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Software Development Done Right

# Lightning Fast Learning ….using simulations

Pieter Rijken

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Job

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Clients

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ACCREDITED KANBAN TRAINER

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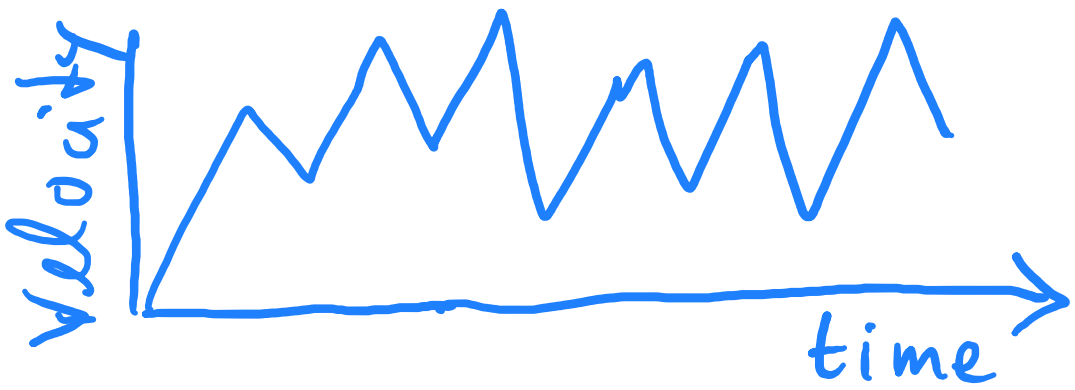
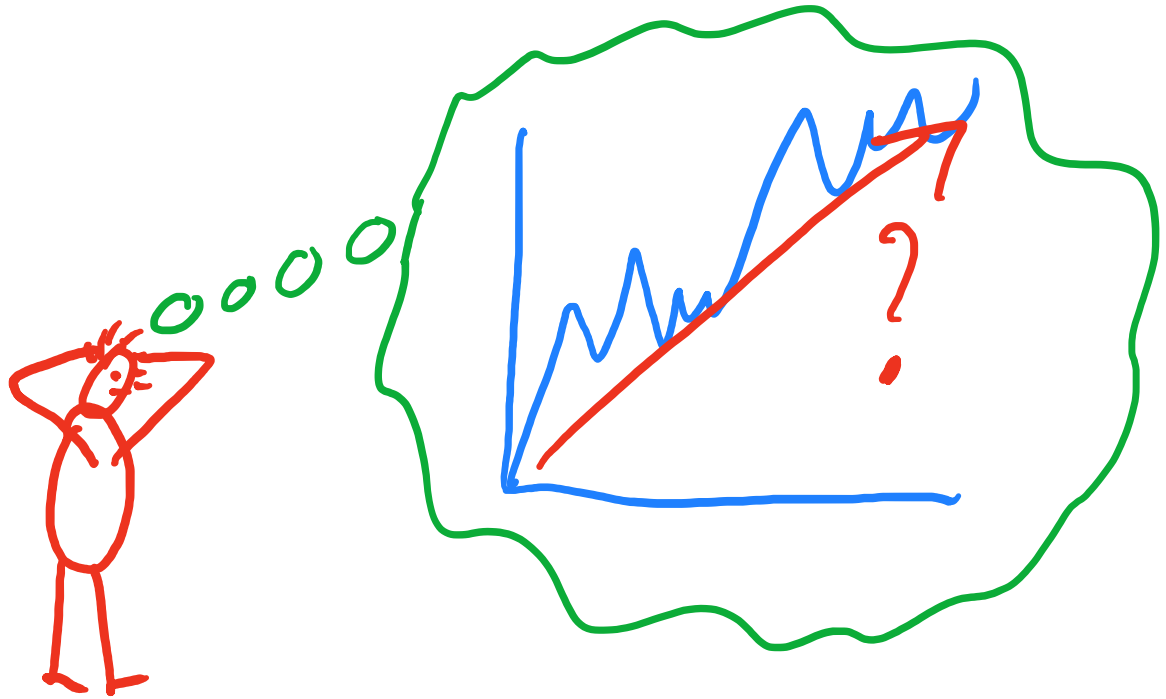
# Case: introduction

- Large telecoms company
- Scrum team
- Complex IT landscape
- Team distributed over The Netherlands and Romania
- Develops application to support internal business units
- Dependencies with other teams

# After a couple of sprints

€?
Lead time?

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- ❑ At the start of sprint the board is reset
- ❑ Improvement action result is known
- ❑ ….or not?

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# There is more!!


