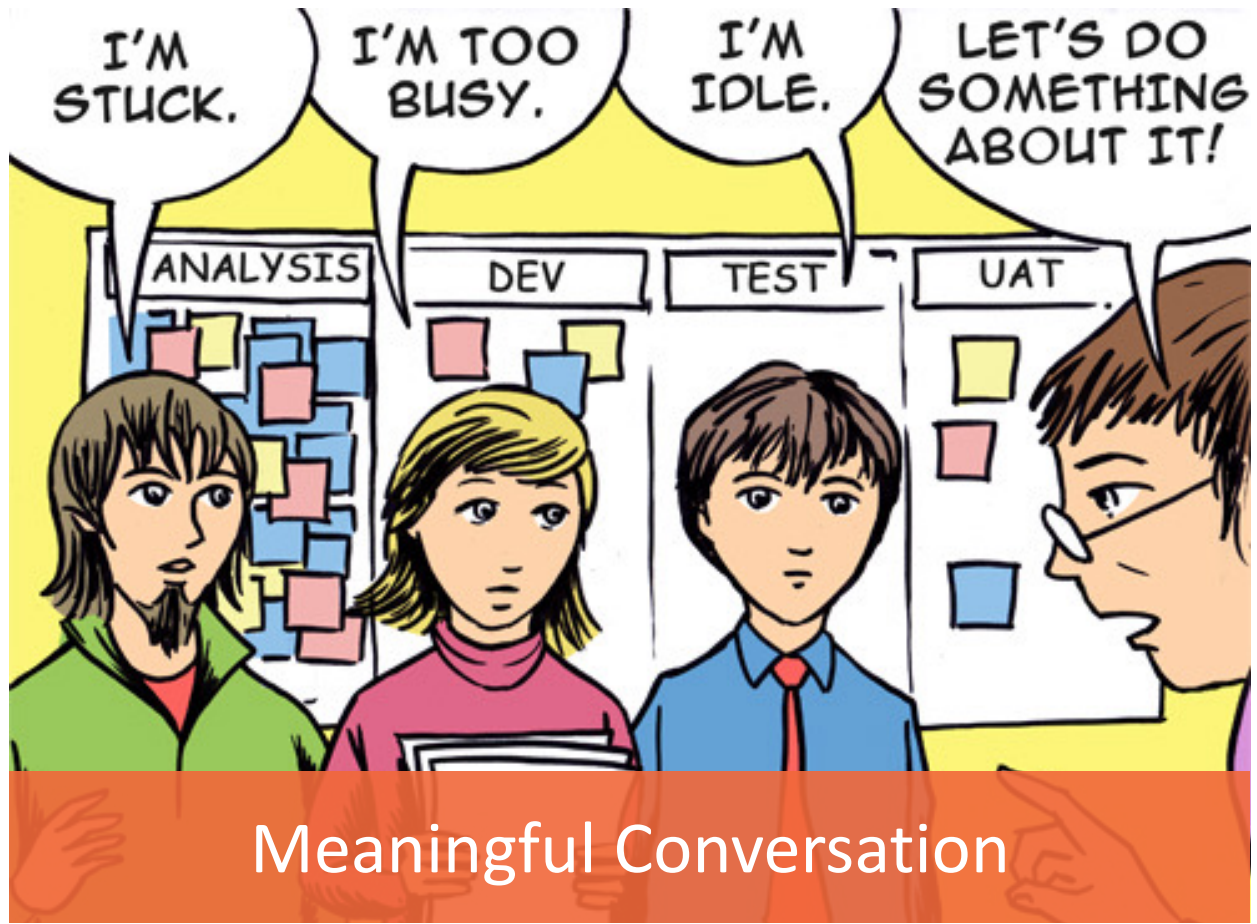
Wrap-Up of Module 2

Kanban in Action



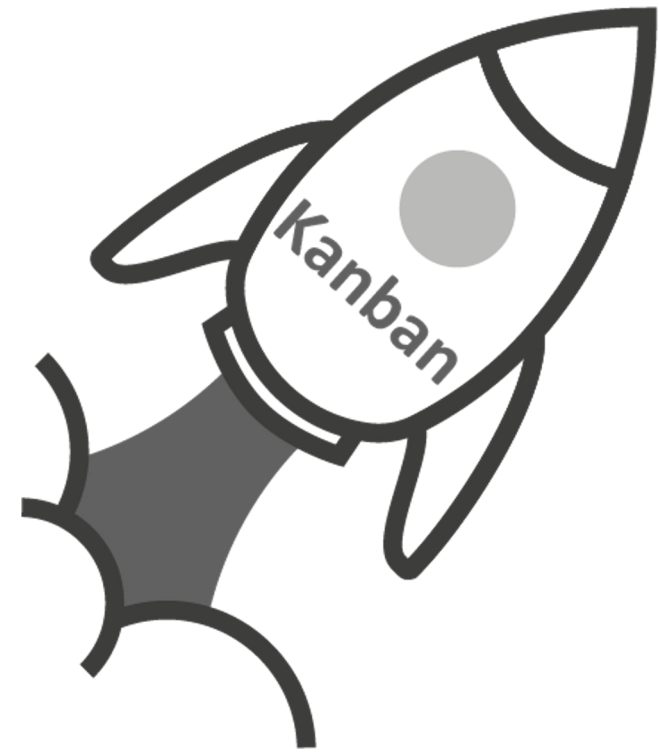
- “Kanbanize” your existing process
- Provoke existing processes to change and service delivery to improve
- Each workflow will evolve as a uniquely tailored process solution, “fitter” for its context
- Customer and employee satisfaction will improve

The Essence of Kanban in Action



Implementing a Kanban System

- Don't just copy an existing Kanban system!
- Each system must be designed using the **S**ystem **T**hinking **A**pproach **T**o **I**ntroducing **K**anban (STATIK)
- Study demand and business risks. Study capability. Design an appropriate Kanban system to balance demand against capability



Benefits of applying Kanban

Building on what you learned and experienced in this class so far:

- When applying Kanban, what positive things might happen?



... and the results

- ... and with all of this, what happens next?
- What results are produced?



Prerequisites for Module 3

- Please make sure to get this done before the start of the next module and bring a scan / photo of your results
- Prepare brief service descriptions of cases for the STATIK exercises!
- Read the XIT Case Study Extract



Module 3

The Systems Thinking Approach to Introducing Kanban

S.T.A.T.I.K.

Introduction to STATIK

Introduction to the Systems Thinking Approach to Introducing Kanban



- A repeatable and humane way to get started with Kanban
- Must be applied to each service and results in a full Kanban system design
- Use systems thinking; always consider the system as a whole, with its goal of improving the flow of value to customers

The STATIK (Systems Thinking Approach to Introducing Kanban) Steps

Identify Services. For each service ...

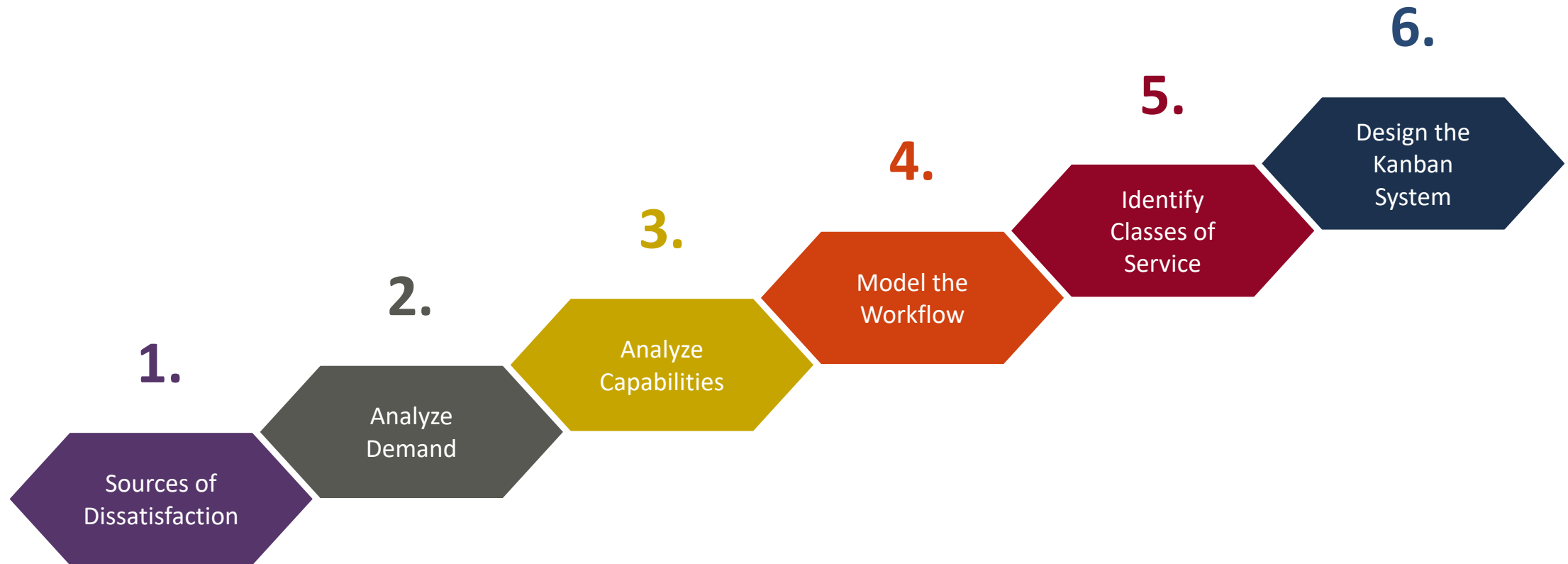
1. Understand what makes the service “fit for purpose”
2. Understand sources of dissatisfaction regarding current delivery
3. Analyze sources of and nature of demand
4. Analyze current delivery capability
5. Model the service delivery workflow
6. Identify and define classes of service
7. Design the Kanban system
8. Socialize design and negotiate implementation

Scope of this
class



This process tends
to be iterative

Overview of STATIK Steps



Microsoft XIT Case Study

Introduction

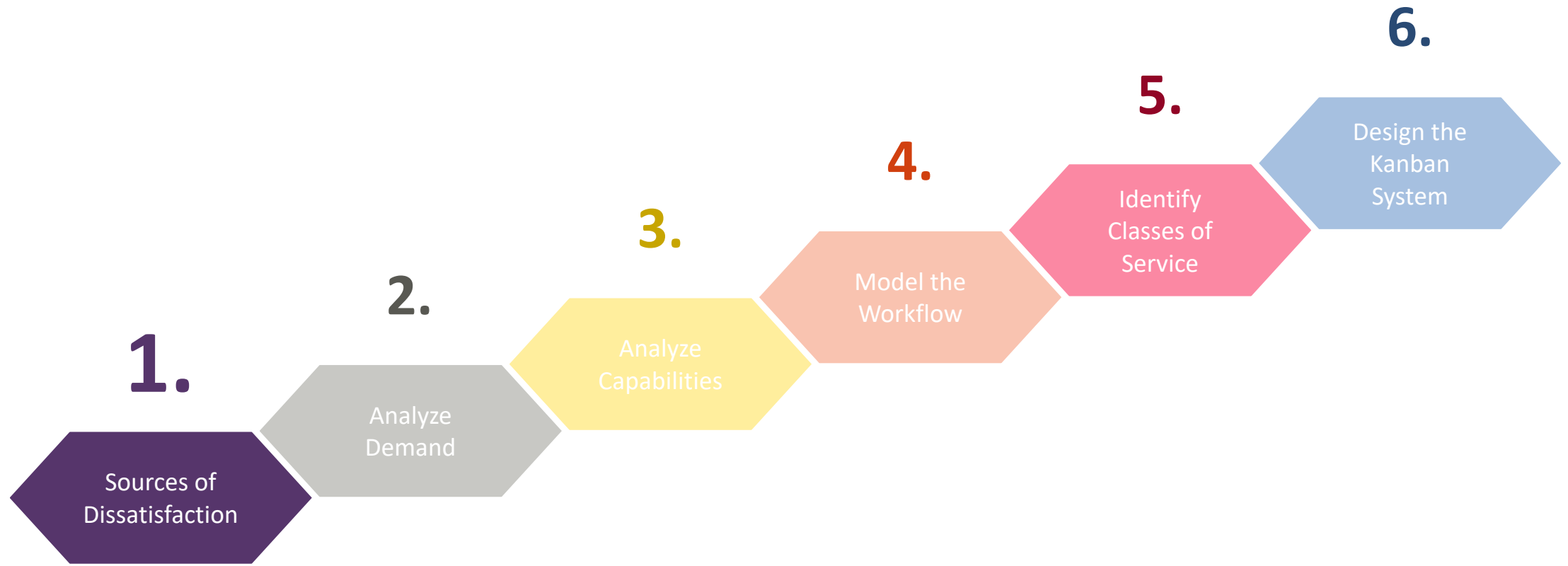
Meet the Microsoft XIT Team!



Introduction: Case Study Microsoft XIT (2004/05)

- XIT was one of Microsoft's 8 IT departments
- XIT Sustained Engineering
 - Small team
 - Change requests
 - Supports over 80 applications (and growing)
 - Engineering responsibilities moved from Redmond (Washington, USA) to Hyderabad (India) in 2004
 - Hyderabad vendor is CMMI Level 5 and uses TSP/PSP
 - Initial quality is very high



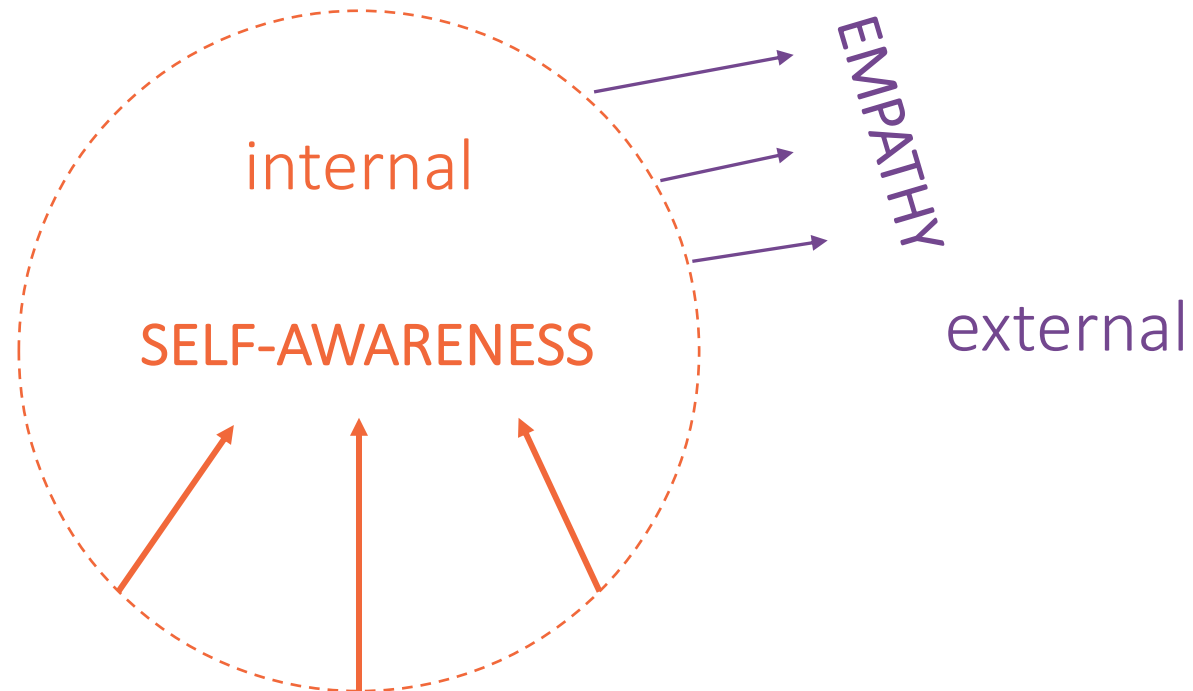


Step 1: Sources of Dissatisfaction

What is the service team dissatisfied with? What dissatisfactions do the customers have? Dissatisfactions give motivation for change!

Introduction: Sources of Dissatisfaction

Sources of dissatisfaction provide motivation for change which is key for a successful Kanban initiative.



Source: Markus Andrezak, LASCOT14

Sources of Dissatisfaction at XIT

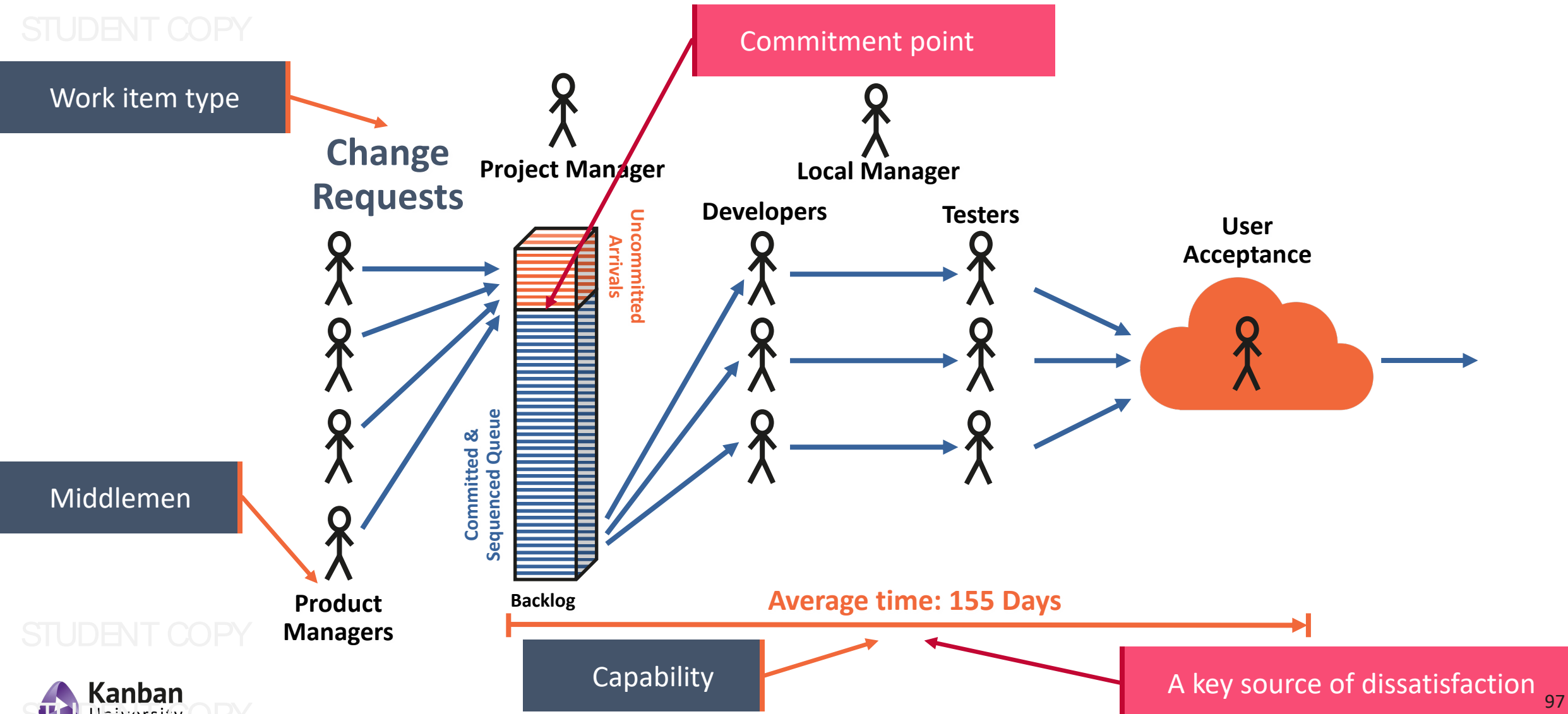
Internal

- Constantly interrupted to make estimates
- Estimates are expected to be highly accurate and take time to develop
- Can't expect us to know code base for all 80+ applications
- Testers occasionally swamped by "PTCs" cannot respond to developers

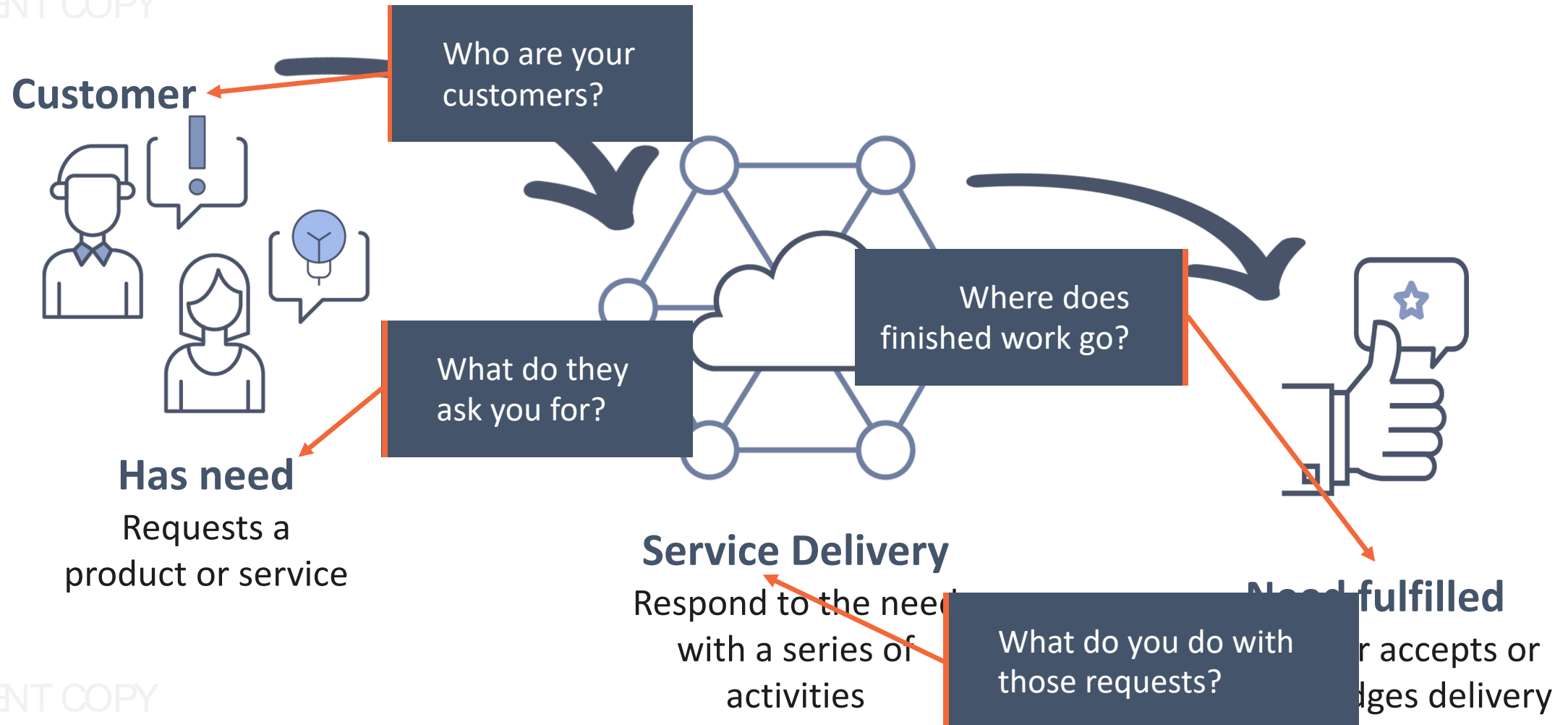
External

- Small requests take months to develop
- Delivery is completely unpredictable
- Constantly breaking promises

Initial Model of the Workflow



What Service Do You Provide?