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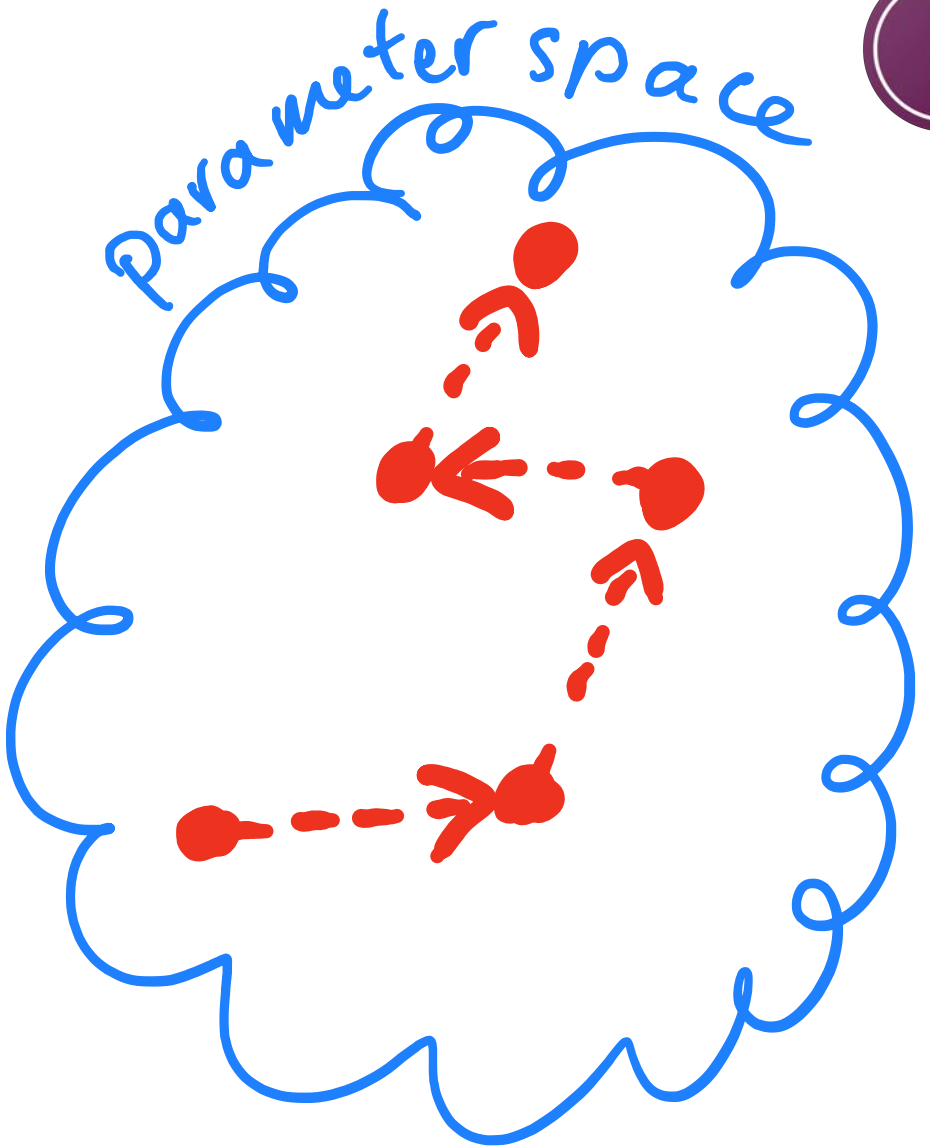
# Learning

- Every sprint (2 week cycle)
- Sequential
- Using partial information

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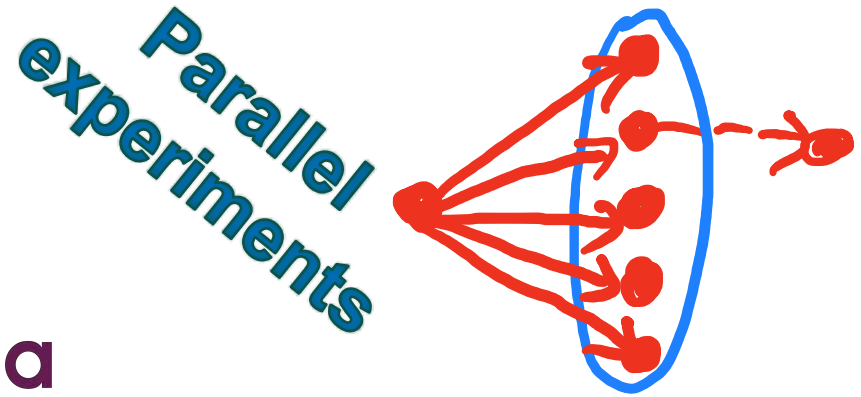
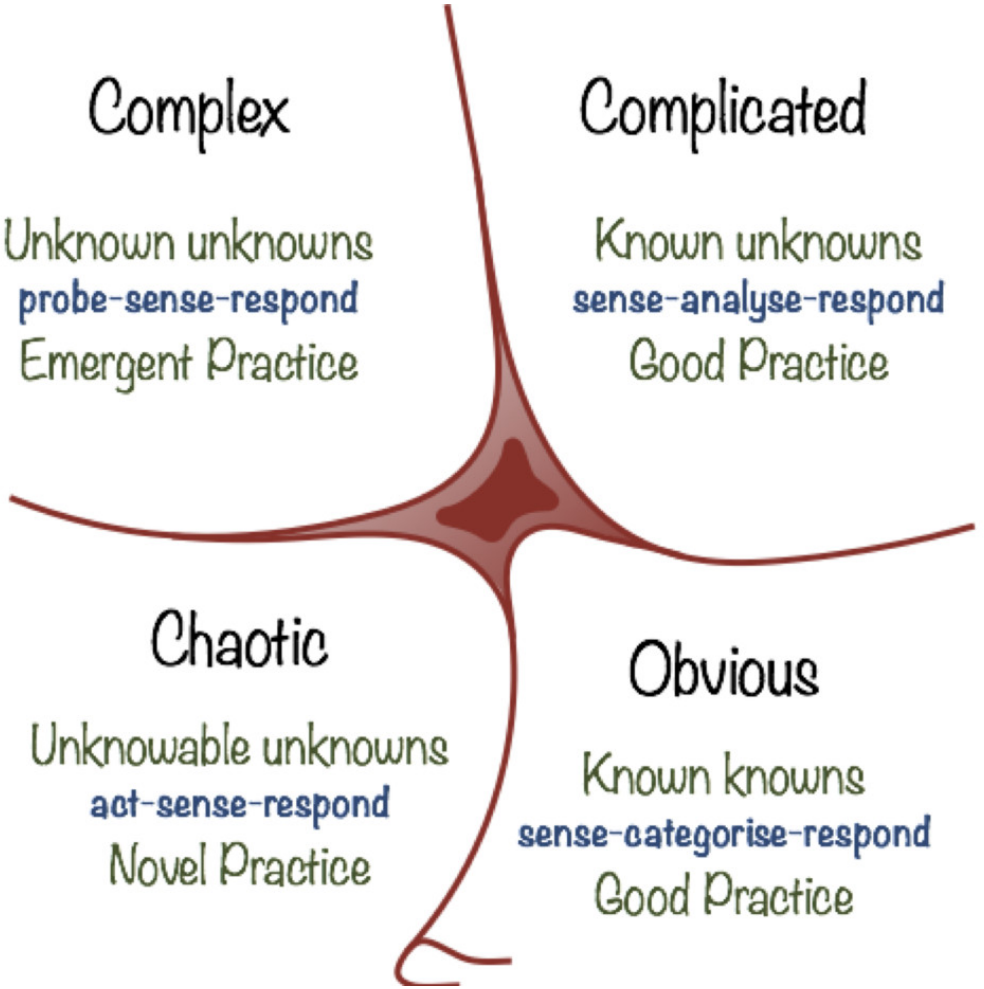
# Cynefin framework