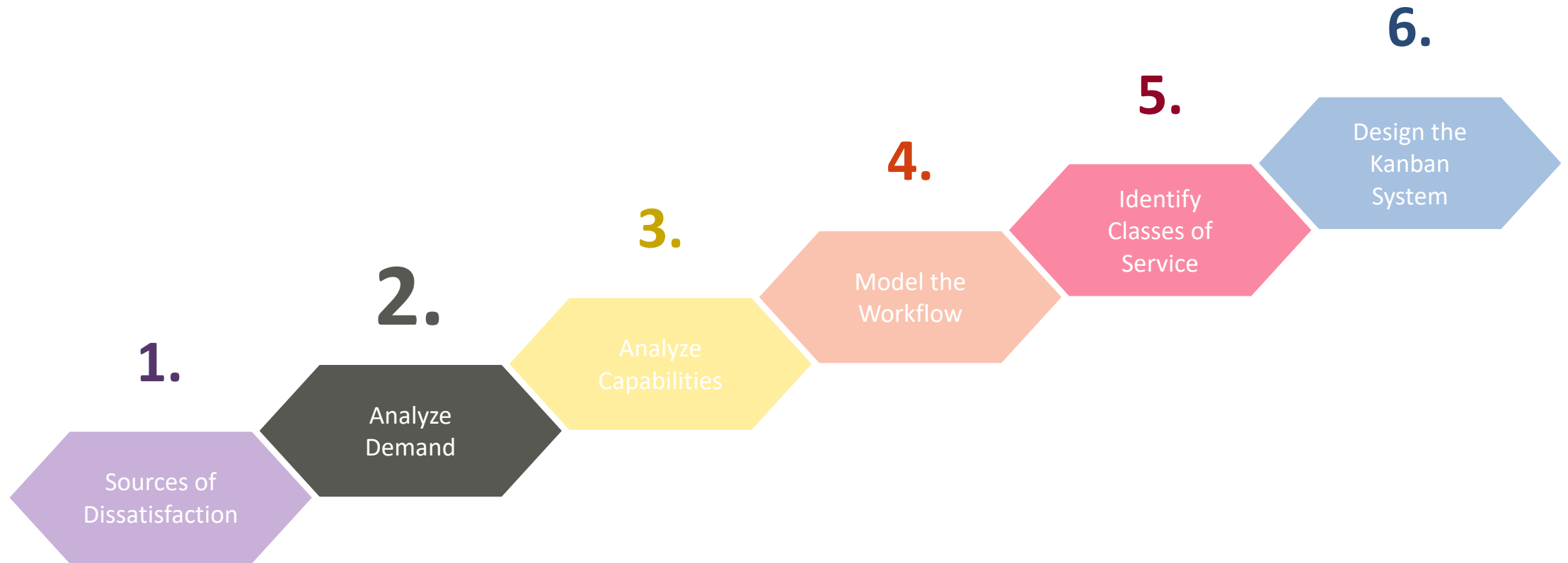


Form groups around cases

- You will have a great learning opportunity to practice STATIK with your own cases. Who would like to offer a real-world case to practice STATIK?
- Form groups of 3-4 people, one of them with a “case;” a (future) Kanban system that should be designed
- As a first step, help the Case Owner to describe their “**Service.**” Use the questions from the prior slide. Note that this description might evolve throughout the application of the STATIK stages
- You might draw a diagram positioning the service in the network of services in that organization

Understand motivation for change

- Describe Sources of Internal/ Team Frustration
 - Variability that randomizes the process
 - What prevents work being delivered on-time, with good quality, etc.
- Describe Sources of Customer Dissatisfaction
 - Reason's customers are unhappy/expectations not met
 - (or points of customer conflict)



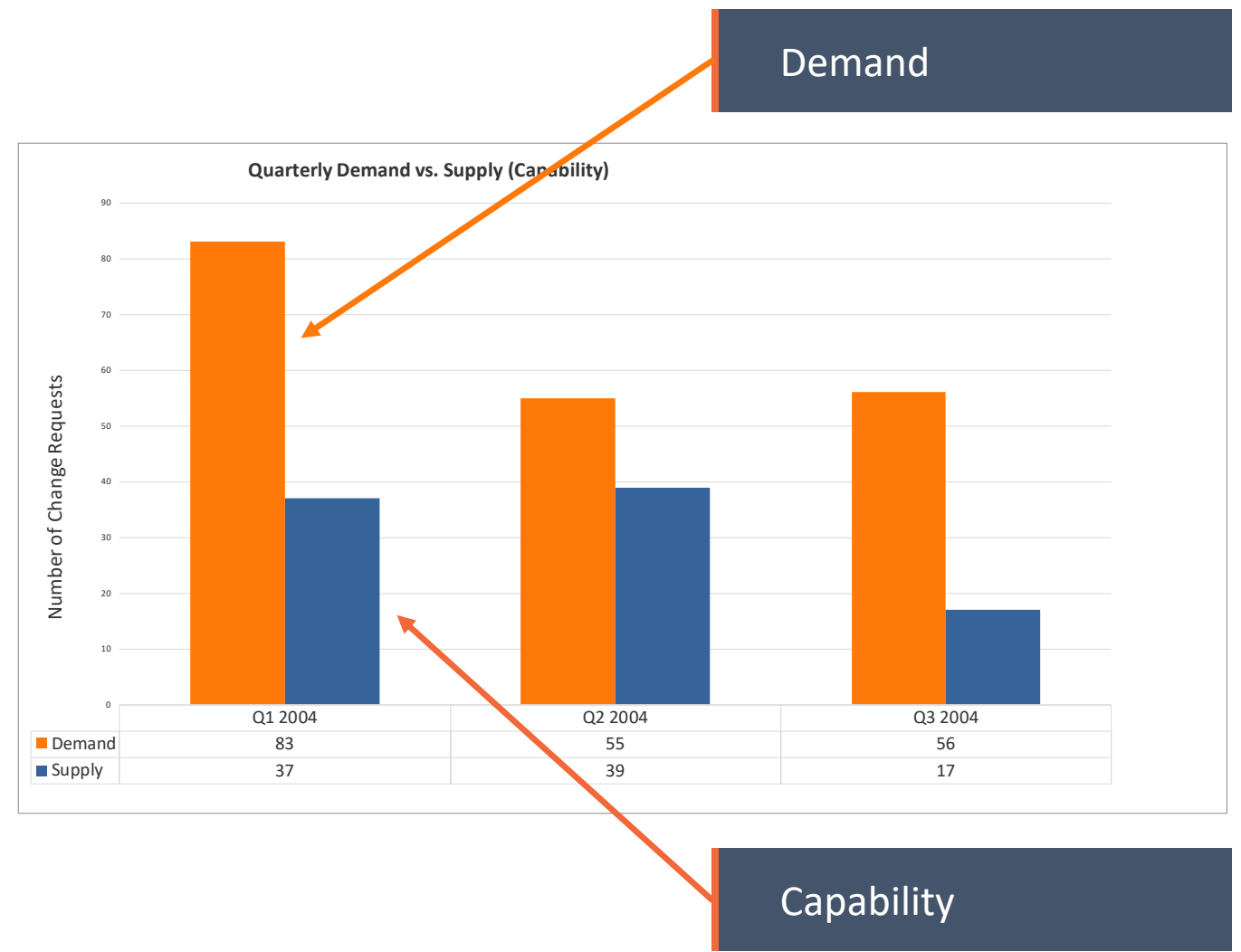
Step 2: Analyze Demand

What do customers request, through which channels? Types and patterns in demand?

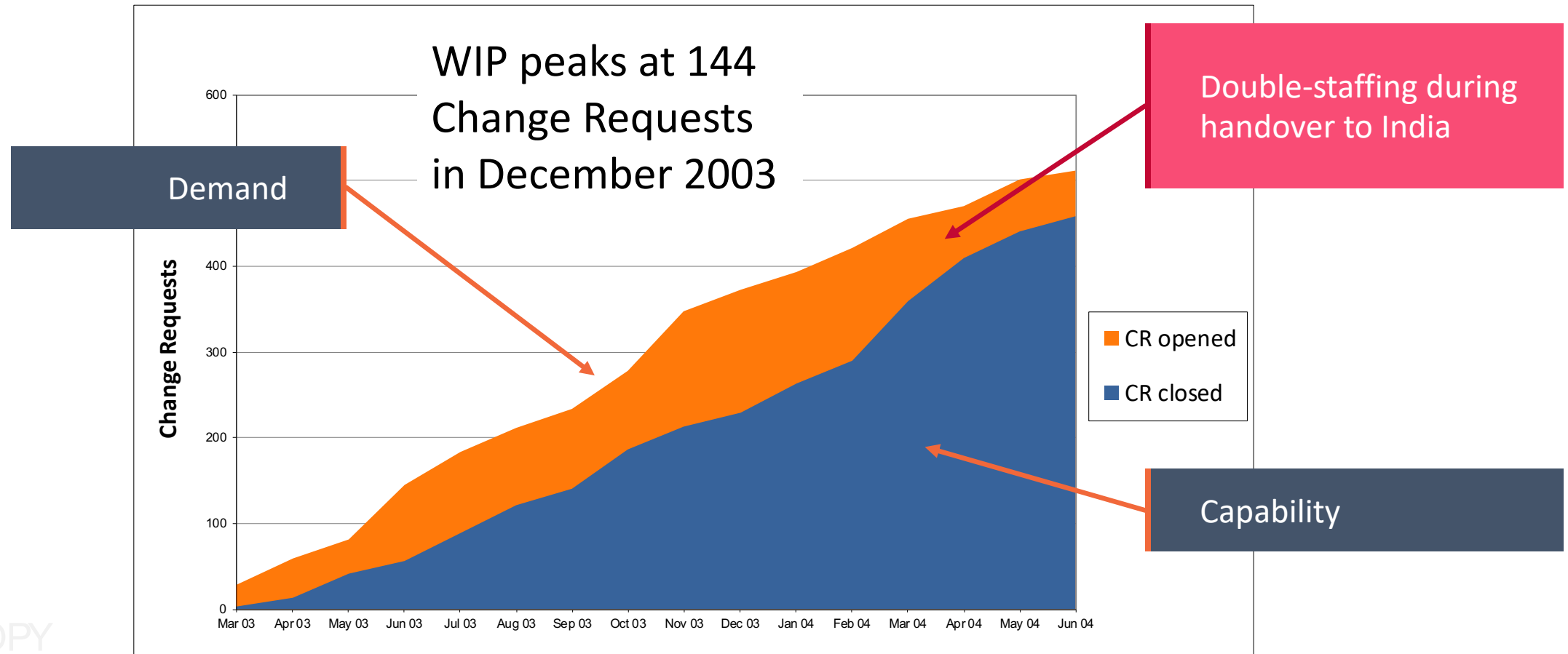
Throughput Capability vs. Demand

Data from three quarters:

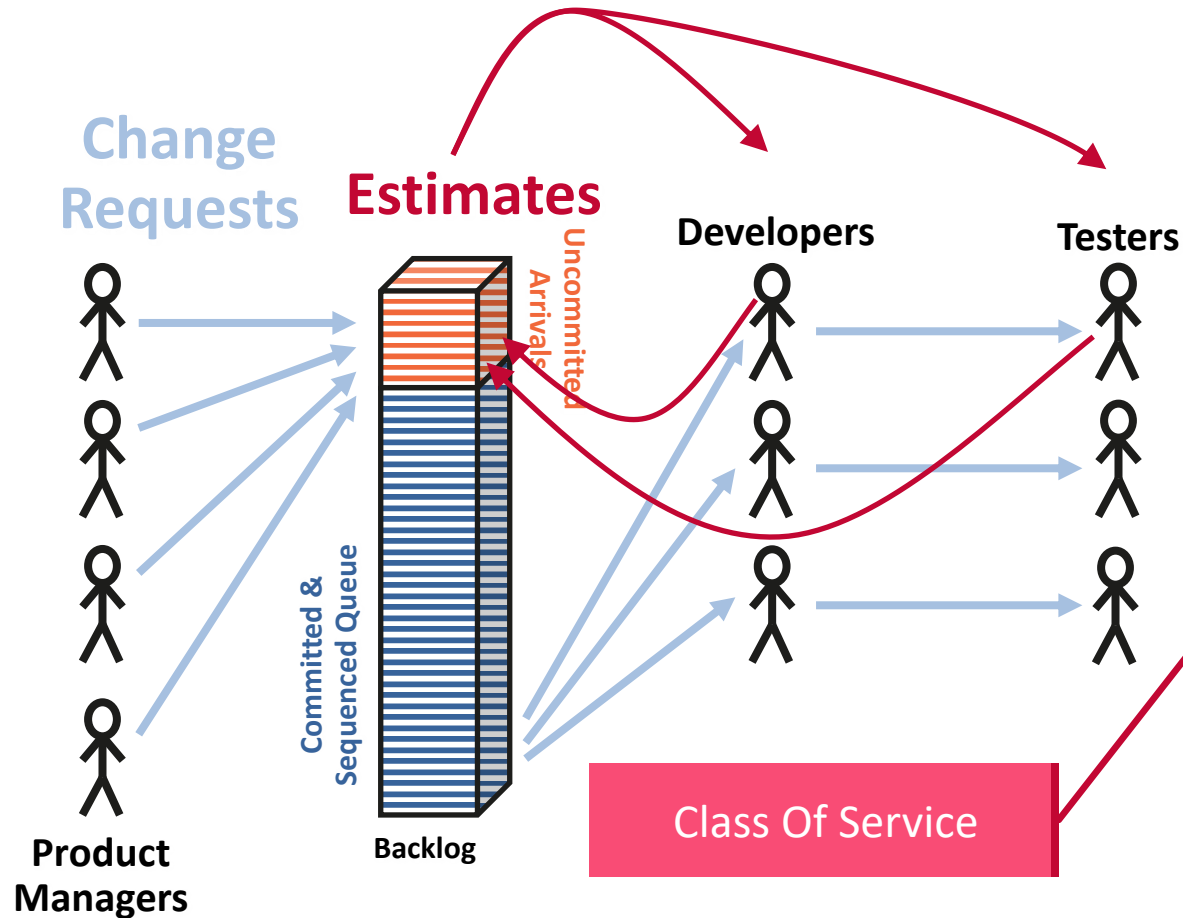
Demand is outstripping capability, and the queue is growing



Demand vs. Capability on a historical CFD



Estimation is a Source of Dissatisfaction



Estimates should be treated as a work type with a **higher class of service** than change request

Estimation requires

- Open and read source code
- Read the application guide
- About 1 day of effort per developer and tester
- SLA – 48 hours to return a rough order of magnitude estimate
- All change requests are estimated
- Estimates are expedited as top priority due to SLA

Demand and Capability Analysis

Work Type	Requested per Month	Delivered per Month	Demand Fulfilled
Estimates	20-25	20-25	100%
Change Requests	12	6	50%

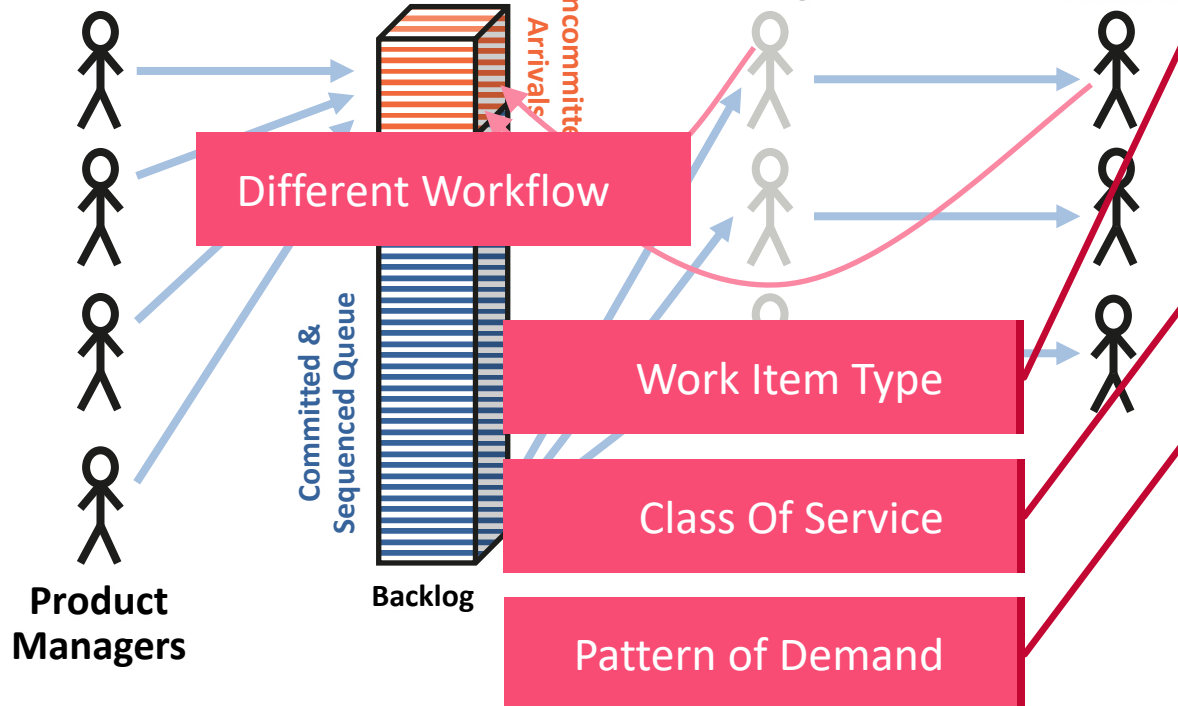
- Demand for estimates is 20-25 per month (or 1 on average, every 3 days per person on the team) and fulfilled
- Change Requests actually scheduled are only 12 per month (typically), demand for Change Requests is ~12/month, with only ~50% of demand being fulfilled
- Many change requests were abandoned, or actively discarded

But wait, there's another type of work!