- Obvious & complicated
  - Sequential

- Complex
  - Selectionism

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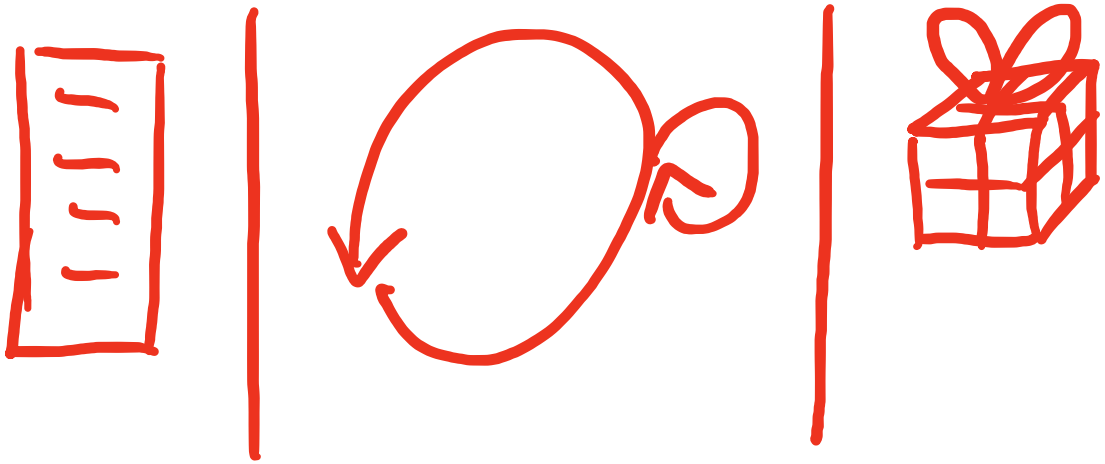
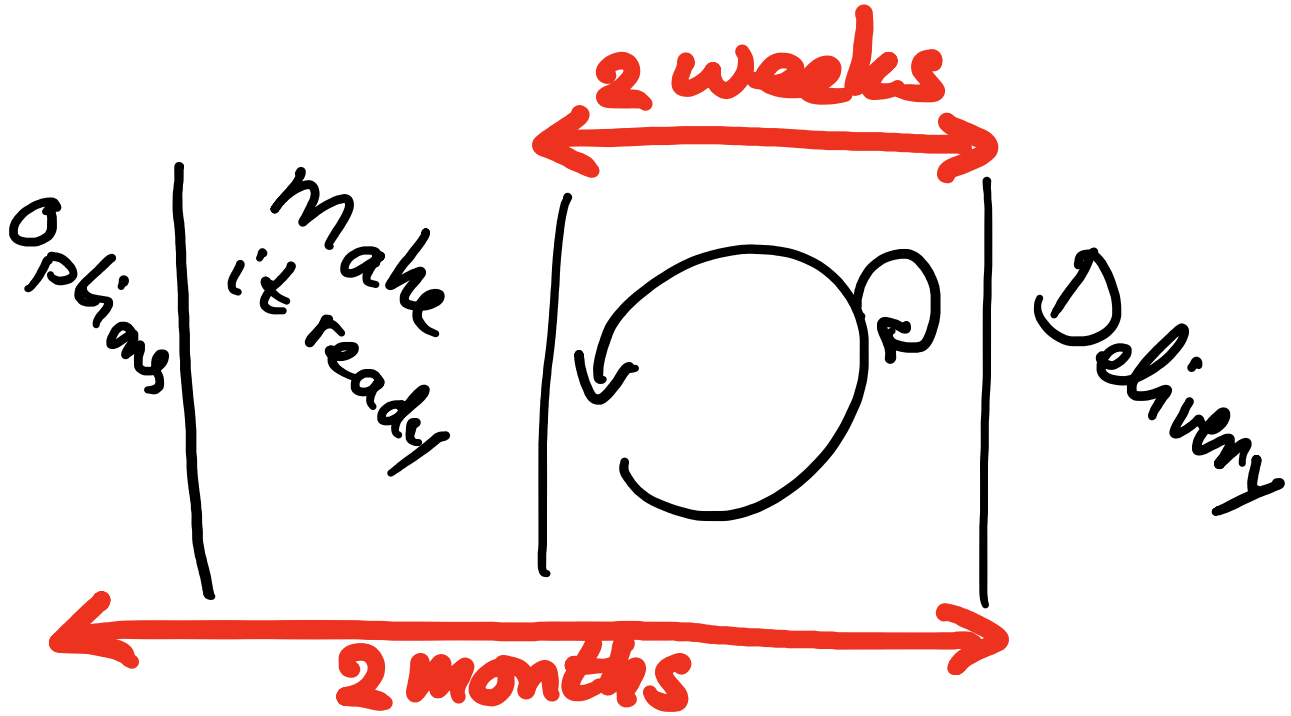
# Partial information



Simple: Effect of improvement is known at the end of the sprint

Complex: Actual situation is more complicated and effect is known much later

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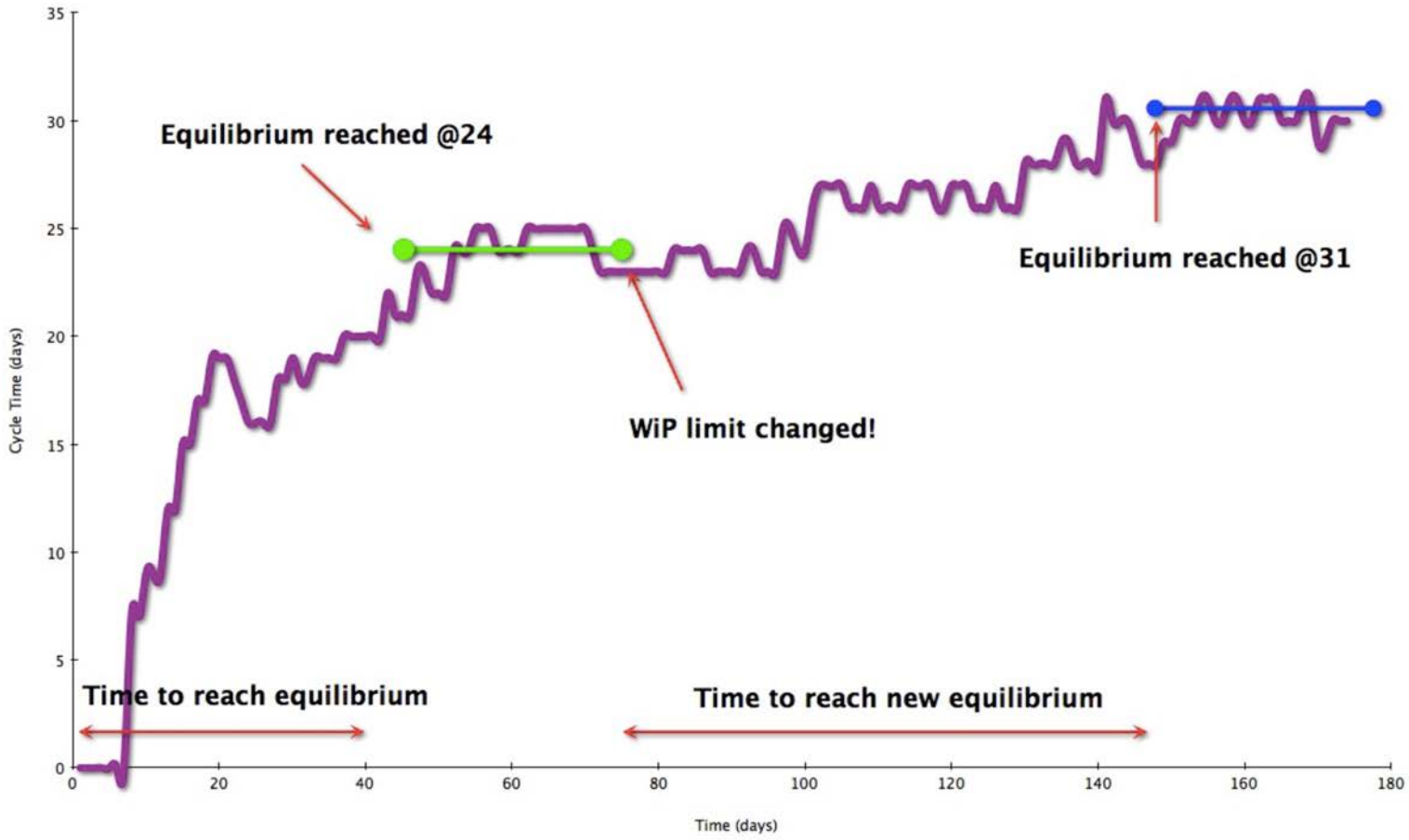
# How much later?

Second and parallel experiments give unreliable results and based on partial understanding of the system

Limited number of learnings and improvements

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# So, why should we care?