Production
Text
Changes (PTC)

Change
Requests

Estimates



PTCs are disruptive and development work could accumulate incurring delay while testers process PTCs

Production Text Changes (PTC)

E.g., graphical changes, data changes, anything that didn't require a developer

- Take Top Priority
- No development required
- Never see any for weeks of months then they all arrive in one burst!
- Strong indication of seasonal/regulatory demand and fixed delivery date

Results of Microsoft XIT Demand Analysis

- 3 Work Item Types identified with these characteristics:
 - Change Requests (12 per month)
 - Estimates (20-25 per month)
 - PTCs (in seasonal bursts)

Sources of Internal Dissatisfaction

- PTC arrival rate
- Constantly interrupted to make estimates

Sources of Customer Dissatisfaction

- Too slow/long lead time
- Totally unpredictable
- Nothing ever on-time

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Wait!

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- **PTC** stands for Production Text Change
 - We learned: PTCs are seasonal and arrive in bursts
 - Class of Service used: Expedite
 - Something is wrong with this picture!
-
- All work that follows the same workflow has been described as PTC for the convenience of electronic tracking!
 - Investigate!

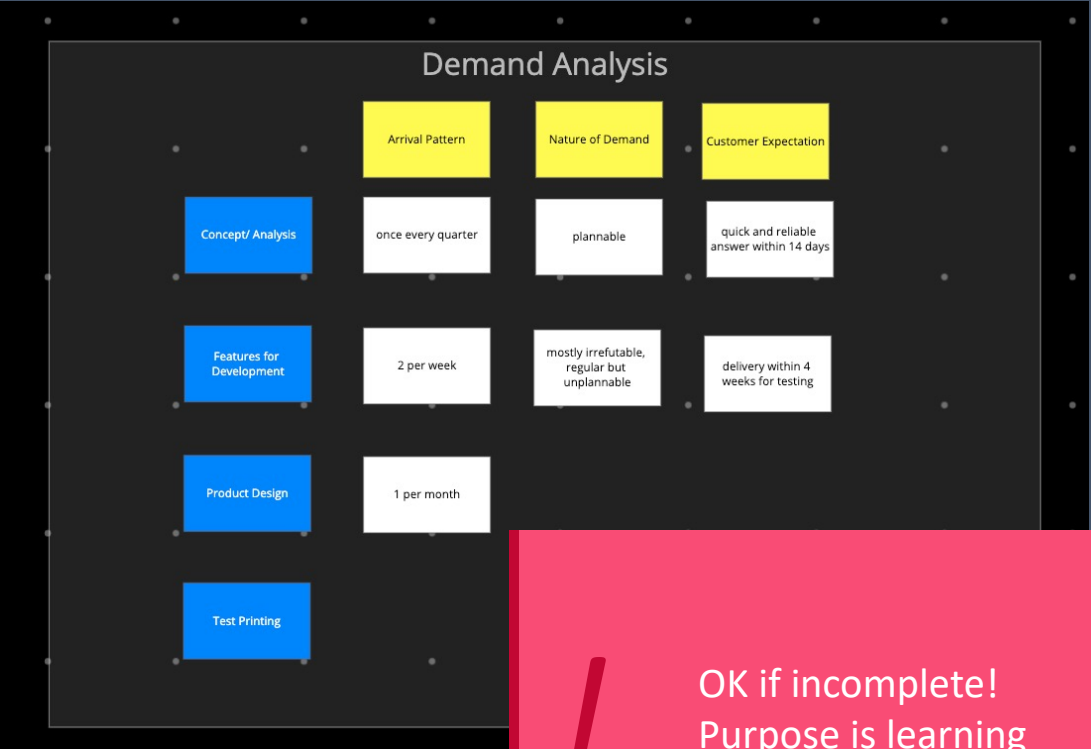
Further Analysis

- Product Managers represent 4 true customer departments: Finance, Human Resources, Facilities, Security
- **PTCs** include:
 - Tax Table Updates for the Payroll System and are seasonal in nature
 - Updates to facilities management apps, tend to align with delivery of new buildings, and construction projects on the campus
- Tax Table updates arrive in late September with fixed date delivery due early January
 - Why were they expedited?
 - It is the wrong class of service, but Product Managers demand it because the system exhibits such poor capability

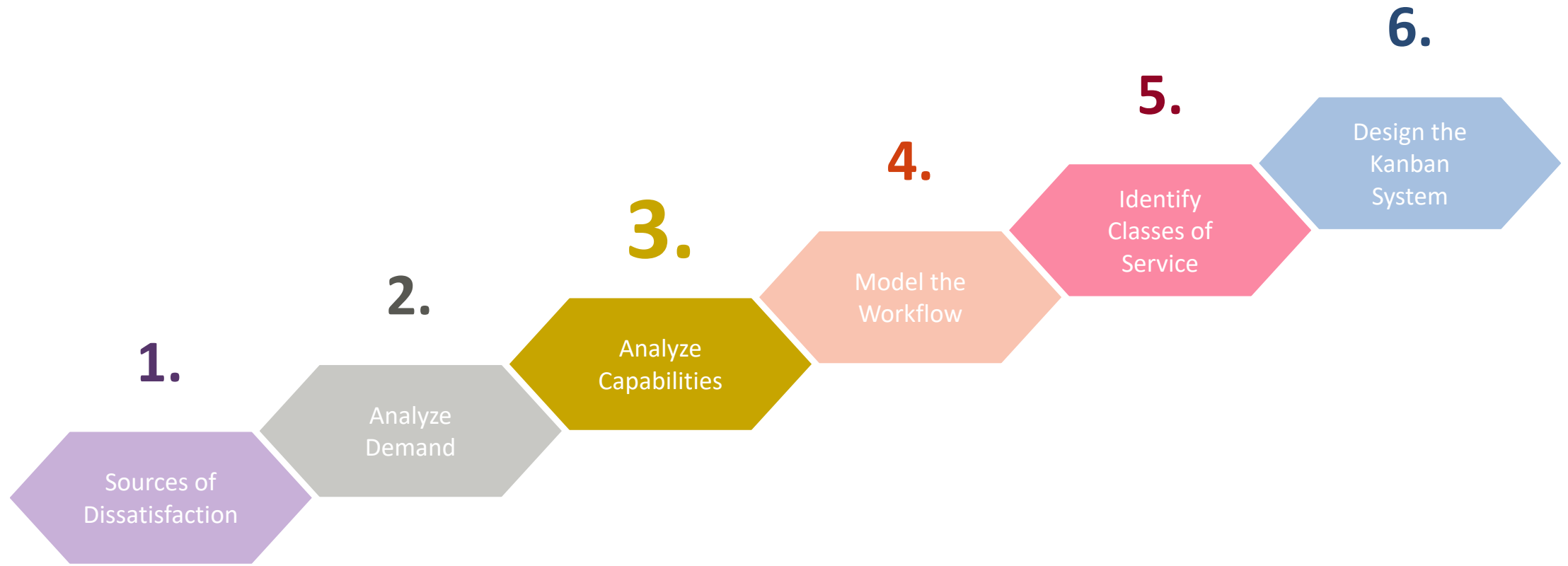
Demand Analysis

In your groups, perform a Demand Analysis

- **Identify work item types**
 - Where does demand come from?
 - What do customers request? Scale? Complexity?
 - (Tip: different types resulting in different workflows, dependencies, required skills)
- **For each type of work, analyze:**
 - Arrival rate and nature of demand (random, burst, seasonal, batches, chaotic, replanned or unplanned, anticipatable, or not? Refutable/discretionary or not?)
 - Customer expectations (even if unreasonable)



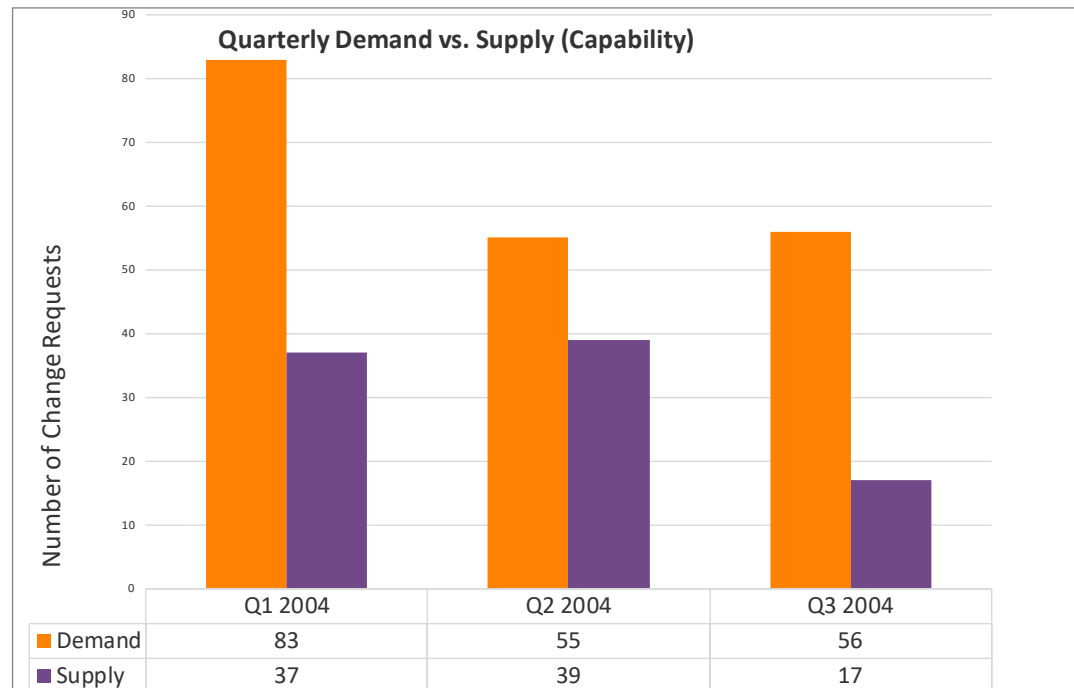
OK if incomplete!
Purpose is learning



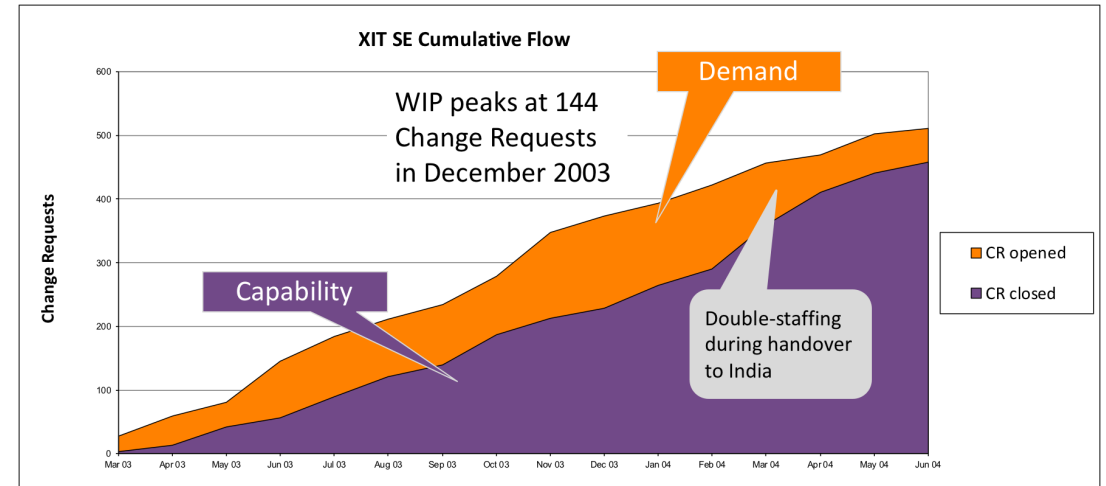
Step 3: Analyze Capabilities

Reminder: Findings from Step 1

Demand vs. Capability



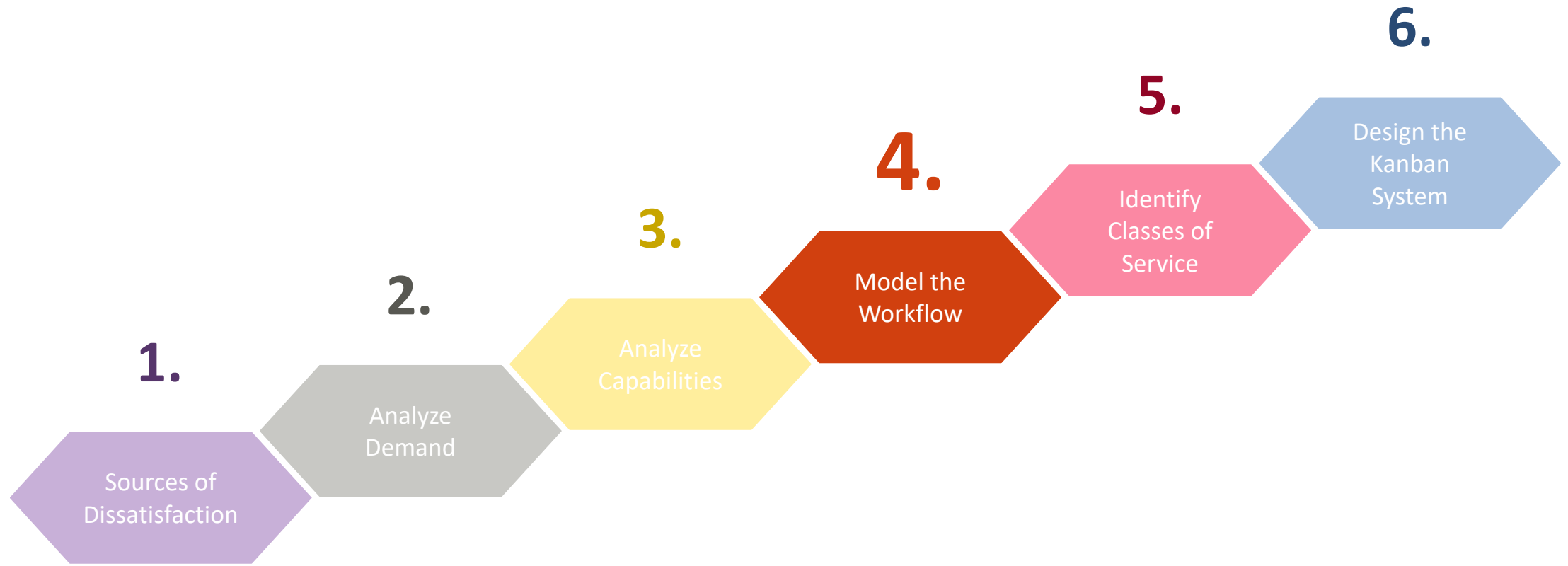
Cumulative Flow Diagram



Optional: Capability Analysis

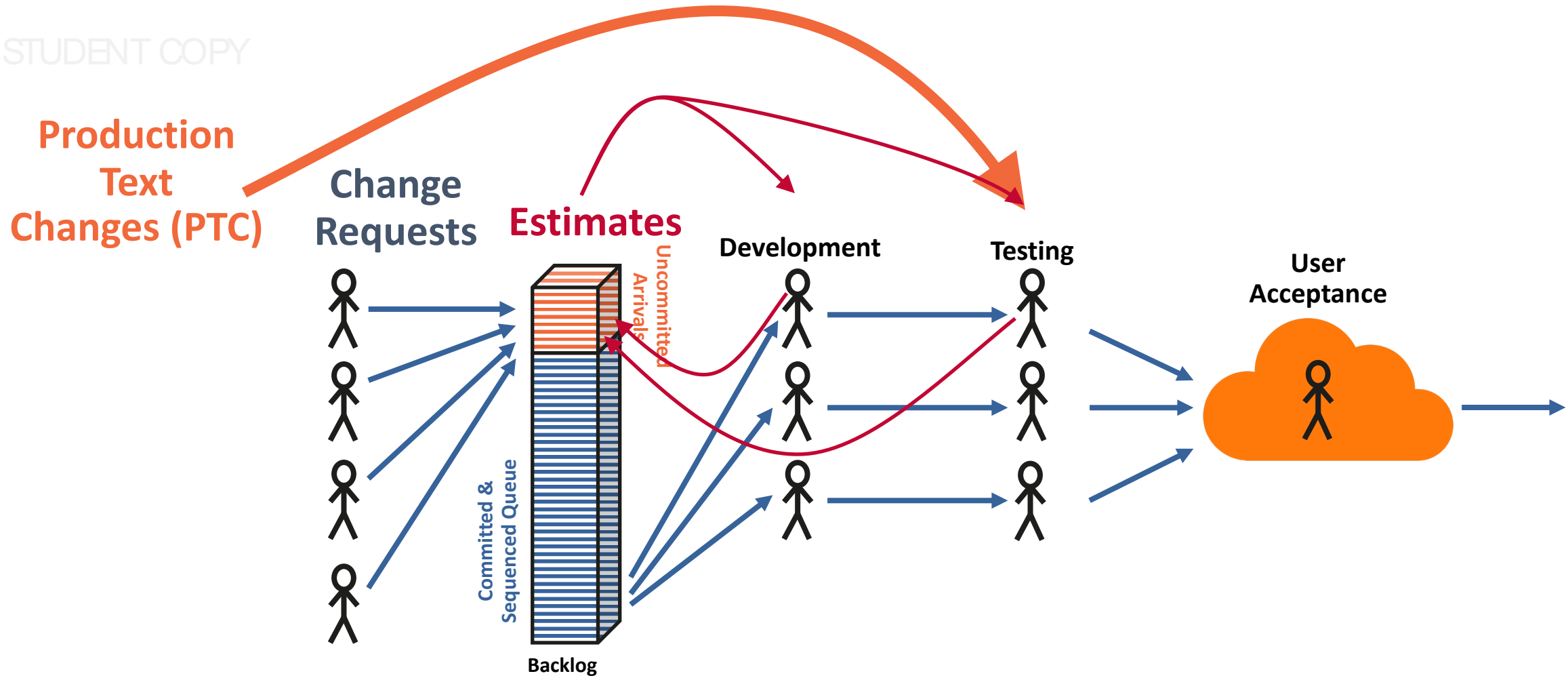
- For each work item type, collect:
 - Delivery rate over time
 - Lead time run chart and distribution histogram
 - Defect rate
- Capability Analysis
 - What is the spread of lead times?
Are there clusters or modes in the data?
 - What is the trend? Is predictability (spread of variation) improving or declining (diverging)?
- Demand vs. Capability
 - Compare demand vs. capability: What are the gaps?