Walking the fitness landscape 

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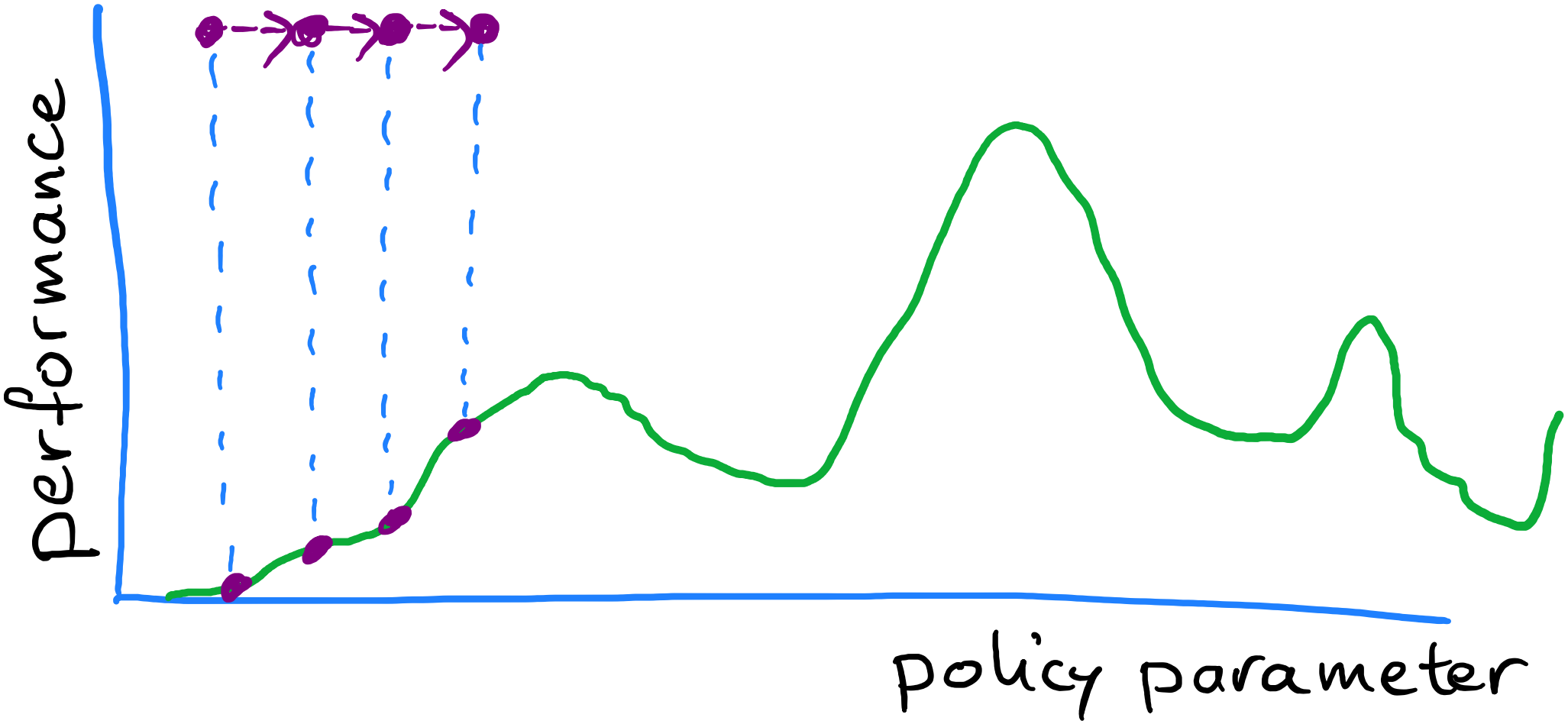
# Fitness landscape

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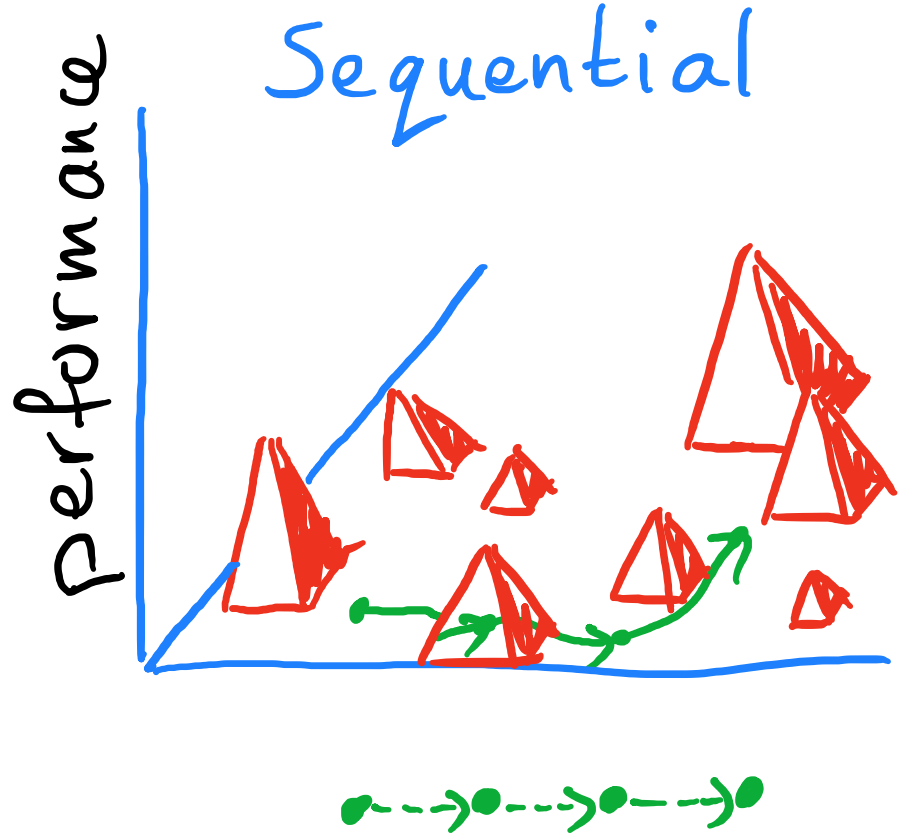
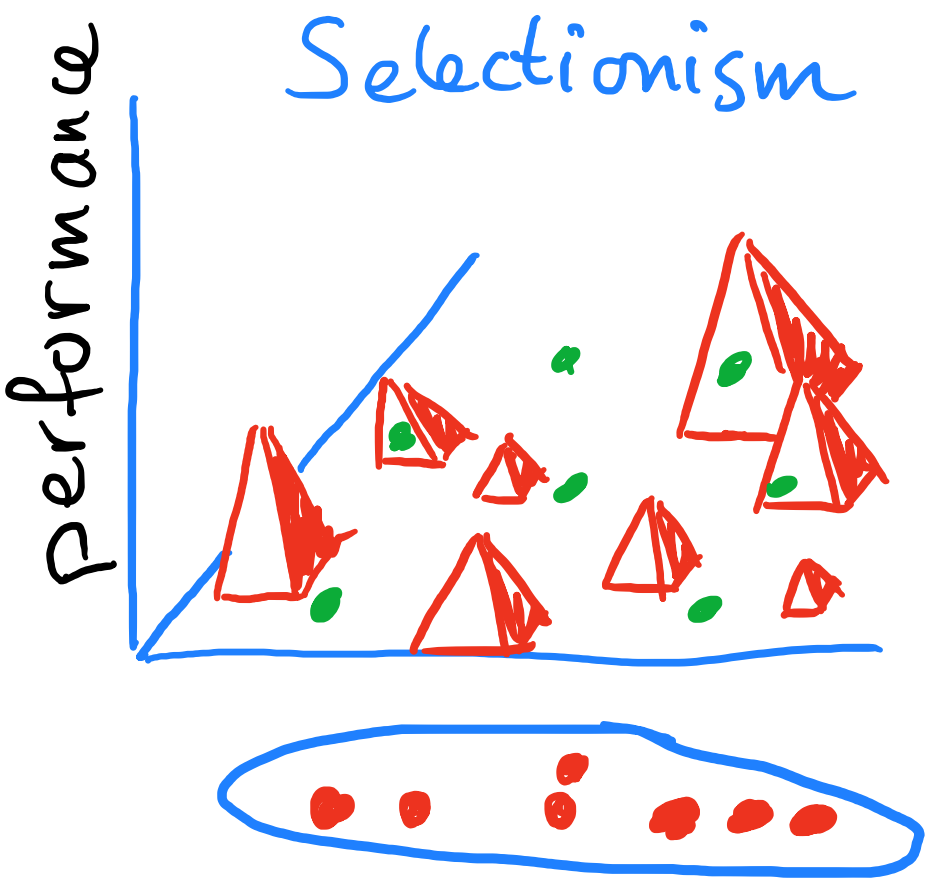
# Fitness landscape: more policies

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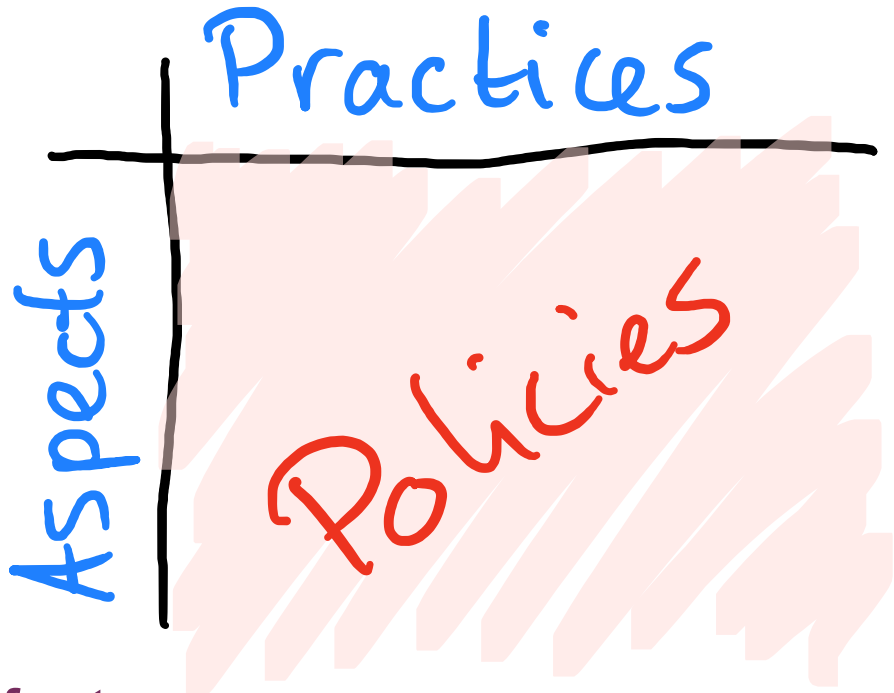
# More complicated