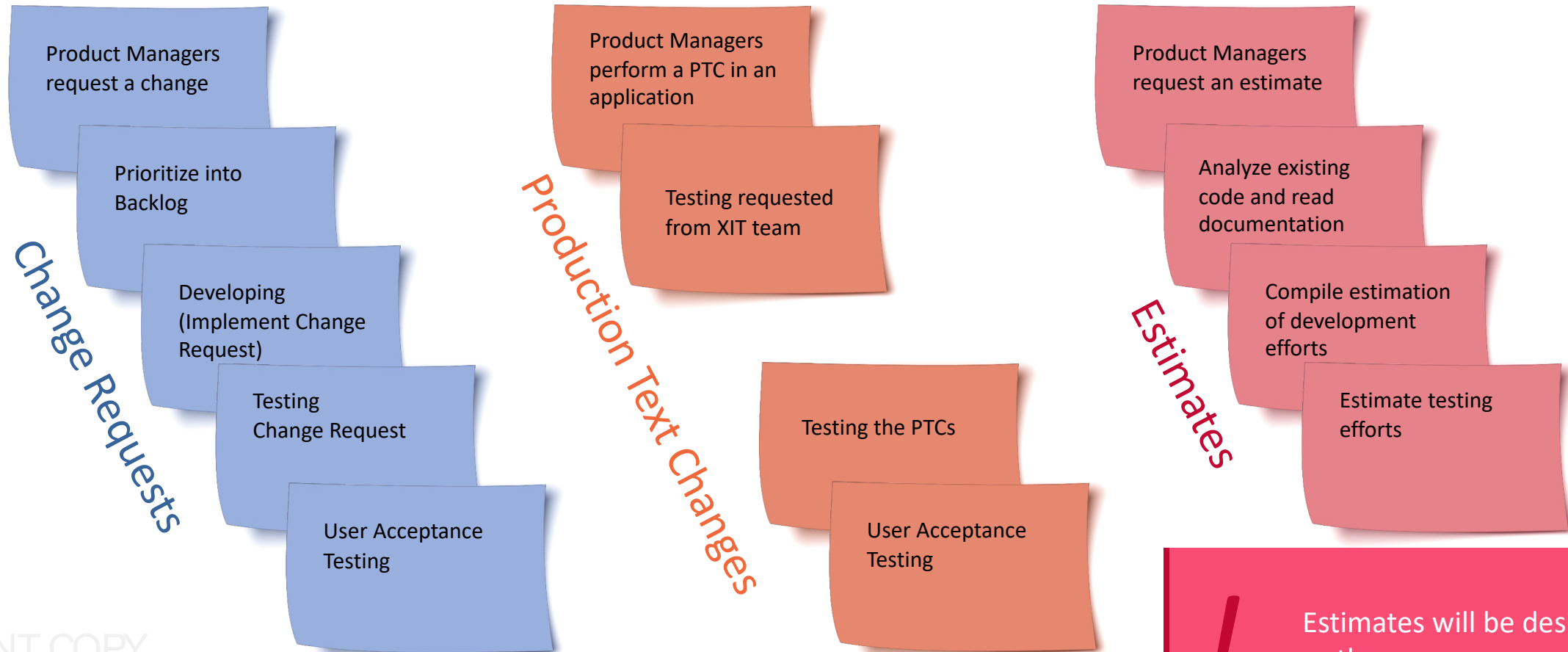


Step 4: Model the Workflow

Reminder: Model of the workflow



Workflow Modeling for XIT Work Types



Estimates will be designed out as they are a source of variability and dissatisfaction

Kanban systems manage work

Remember to model knowledge discovery not handovers

Work item states should reflect the dominant activity for discovering new knowledge at each stage in the workflow

Effects on the Kanban board design and collaboration

Results in simpler board design and changed focus in communication

Map the workflow(s)

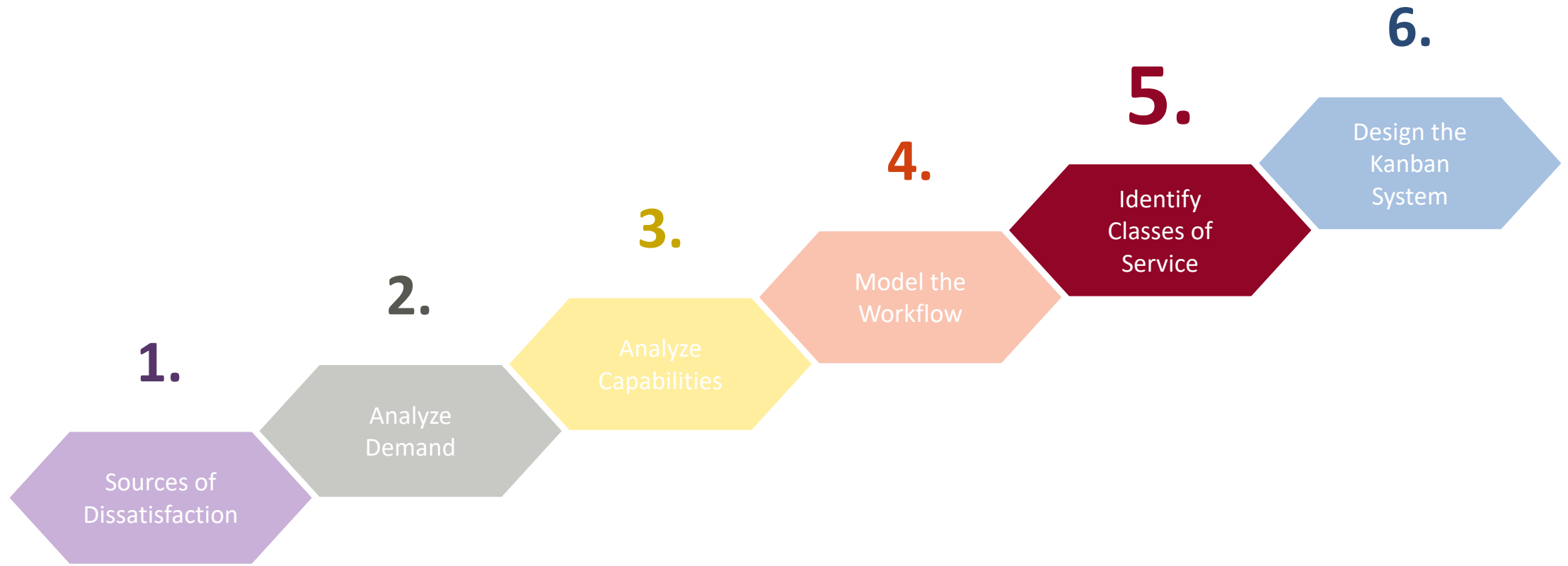
In your groups, model the workflow(s) in your service delivery

- Sketch the workflow for a few types of work
 - Any method is acceptable, like flow charts, sticky notes, or stickmen drawing
- Discuss the sequence of dominant activities for discovering new knowledge/information
 - List the activities (use verbs)
 - Does the knowledge discovery activity span across people/teams and show collaborations?
- Are there any specialist activities?



Activity A

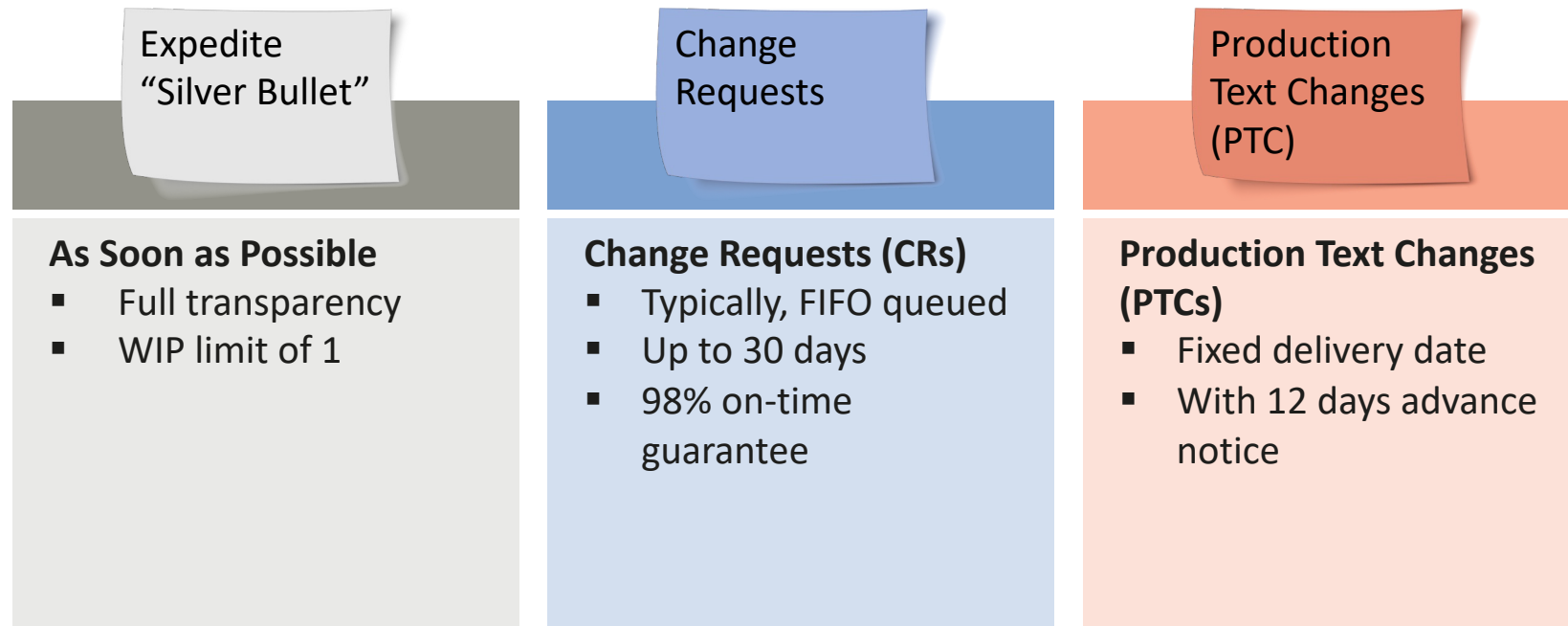
Activity B



Step 5: Identify Classes of Service

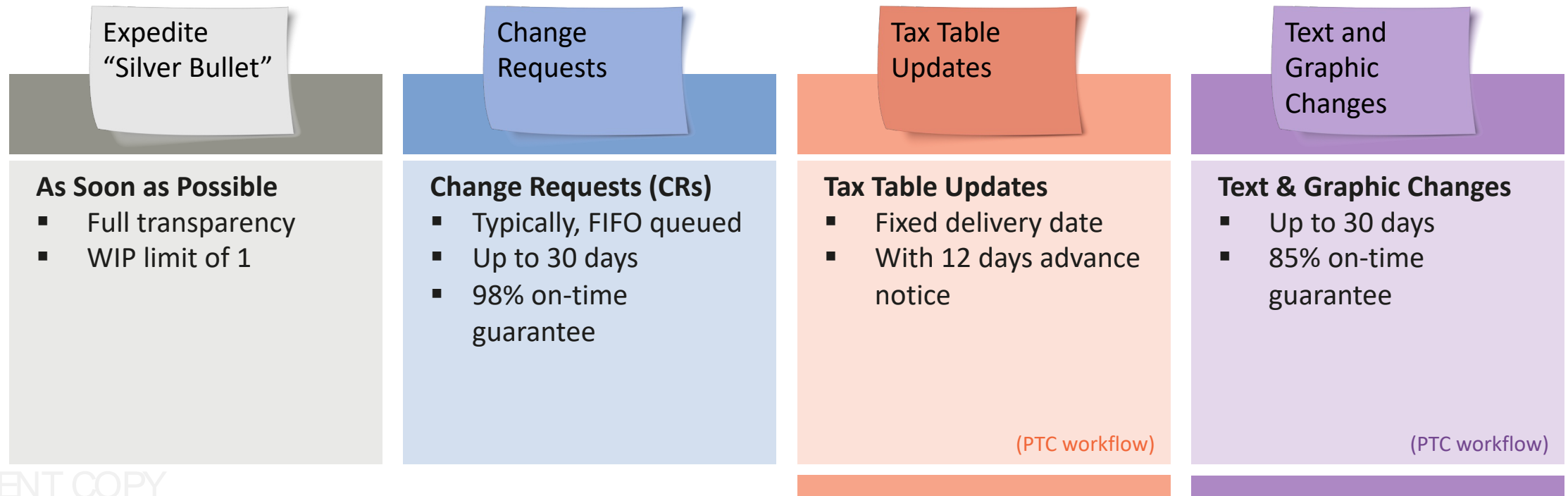
Finding categories of items being treated differently in the system

Initial Classes of Service at XIT



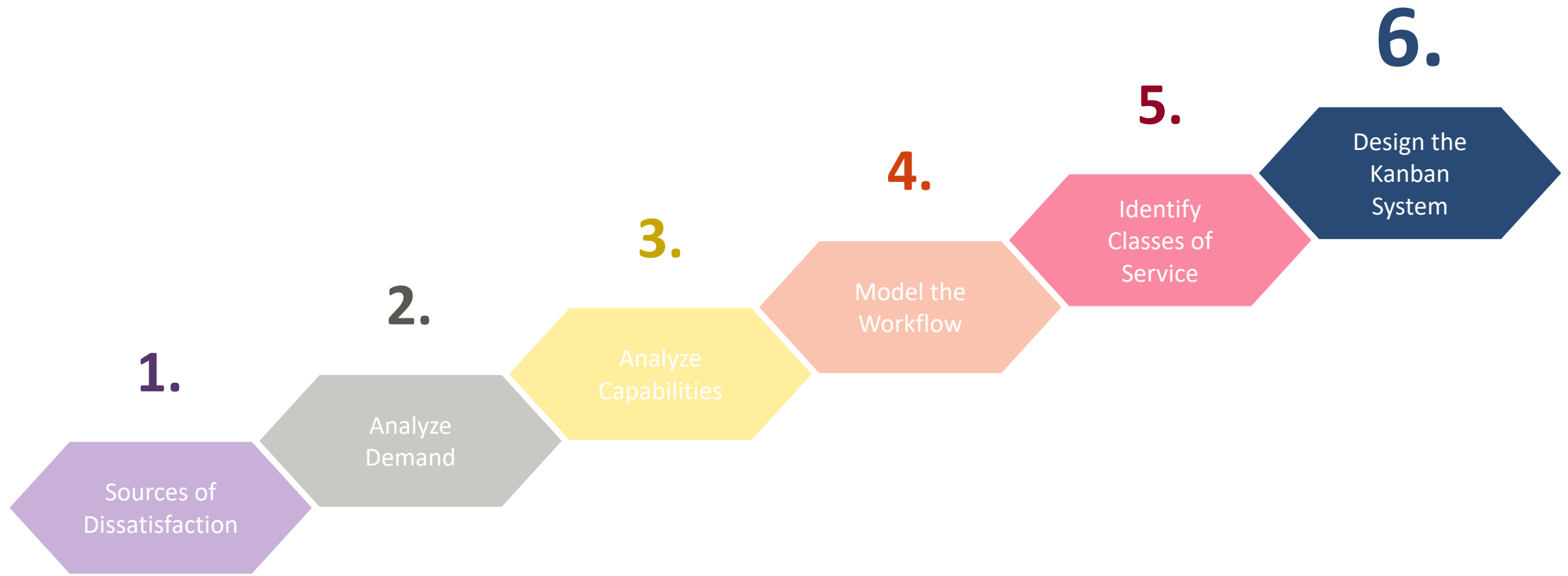
Additional Classes of Services Emerge

Breaking up PTCs into urgent (fixed date) and non-urgent Class of Service



Discovering Classes of Service

- Consider the risks associated with different work items types, such as cost of delay
- Describe some policies for classes of service, e.g., Expedite.
 - What are the rules for how something should be treated?
 - Typically, we care about queuing discipline & volume of tickets
- Which classes of service apply to which work item types? 1 to 1 mappings are common
- Are there any existing SLAs or other policies that cause interruptions, untracked work, and hidden Classes of Service?
- Do these (negatively) affect customer satisfaction?

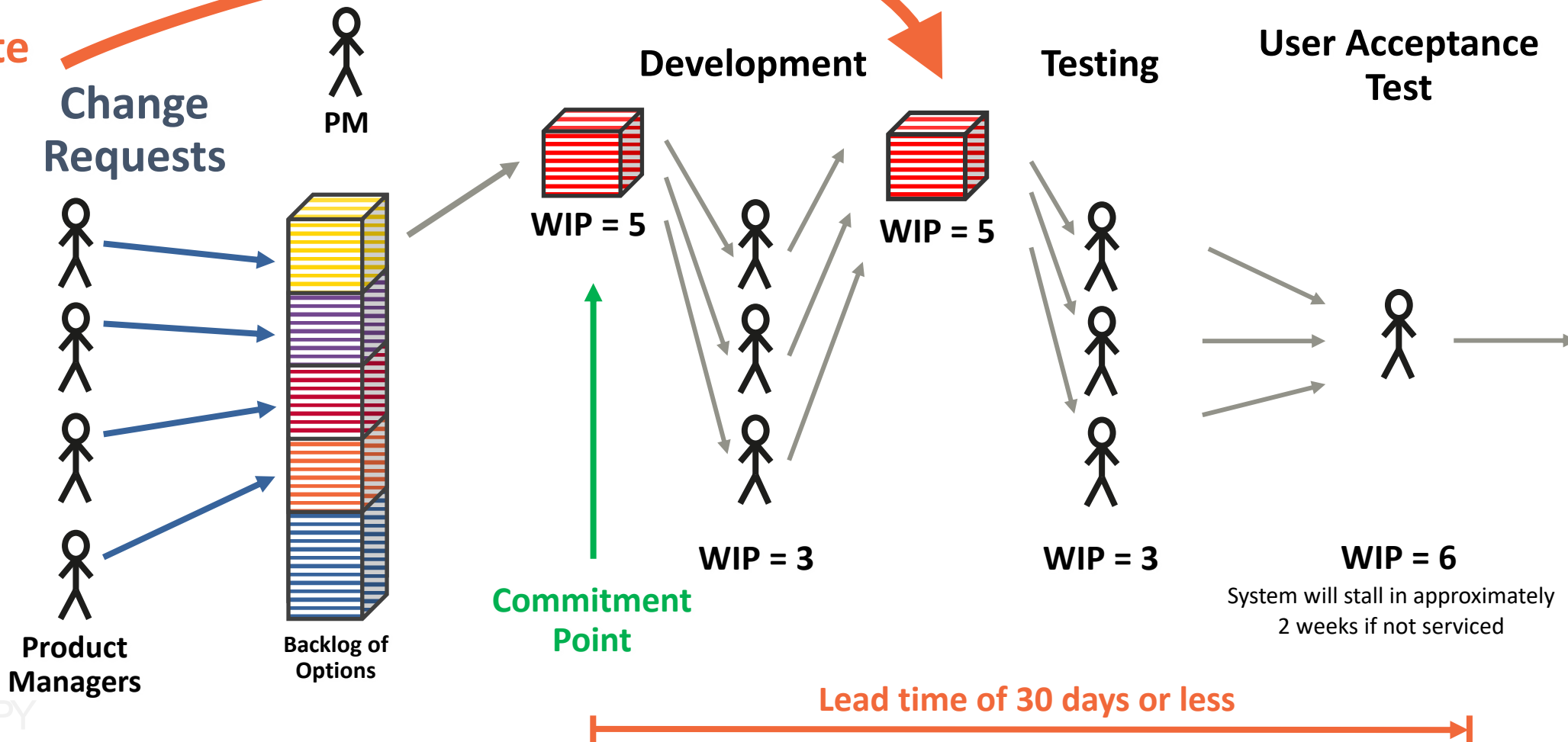


Step 6: Design the Kanban System

Putting it all together into the initial Kanban system design

Kanban System Design for XIT

PTC
Expedite



Designing for sources of variability

- Estimates
 - These will be designed out and replaced with service level agreements
- Planning (and re-planning)
 - This will be replaced with kanban system queue replenishment
- PTC arrival rate (burst traffic)
 - This will be mitigated by the kanban system WIP limit and the “just-in-time” queue replenishment for Change Requests

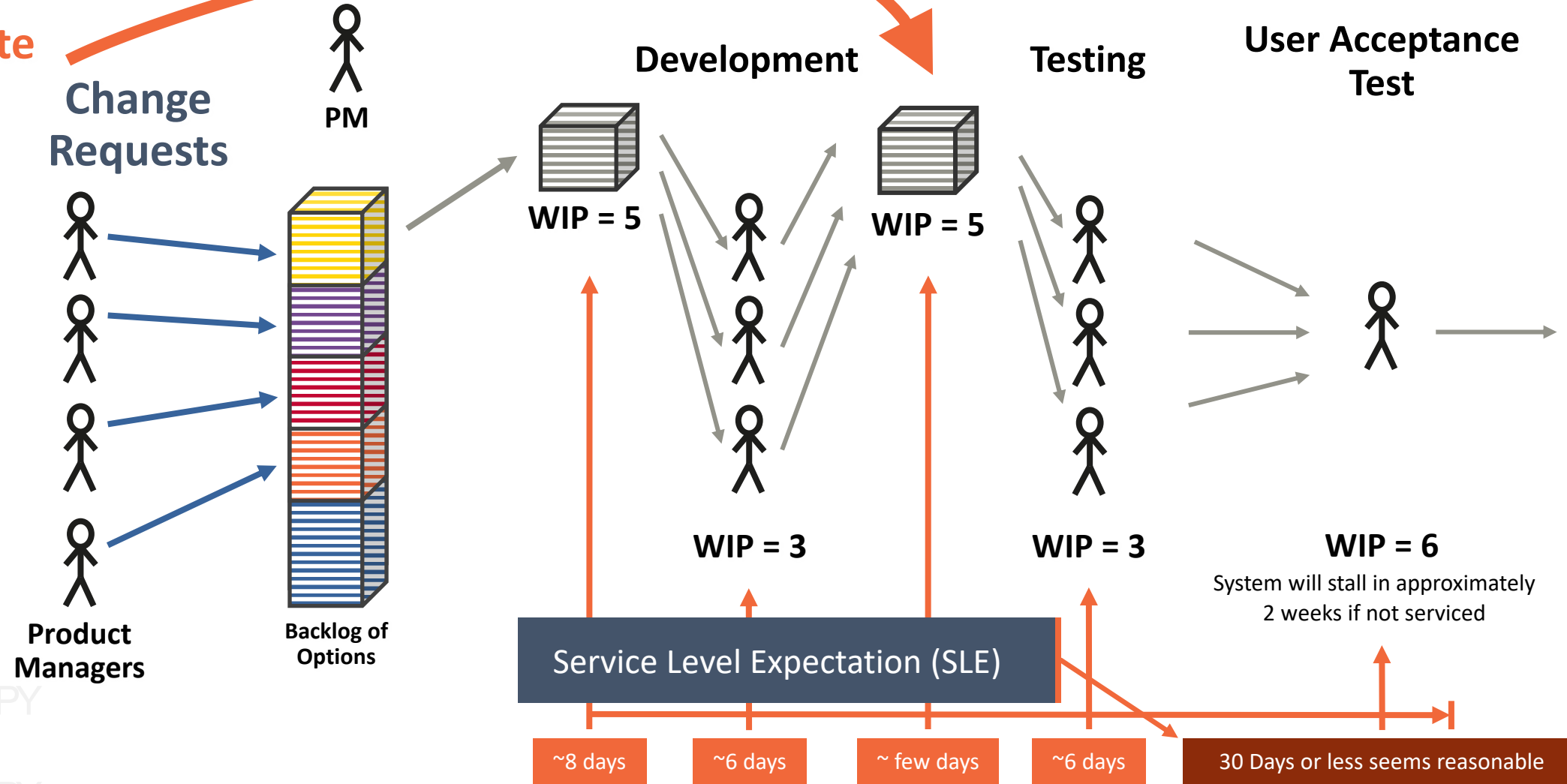
Determining an Expectation of Service Delivery

- Engineering effort (touch time)
 - A histogram of local cycle time showing development and test effort revealed that average engineering time was 11 days with outliers > 24 days
- Delivery rate estimate
 - Without estimation interruptions, it ought to be possible to increase delivery rate to 10-12 per month (~3 per week)
- Queuing & buffering time estimates
 - Input buffer queuing time is likely to be a maximum of ~8 days based on a throughput rate of ~3 per week
 - Buffering time between development and testing is likely to be almost zero except during times of PTC demand

! This level of predictability is only achievable if we **limit WIP** in the system

Lead Time Expectations for XIT

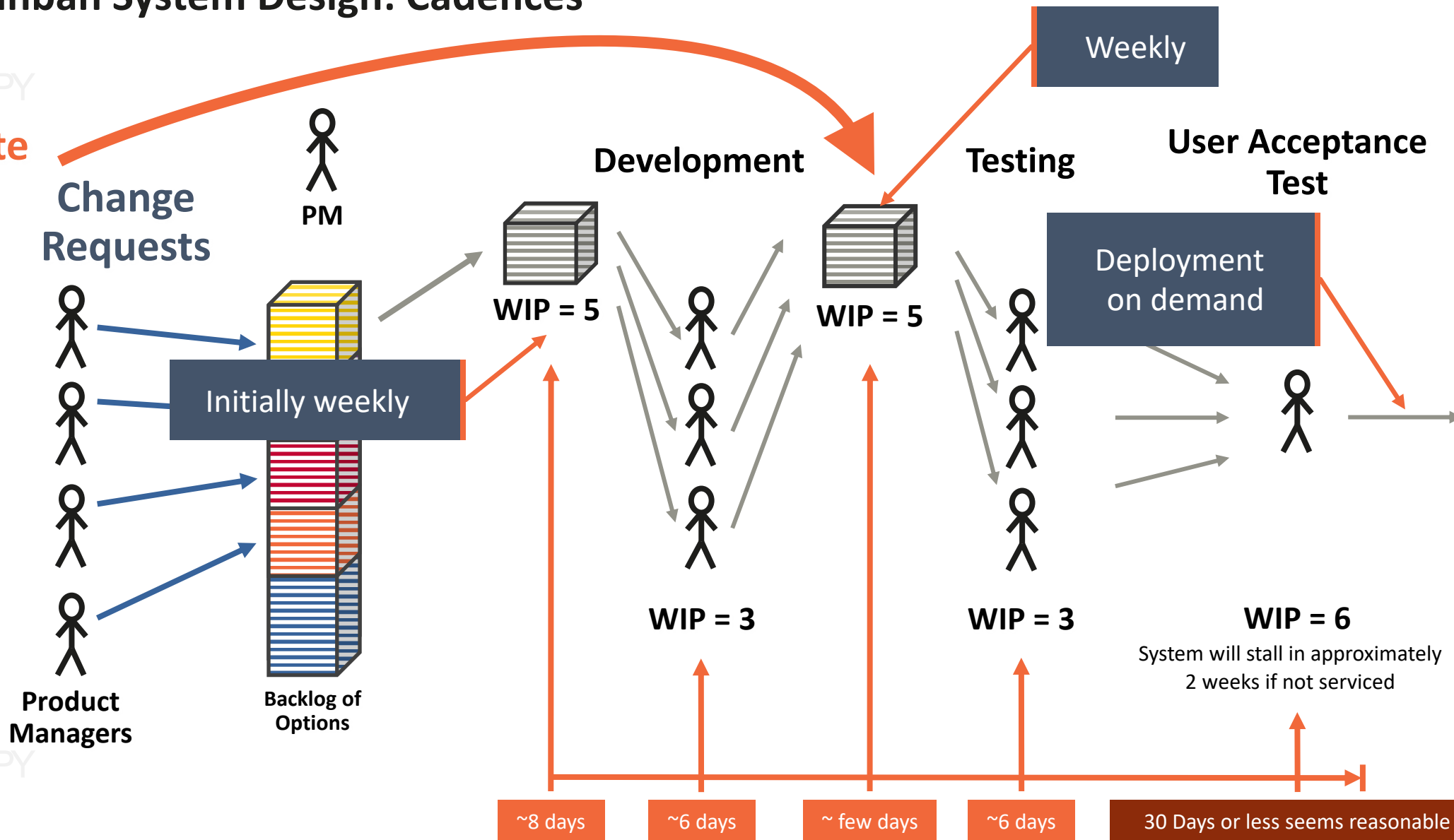
PTC
Expedite



Recurring Events (and Cadence)

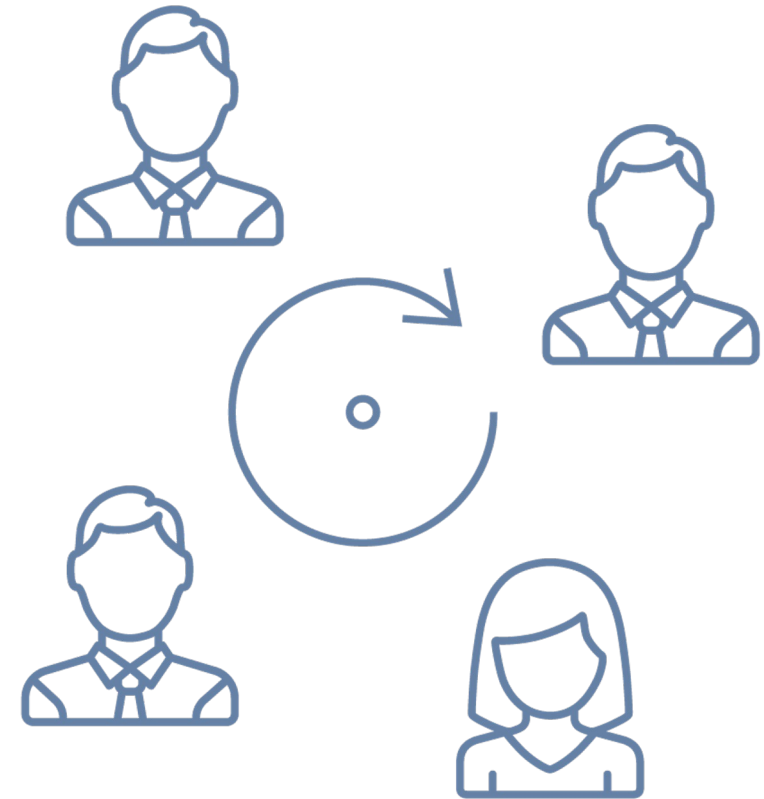
XIT Kanban System Design: Cadences

PTC
Expedite



System Replenishment policies at XIT

- Weighted round-robin queue replenishment mechanism based on budget contribution: **“Whose turn is it to pick next?”**
- This effectively introduces a **WIP limit per product manager** (or customer department) into the system – effectively a capacity allocation
- This is both a risk management strategy and a way to communicate fairness and raise the level of trust in the system



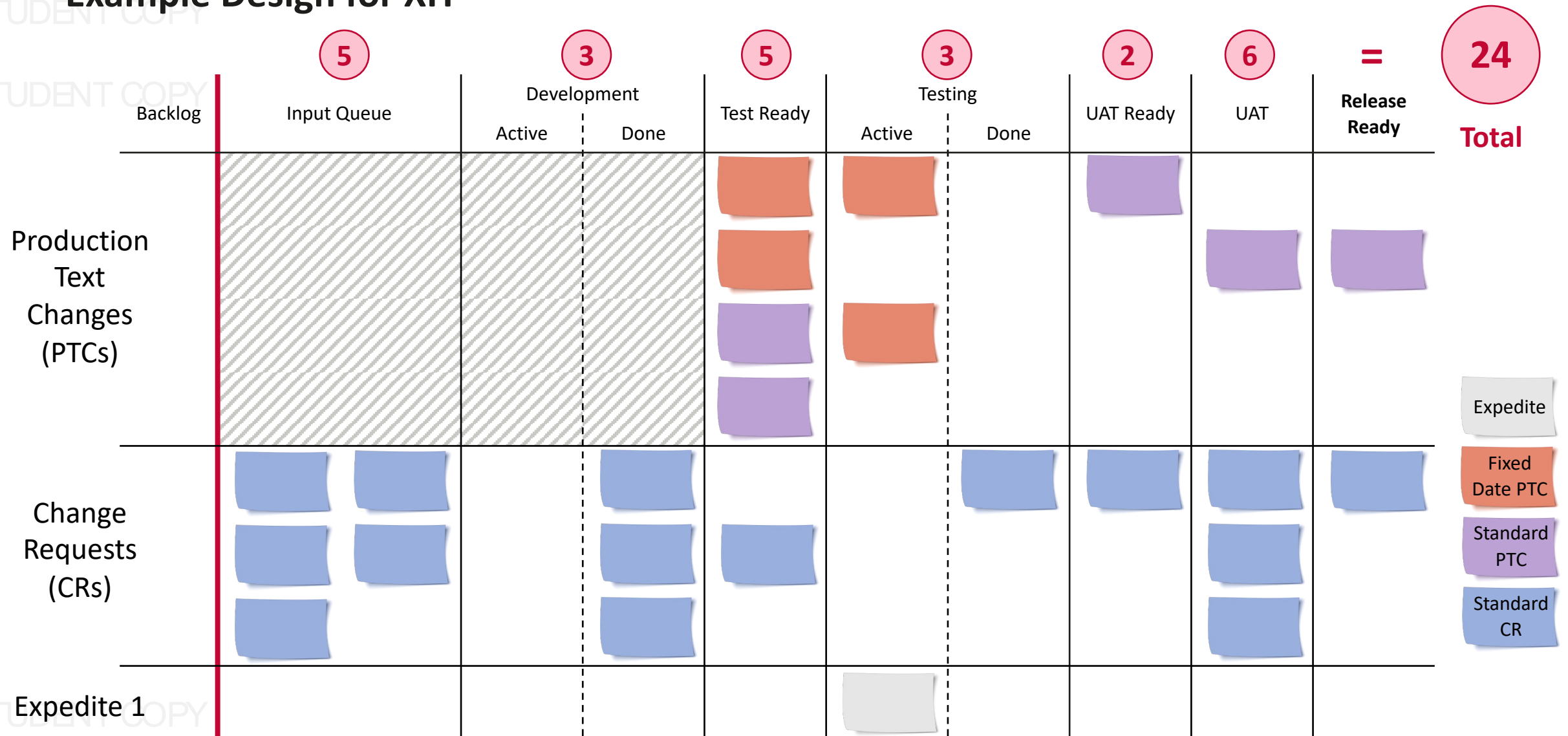
System Replenishment & Delivery Frequencies

15 min

- What is the appropriate input or system replenishment frequency?
- How quickly are things changing (in the business)? What is the arrival rate of new information that would affect selection of items?
- What is the ideal delivery frequency for your Kanban system?
- What are the transaction costs of a delivery (training, deployment, governance) and the lead times involved (e.g., training lead time)?
- Does it make sense for delivery and system replenishment frequency to be the same, or is it more natural for them to be different?
- Is on-demand delivery or replenishment possible? What would it take to make it possible?

Wrap-Up: XIT Case Study

Example Design for XIT



Results in the XIT Case Study



No changes were made to the software development or testing process

- Additional capacity increased throughput beyond demand; the backlog was eliminated entirely on November 22, 2005
- Lead time down to an average of 14 days against an 11-day engineering time; the due-date performance on the 30-day delivery time target was 98 percent
- The throughput of requests had risen more than threefold, while lead times had dropped by more than 90 percent, and reliability improved almost as much



Prerequisites for Module 4

- Please get this done before the start of the next module!
- Kanban Foundations Quiz
- Worksheet “Elements of a Kanban System”



Module 4

Designing a Kanban System

Introduction

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10 min

Review Quiz

- Any open questions?



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Review of the exercise “Kanban System elements”

- Review results from the worksheet
- Gather Kanban system elements



Key Elements of Kanban System Design

- Work item types
- Workflow states
- Sources of variability (that disrupt planned work and commitments) to be designed out during initial implementation
- WIP limits and queue replenishment policy
- Classes of Service
- Commitment points
- Replenishment and release frequencies
- Visualization – board and ticket design
- Metrics and reporting
- Feedback mechanisms
- ... and the relating policies

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Strive for flexible Kanban system designs

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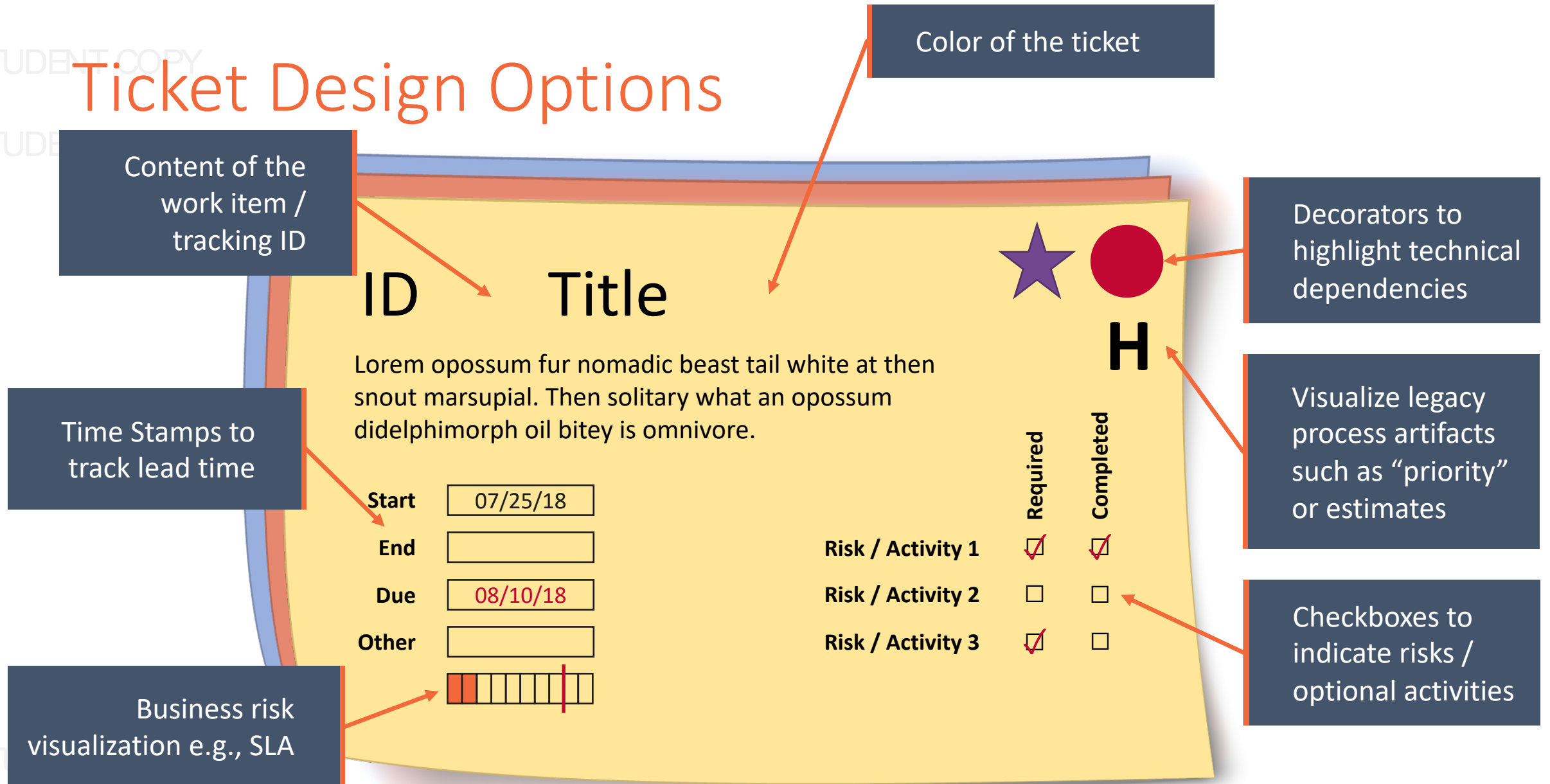
Patterns of Ticket and Board Design

Ticket Design



What is enough
information for you
to make a good pull
decision?

Ticket Design Options



The ticket needs to contain the right information to support a good pull decision!

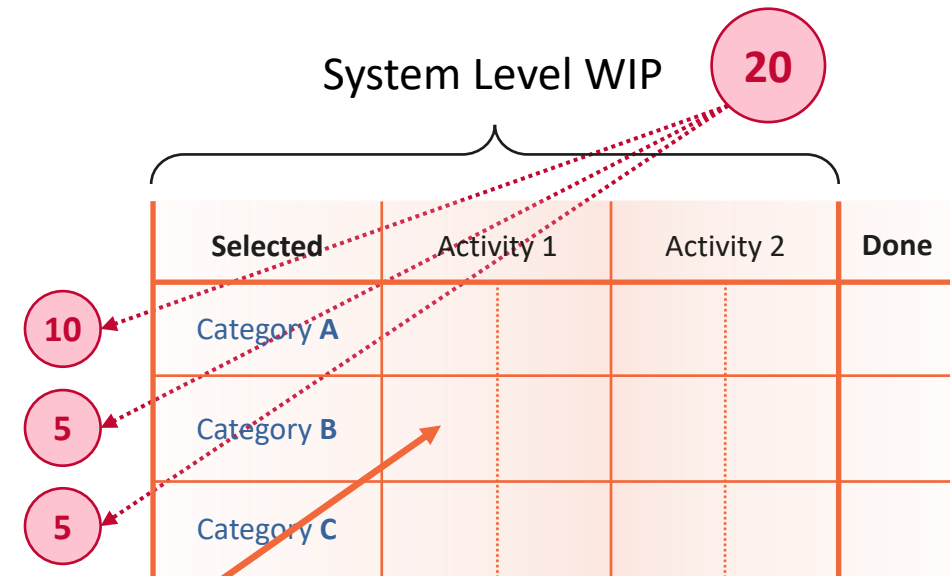
Patterns of Visual Board Design

Starting Considerations

- Remember, every board is unique!
- The board should represent a visual model of your work
- Use the two strongest visual elements wisely:
 - Swim lanes
 - Color of the tickets
- Strive for a flexible board design. It will not be perfect at the beginning, and it will never be “done”
- Smart ticket design might simplify your board design

Use of Swim Lanes (Rows)

- Swim lanes can be used to de-lineate:
 - Work item types
 - Classes of Service
 - Work for different requestors
 - "Boxes" of work e.g., different projects



"We will spend half of our capacity for category A, and 25% for categories B and C"

The scheme above shows Capacity Allocation implemented with swim lanes. The system-level WIP is split and allocated to different categories.

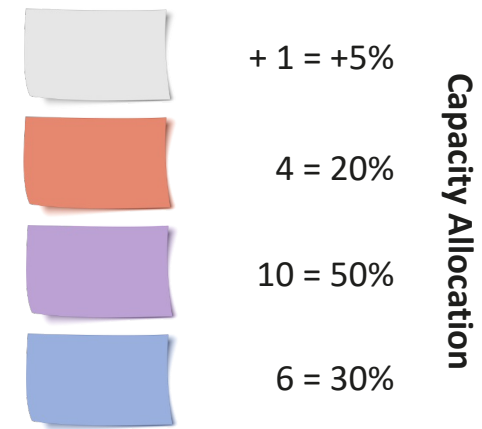
Use of Ticket Color



Real-world example

- Comparable to swim lanes, the color of the ticket can signify different categories
- Often used for class of service, different initiatives or organizational units (see example to the left)

Example right:
Capacity allocation can be implemented by color across the entire board

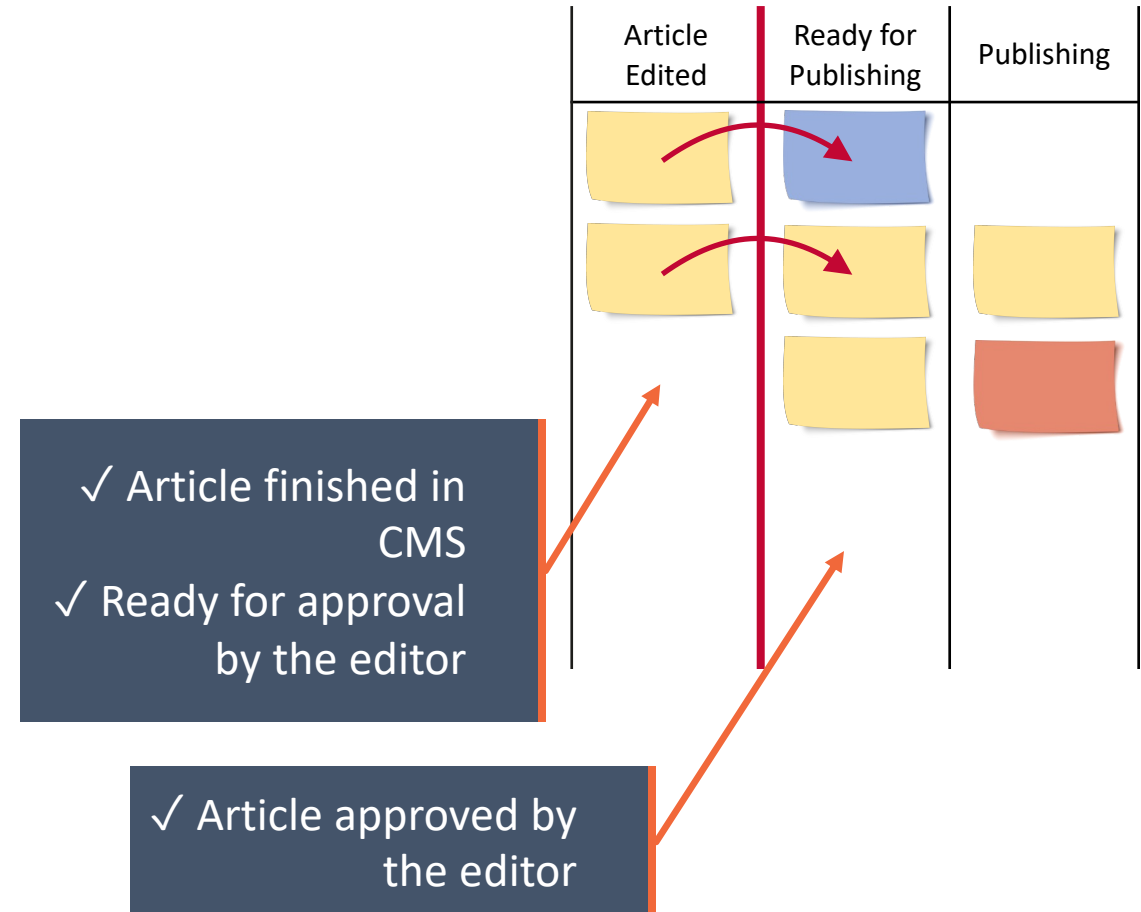


Modeling Short-Lived Activities

- Some activities are completed rather quickly, and it would be impractical to have an individual column where they'd stay only briefly
- These types of activities can be modeled "on the line"
- Examples: approvals, automated steps, deployments, "external" signals such as customer order or delivery by providers

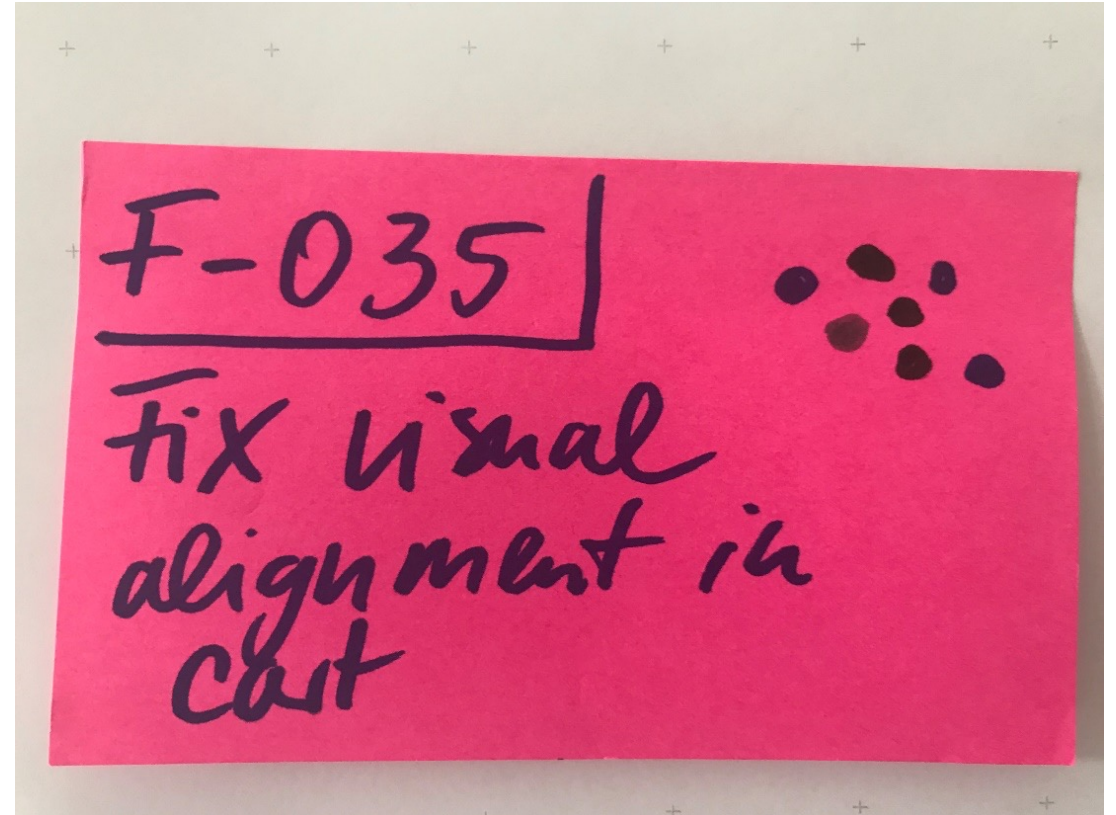


Approval activity happens "on the line"



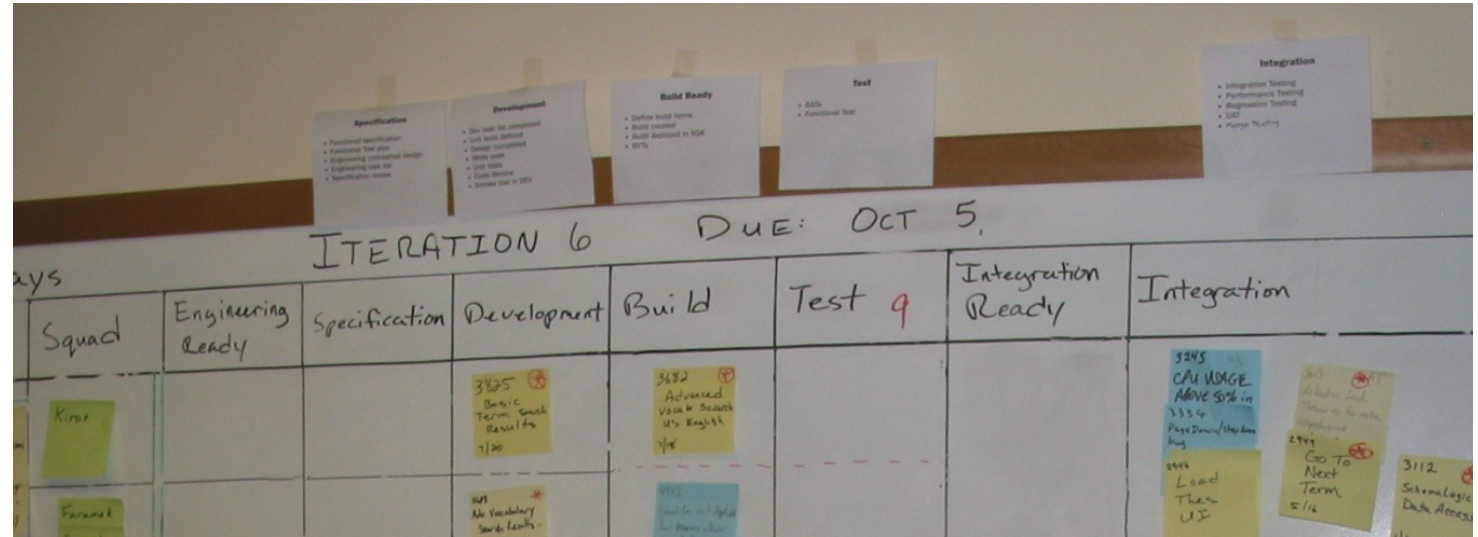
Visualize Ticket Age or “Time in Process”

- It is important to see how long a work item is in the system already (“age”), and/or in the current step of the process
- Work item age informs pull decisions
- For physical boards, dots or tallies can be used:
 - Directly on the ticket to show the ticket age
 - Beside the ticket on a whiteboard to show time in process (i.e., the current column)
- Some electronic tools offer a “ticket aging” or “WIP aging” function



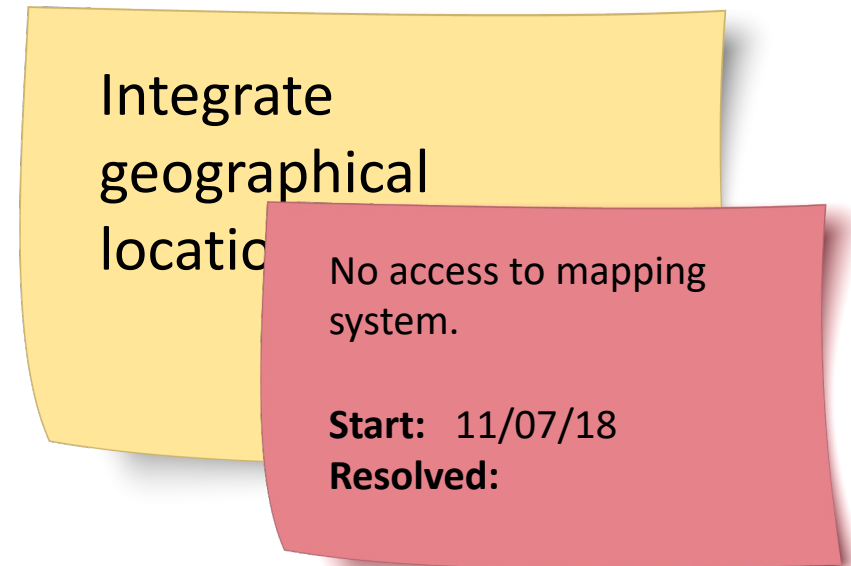
Visualizing Pull Criteria

- Pull criteria policies encourage a focus on quality
- Pull criteria are typically short lists describing the state of work required to signal completion of this activity in the workflow
- They are typically placed above or below the column separator



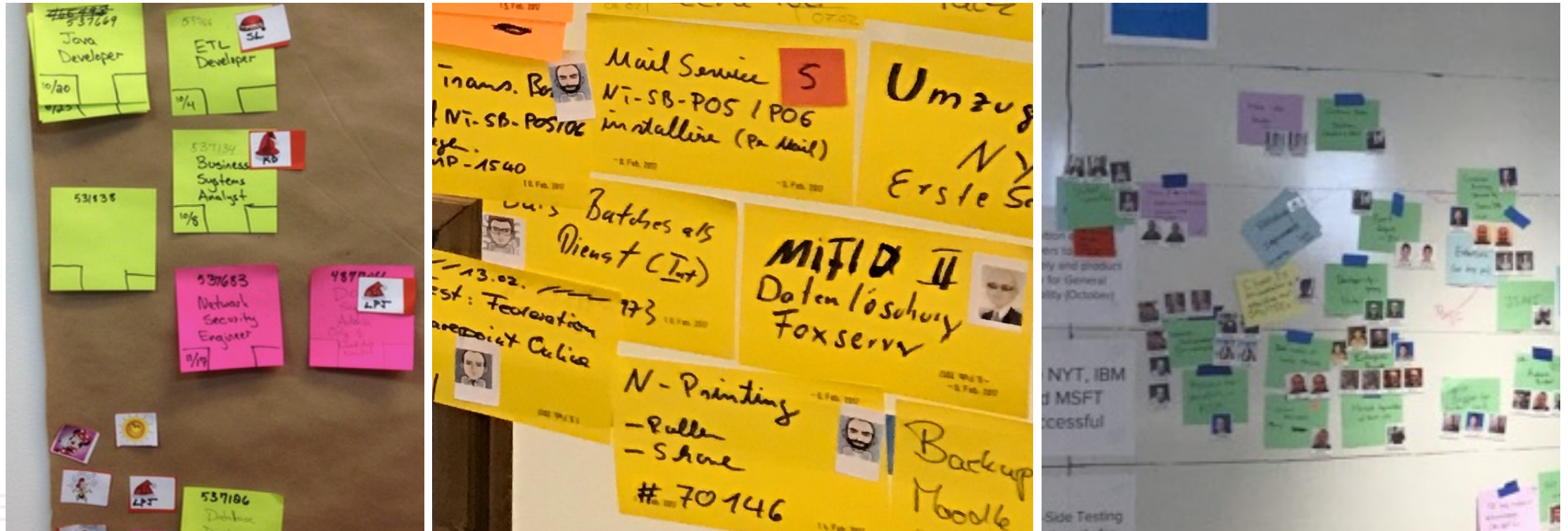
Blocking Issues and Defects

- Typically, blocked items are marked with stickies on top
- Blockers should be annotated with:
 - Cause for the block
 - Ideally time when block occurred and date it was resolved
- Defects can be marked in a similar way



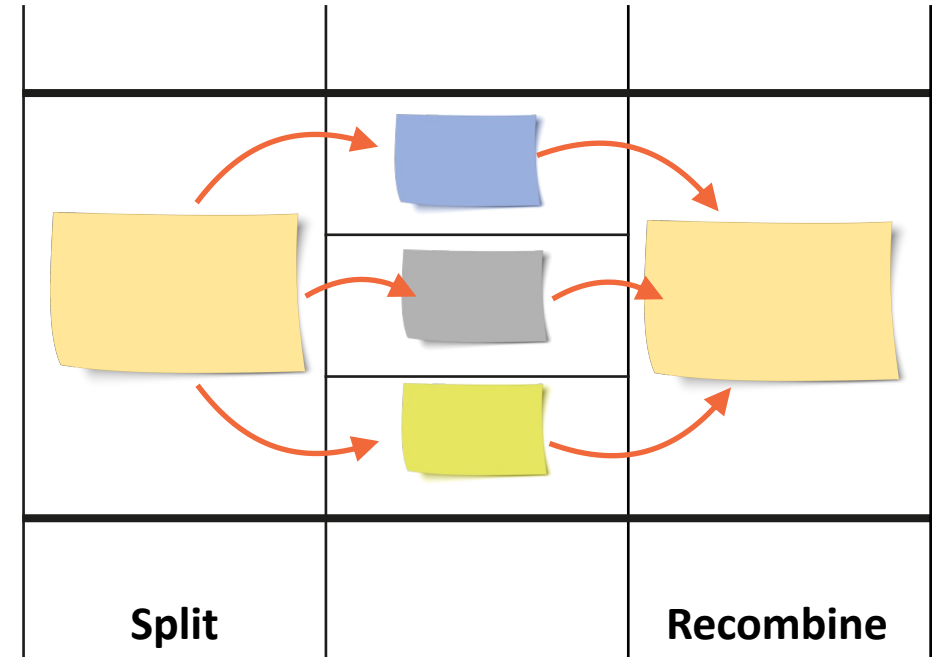
Avatars

Avatars are symbols or photos indicating who (e.g., teams or individuals) is working on which work items.



Split and Recombine Pattern

- On Kanban boards, items can be split and recombined later in the process
- Applied for:
 - Items of different granularity, e.g., work packages split into tasks
 - Concurrent activities by specialist(s) (teams)
- Be careful setting WIP limits (don't mix apples and oranges)



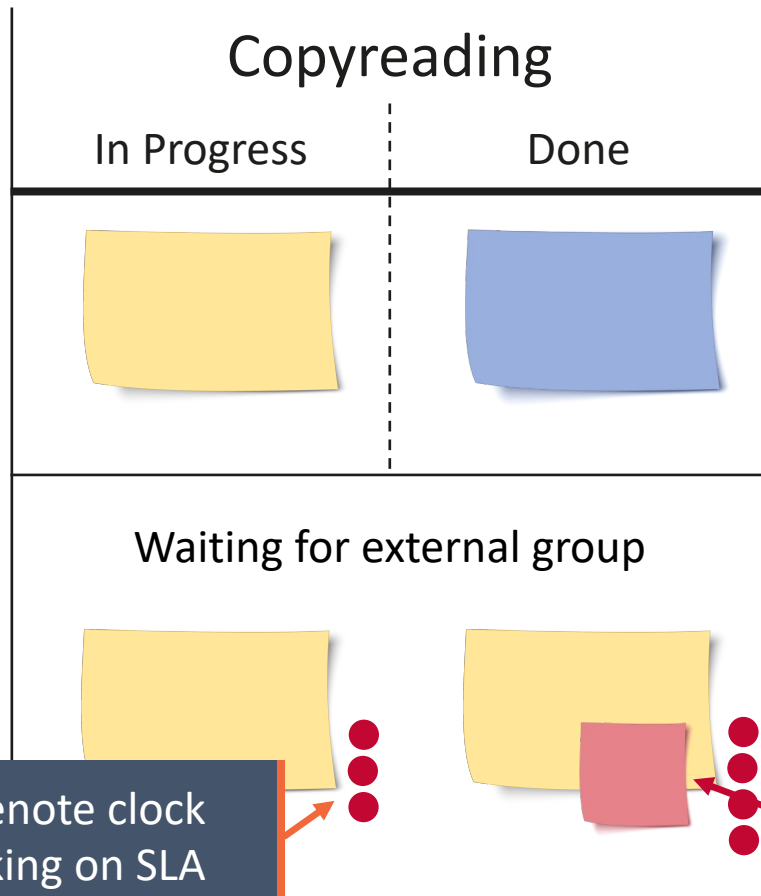
How to Model Non-sequential Activities

- Consider putting information on the ticket
- Good ticket design can make the board layout less complex!
- For unordered activities, use checkboxes to indicate status
- If you have multiple optional, unordered activities, use an additional checkbox to indicate whether this activity is required or not

Lorem opossum what white and what then didelphimorph then one marsupial prehensile call.

	Required	Completed
Text	☒	☒
Photos	☐	☐
Legal Check	☒	☐

How to Handle External Dependencies



Dots denote clock ticking on SLA

Late against SLA

- If items are blocked to an external dependency (outside of our organization, e.g., with a vendor), they can be parked in a separate area
- If they are outside our direct influence, we can agree to exclude them from the WIP limit, but they should still be kept “on the radar”
- Handle with care!
- Establish clear policies for criteria for “external waiting,” and how to re-enter the process
- Be careful to avoid hidden WIP! Make sure to regularly review external blockers

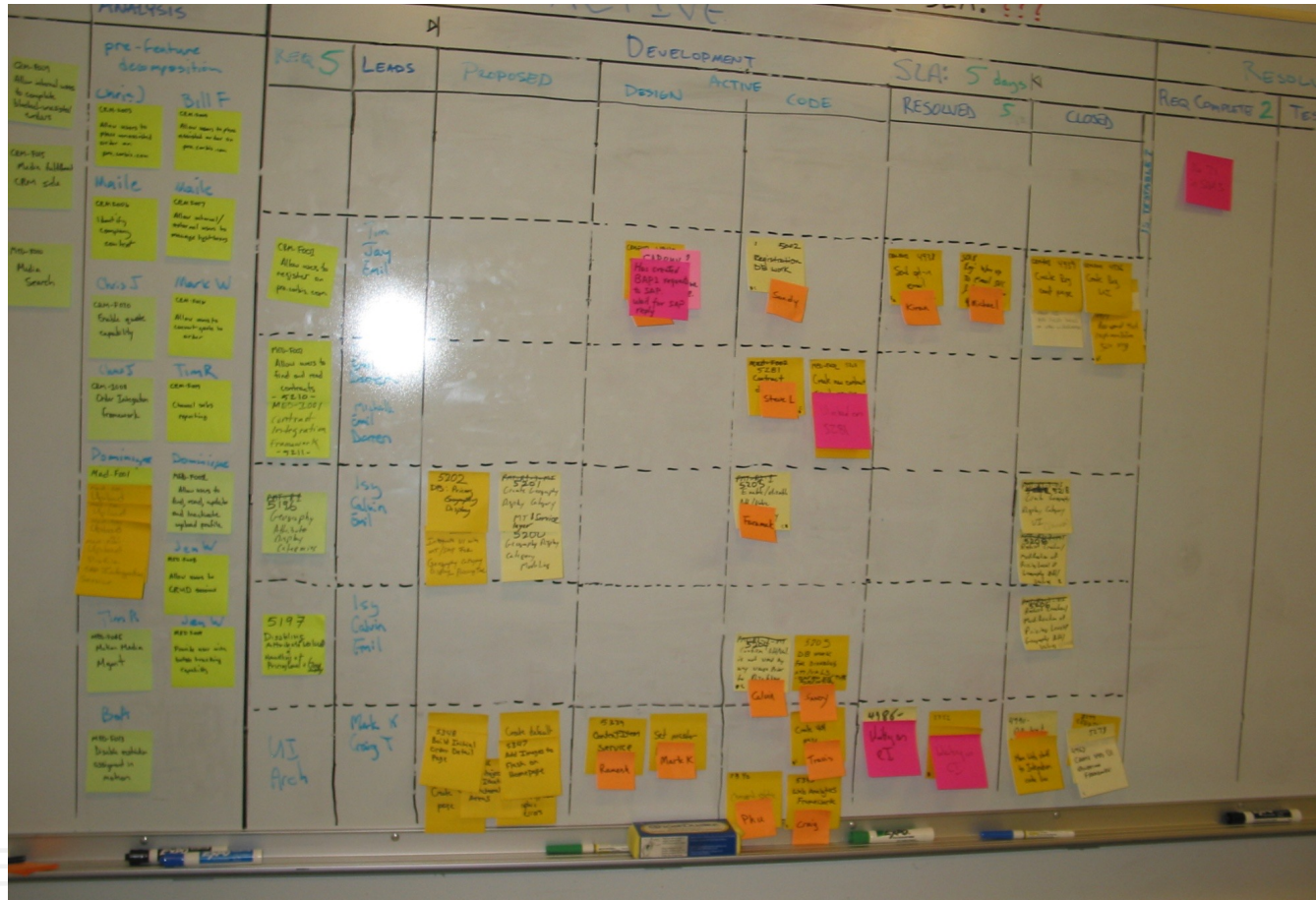
Real-world Kanban Boards

Example: Business Analysis and Delivery in Different Workflows



- Swim lanes for multiple type flows (different governance and workflow)
- Shared upstream activity (business analysis) with tickets split for different destination platforms, not recombined

Major Project with Two-Tiered Kanban Board Using Swim Lanes for Feature Sets



- Board contains different work item types: Requirements (green stickies) and User Stories (yellow stickies)
- Swim lanes control WIP limit: The number of requirements (green) is limited to five
- User Stories (yellow) only WIP limited in Test; Test was actually a service located off-shore (Chennai, India)

Example: Sales Funnel

Physical slots
(Kanban)

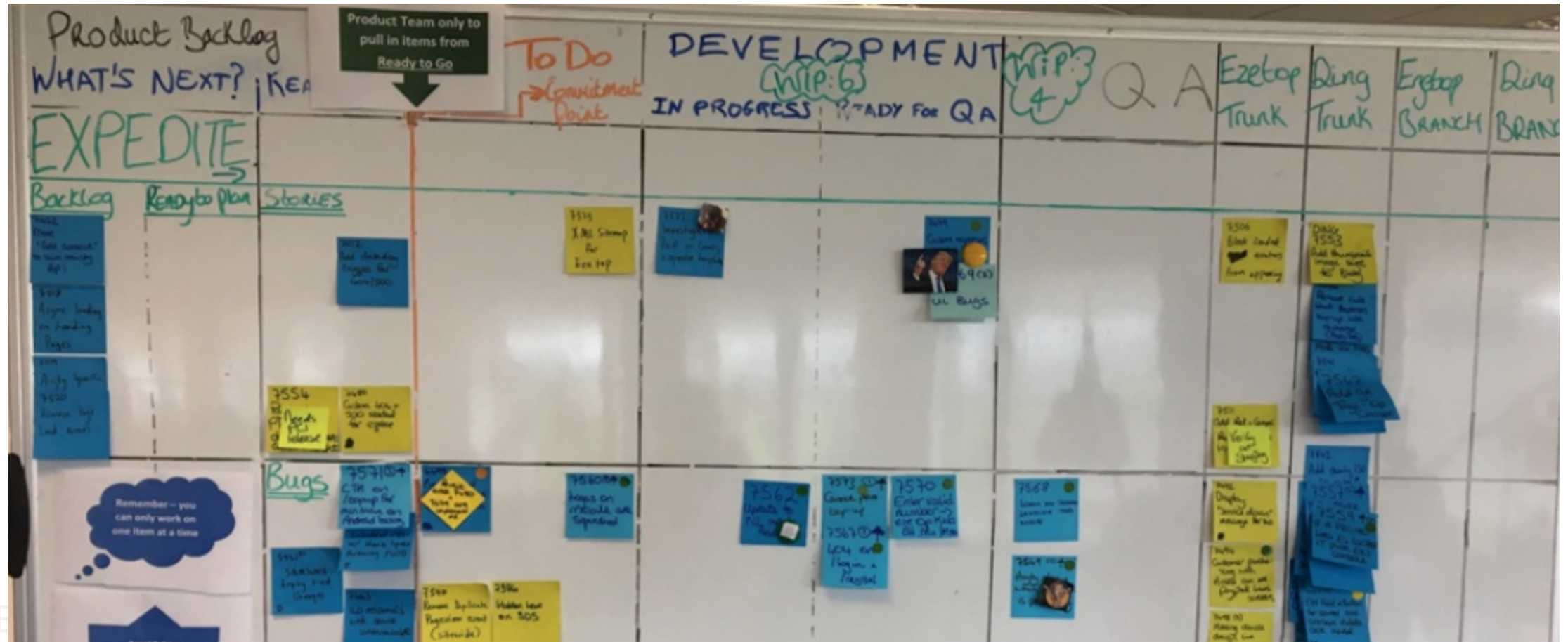
Recent losses (for
retrospective)

Local Service
Level Expectation

Recent wins (for
retrospective)



Example: E-Commerce Software Development



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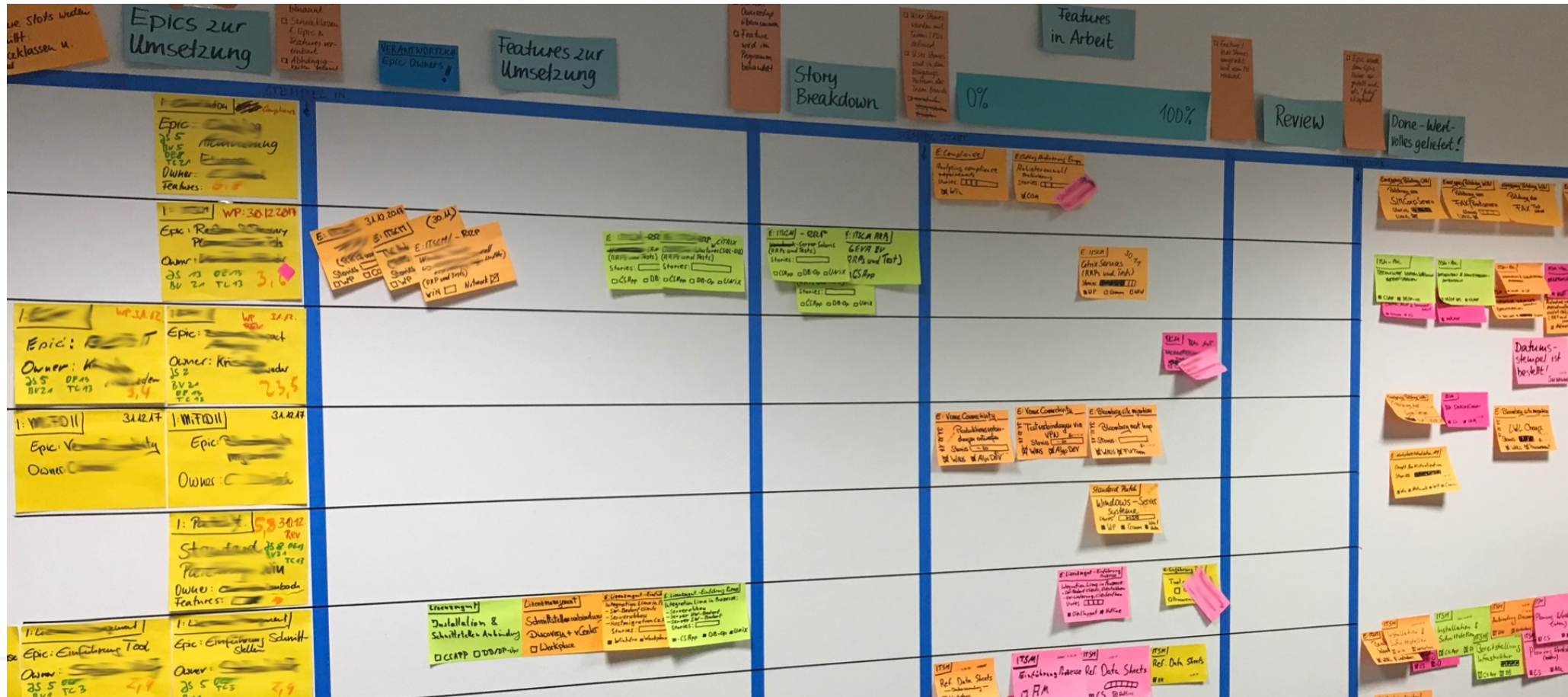
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Online

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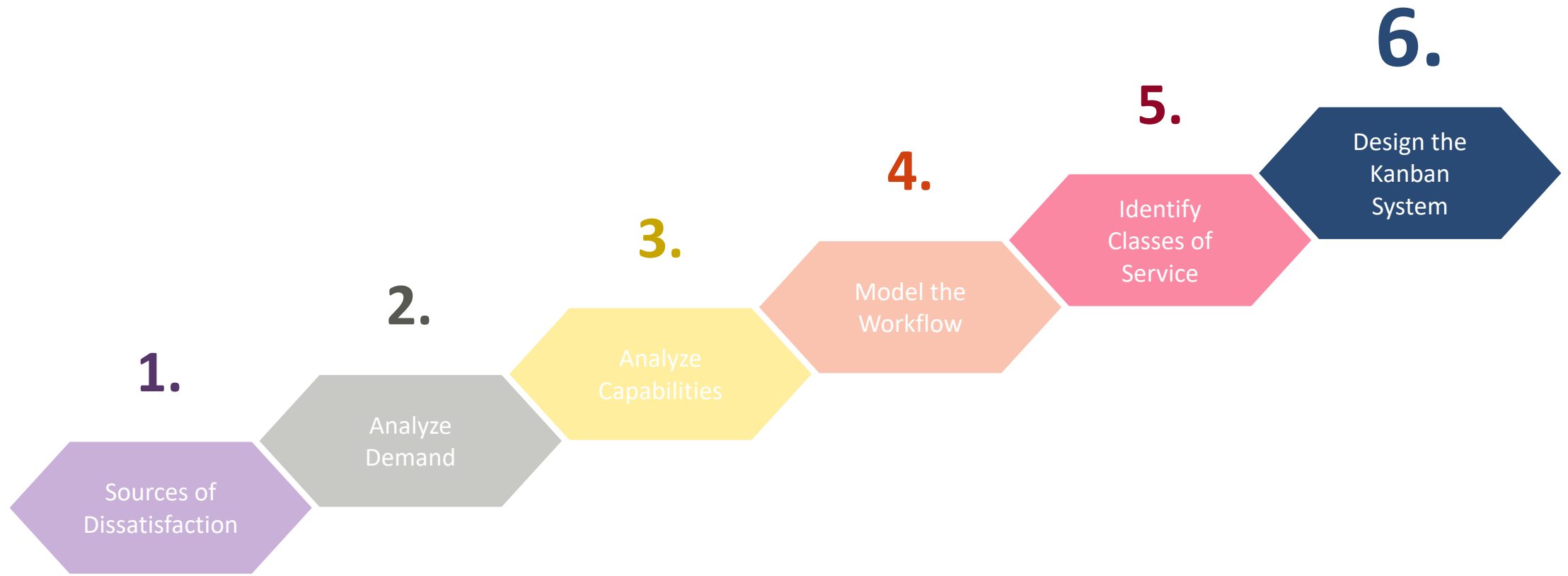
Operations Portfolio Board, Private Bank



Optimizely's End-to-End Board



Closing exercise: Design your Kanban System



Step 6: Design the Kanban System

Putting it all together into the initial Kanban system design

Initial Kanban System Design

Building on all the information gathered so far, create your Kanban system.

- You might start with the Commitment Point. Don't forget to create your limited input buffer!
- What are the major elements?
 - Work item types
 - Classes of service
 - Other categories of work?
- How will you use ticket color and swim lanes?
- How to indicate blockers / defects?
- Map workflow states to columns. What is the last column?
- What initial WIP Limits make sense?
- Ticket Design
 - What information is needed to make good quality pull decisions?
- Write down all decisions made into your "Initial Policies"
- Revisit your cadences
- Do a dry run checking if the mechanics (e.g., allowing pull) work!

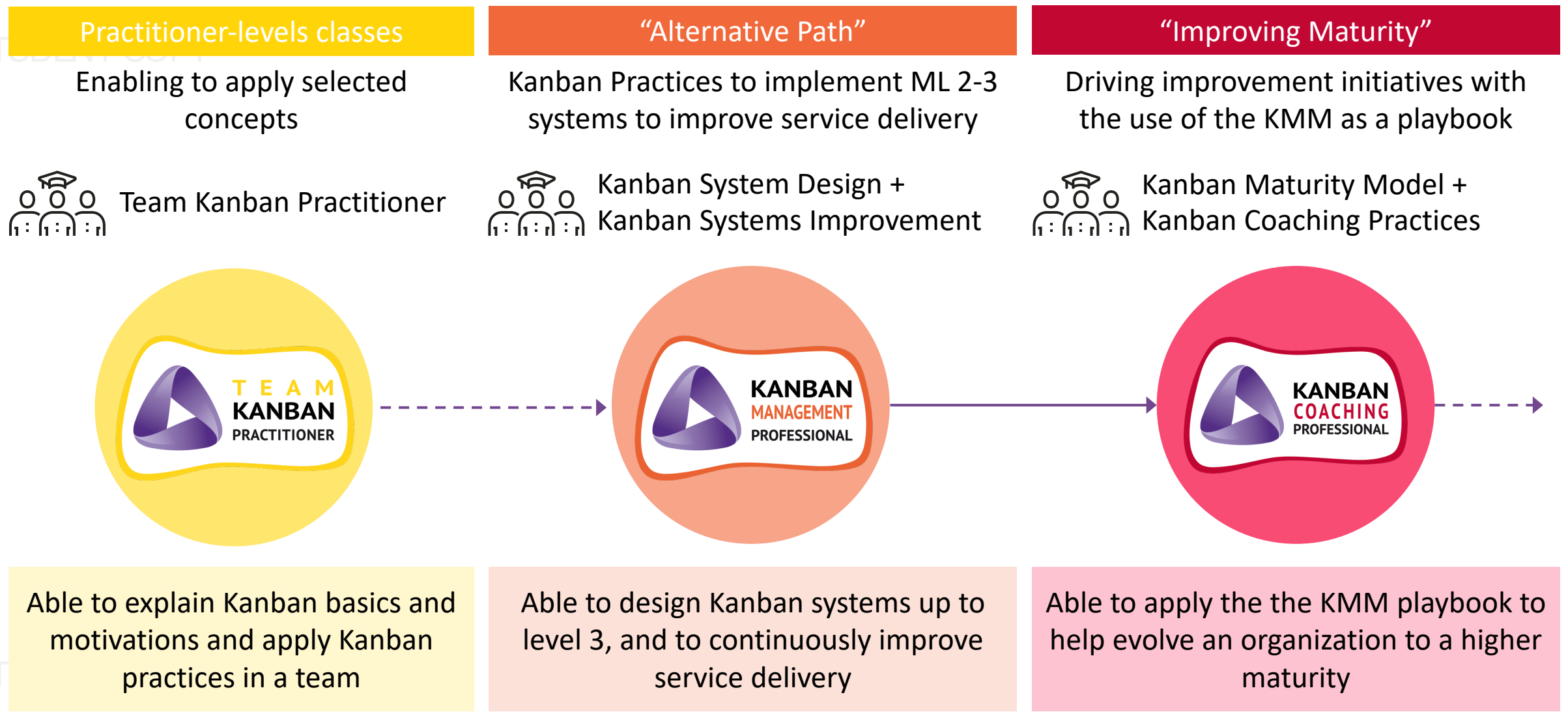
Gallery walk

15 min

- Every group to present their Kanban system design in 3-min
- Glow and grow of 2-min by the whole group: What was done great, what might be improved further?

Closure of the class

Basic Learning Paths



Outlook into Part 2

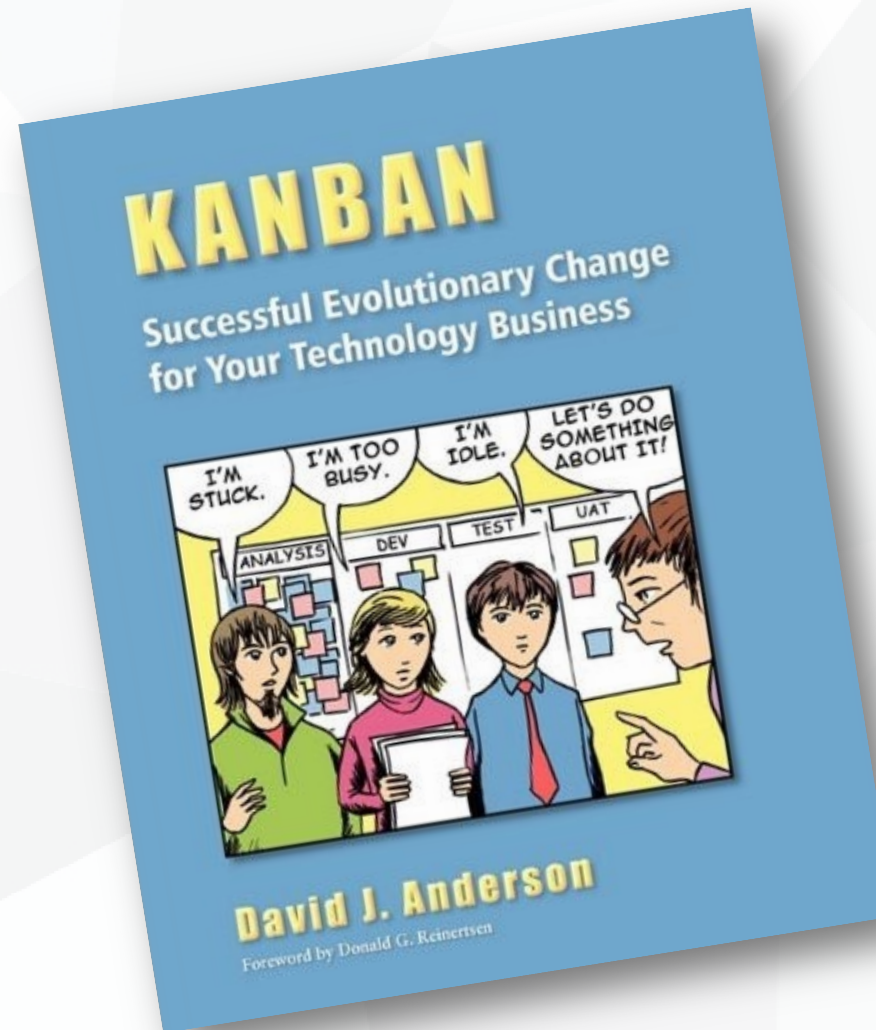


Kanban Systems Improvement

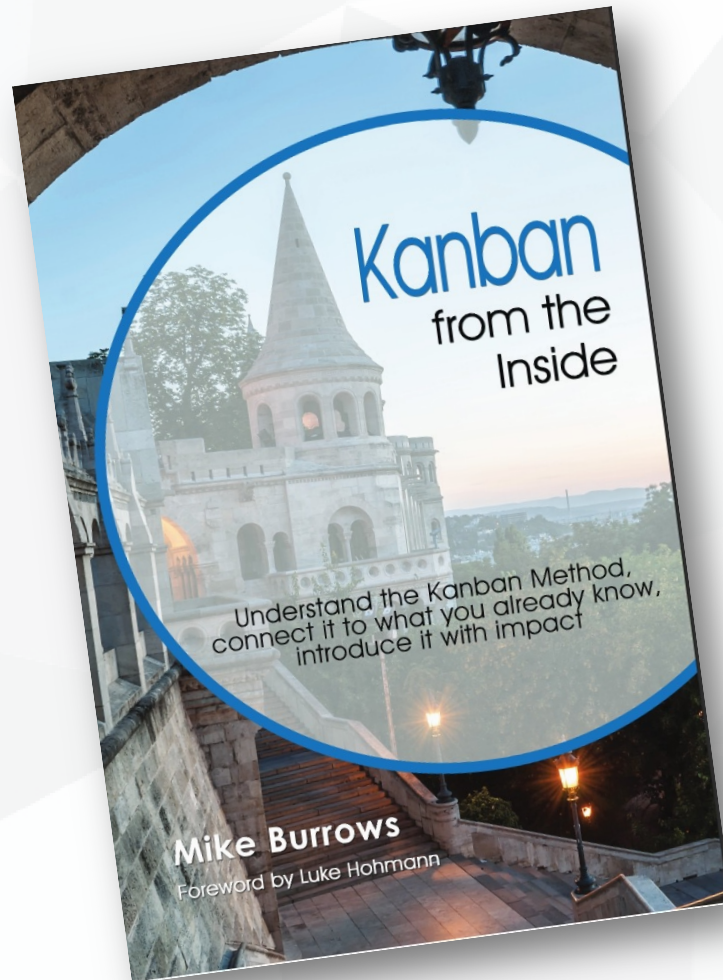
- Motivation for Kanban and Kanban as an evolutionary change method
- Different types of Kanban: Kanban Maturity Model introduction
- Kanban for the enterprise:
 - Seeing Services
 - Scaling across the Enterprise
 - Upstream Kanban
- Feedback loops fitting the organizational context and maturity
- Working with data and applying models for improvement

E-Books and Kanban Tools

Kanban “Blue Book”



Kanban From the Inside



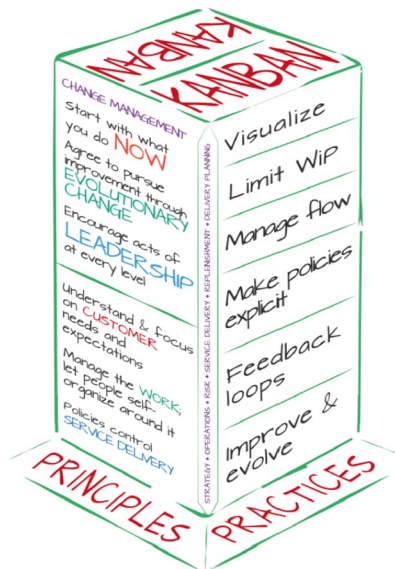
Kanban Maturity Model



Essential Kanban Guides

Also available in Spanish,
Portuguese, Polish,
French, and German.

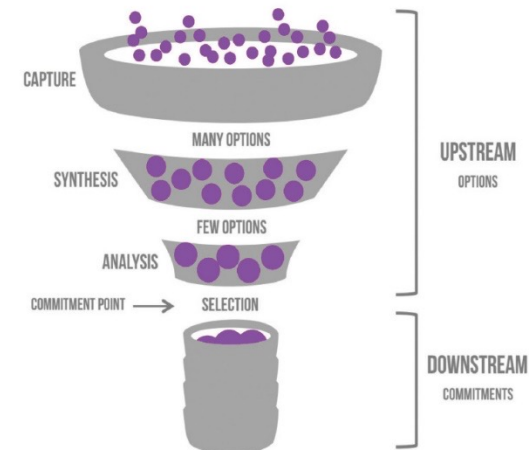
ESSENTIAL KANBAN CONDENSED GUIDE



DAVID J ANDERSON

ANDY CARMICHAEL

ESSENTIAL UPSTREAM KANBAN

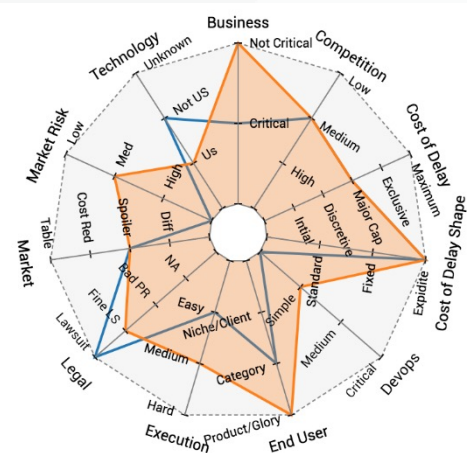
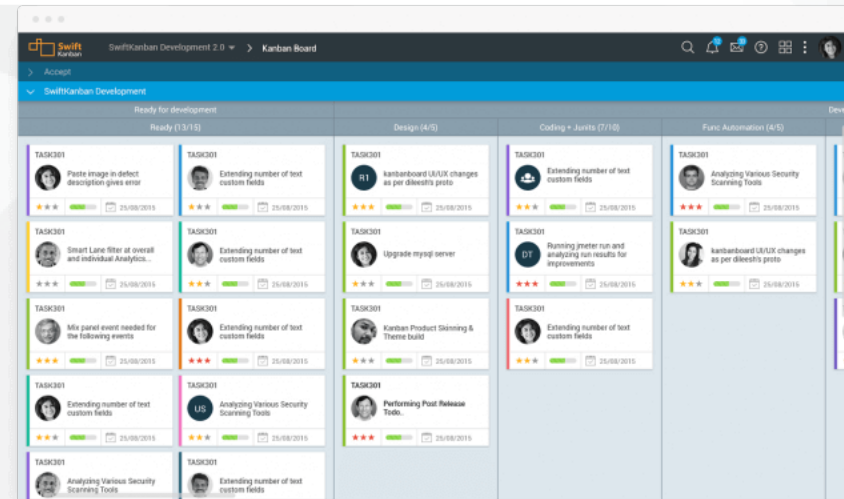


PATRICK STEYAERT

Download for free at <https://www.kanbanbooks.com/>



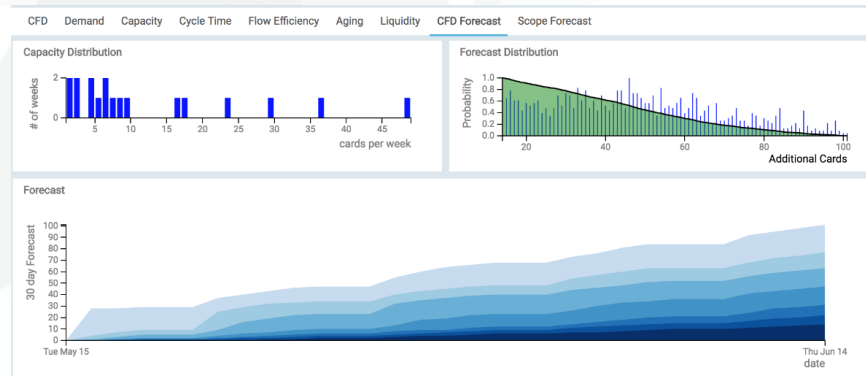
Swift
Kanban
from digité



ESP Edition available!

Visualize your workflow and increase your team's productivity with SwiftKanban visual management and collaboration tool.

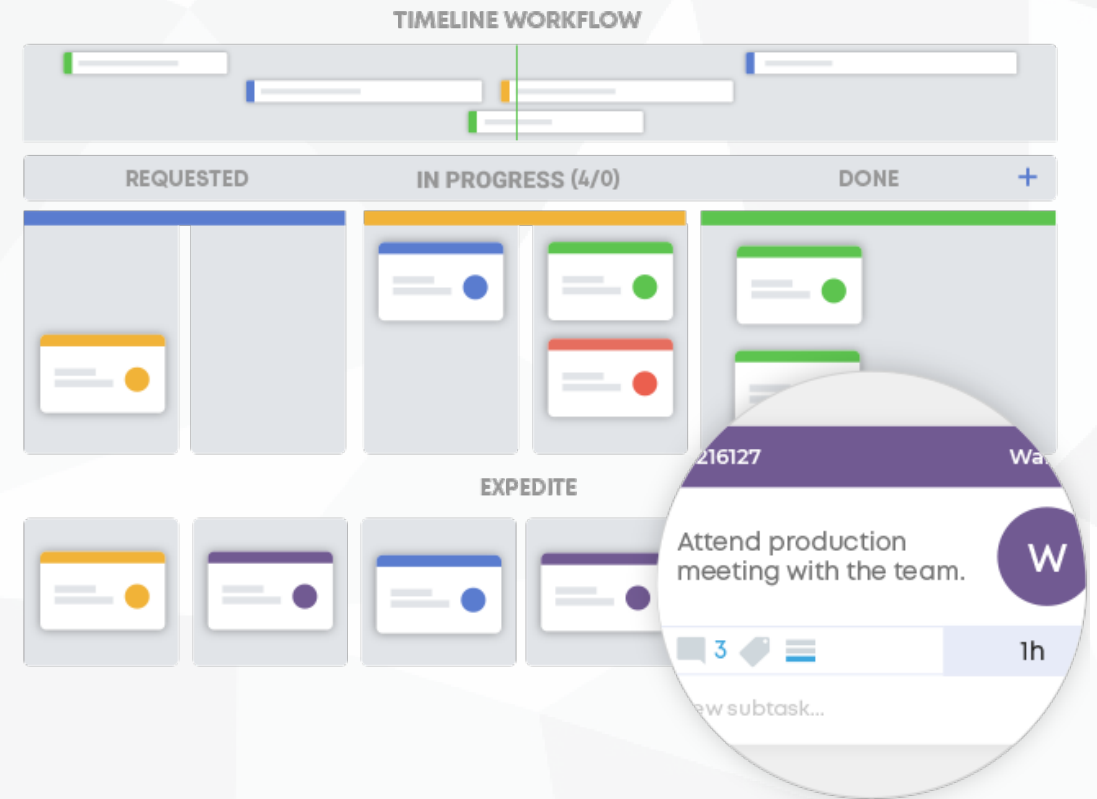
Digité's SwiftKanban helps remote/distributed teams across business functions with their collaboration and work management needs. It enables you to do Kanban the right way - YOUR way - with robust analytics and support for Team, Portfolio and Upstream Kanban, Scrum/Scrumban and Enterprise Services Planning





Gain visibility across all projects, connect planning with execution and deliver 3x faster with Kanbanize.

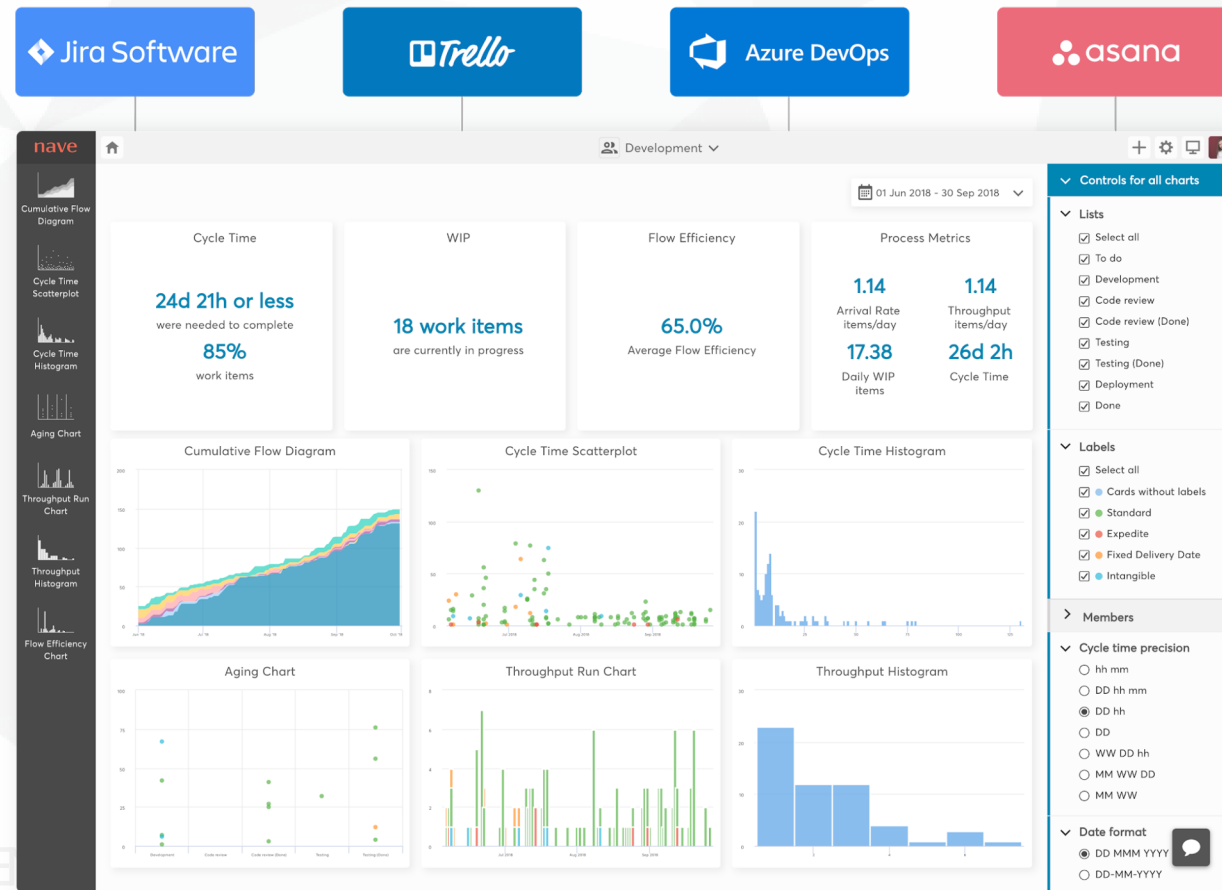
Managing dependencies and tracking the overall status has become the major time-eater for most of the managers and their teams. Having flexible Kanban Boards and built-in Business Rules, you automate all existing processes, dependencies, and interactions. This makes status always accurate, and nothing falls through the cracks.



Nave (getnave.com)

nave

Kanban Analytics on Your Preferred Tool



● Evaluate your workflow performance

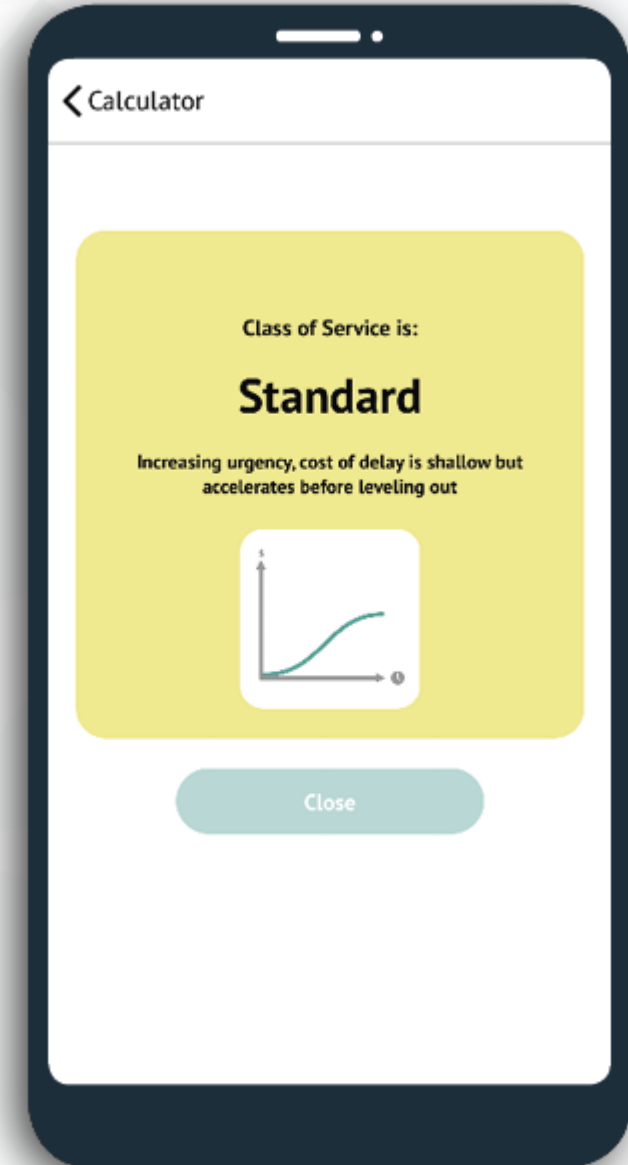
● Analyze lead times and cycle times

● Monitor how long work stays in progress

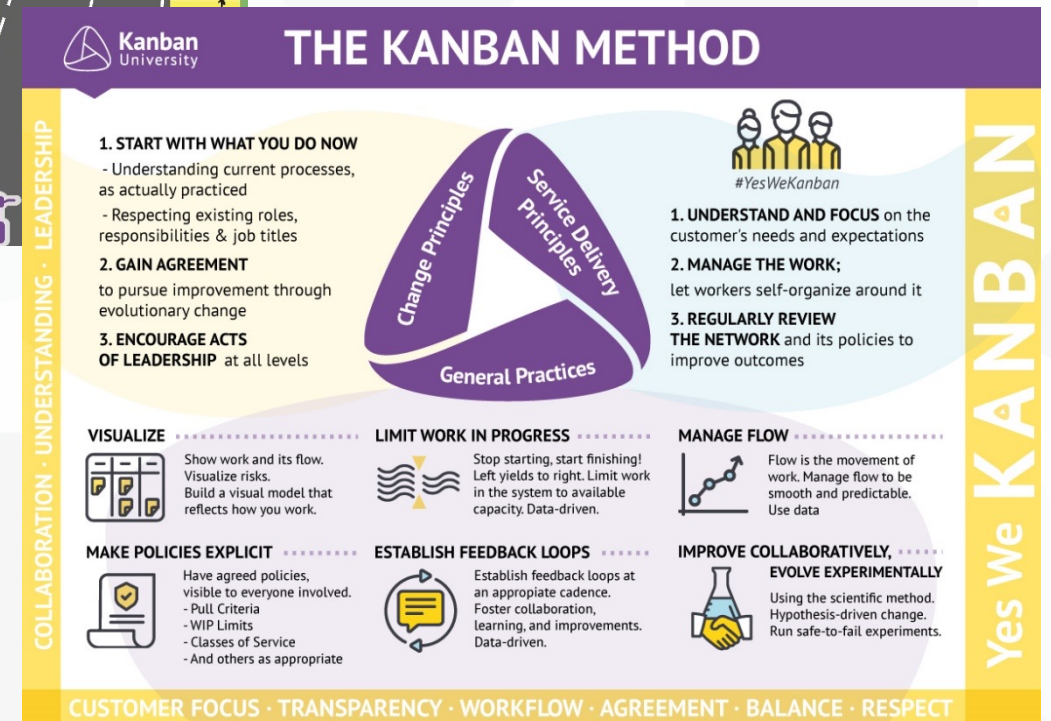
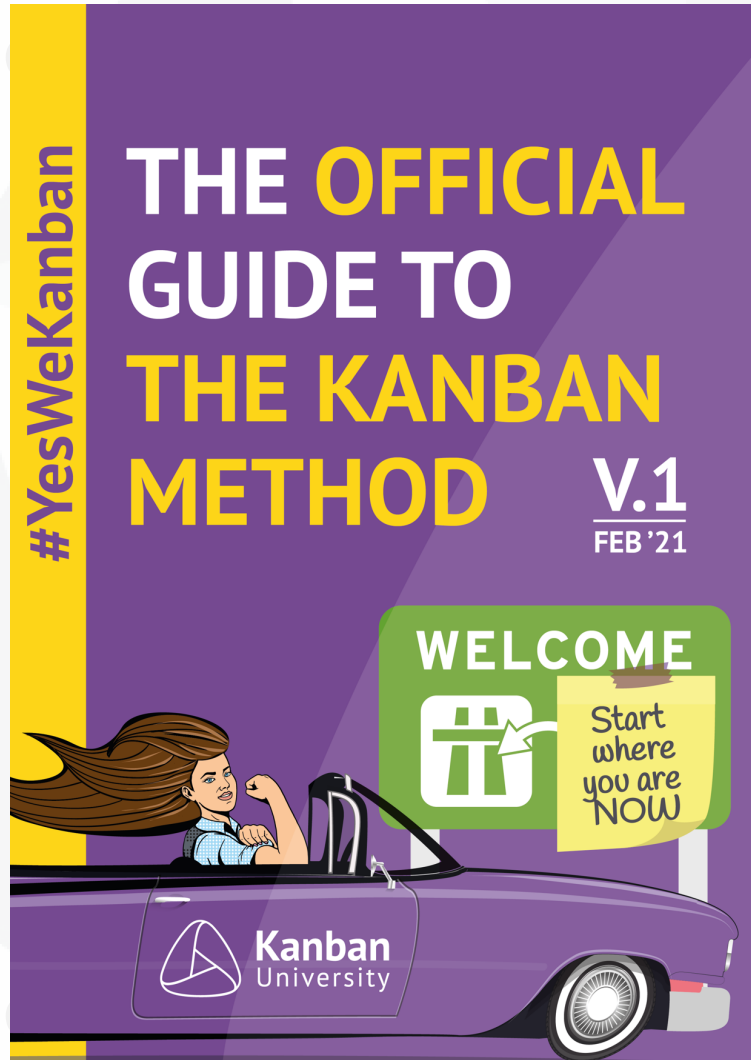
● Identify bottlenecks as they occur

● Calculate your work delivery rate

● Make probability-based forecasts



The Official Guide to the Kanban Method



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YES

WE

KAN

BAN



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