- Aspects
  - Up & downstream
  - More services & dependencies
  - Types of work
  - Scaling work item, eg tasks, stories, features

- 6 Practices of the Kanban Method
  - Visualize
  - Limit wip
  - Manage flow
  - Make policies explicit
  - Implement feedback loops & improve collaboratively

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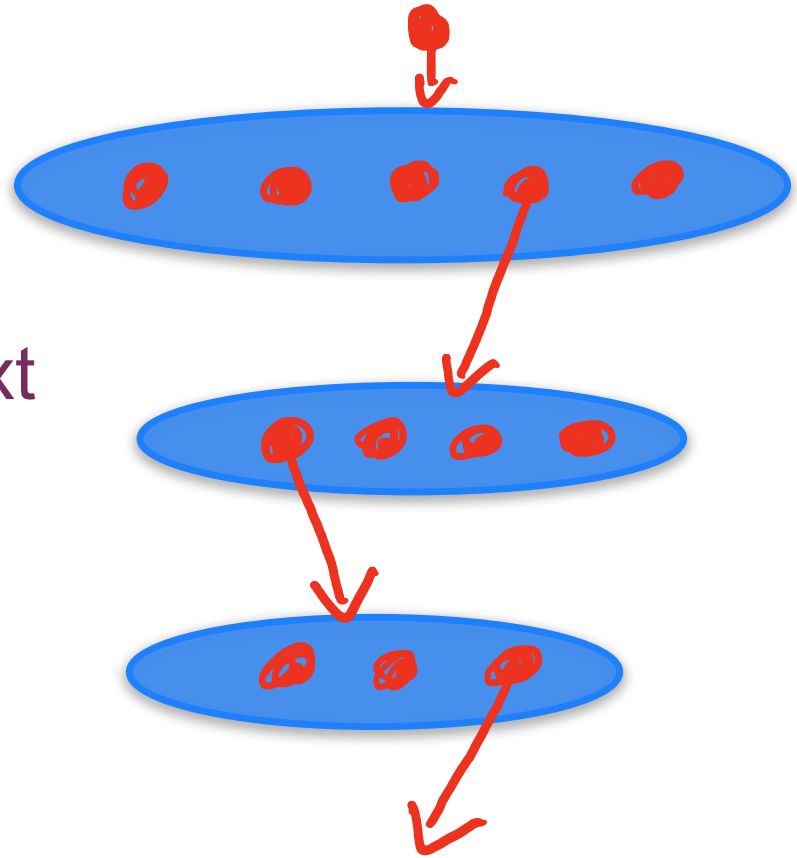
# Learning in complex environments

- We need a combination of sequential and selectionism

- Run parallel experiments
- Choose the best outcome
- …as starting point for the next



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# Learn faster

- Use simulations! Especially Monte Carlo based methods
- Examples



Enterprise Services Planning

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# Monte Carlo Methods

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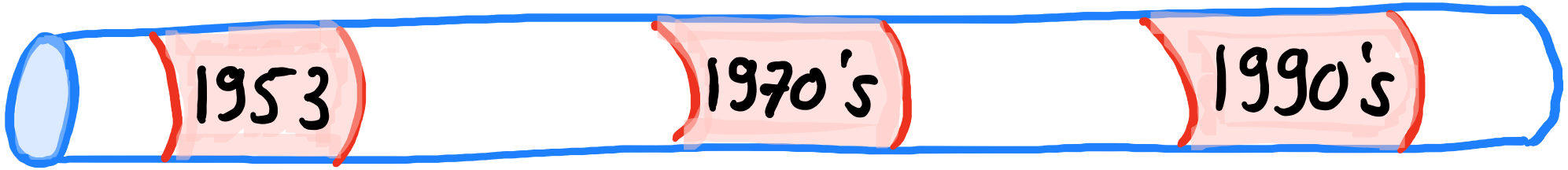
# History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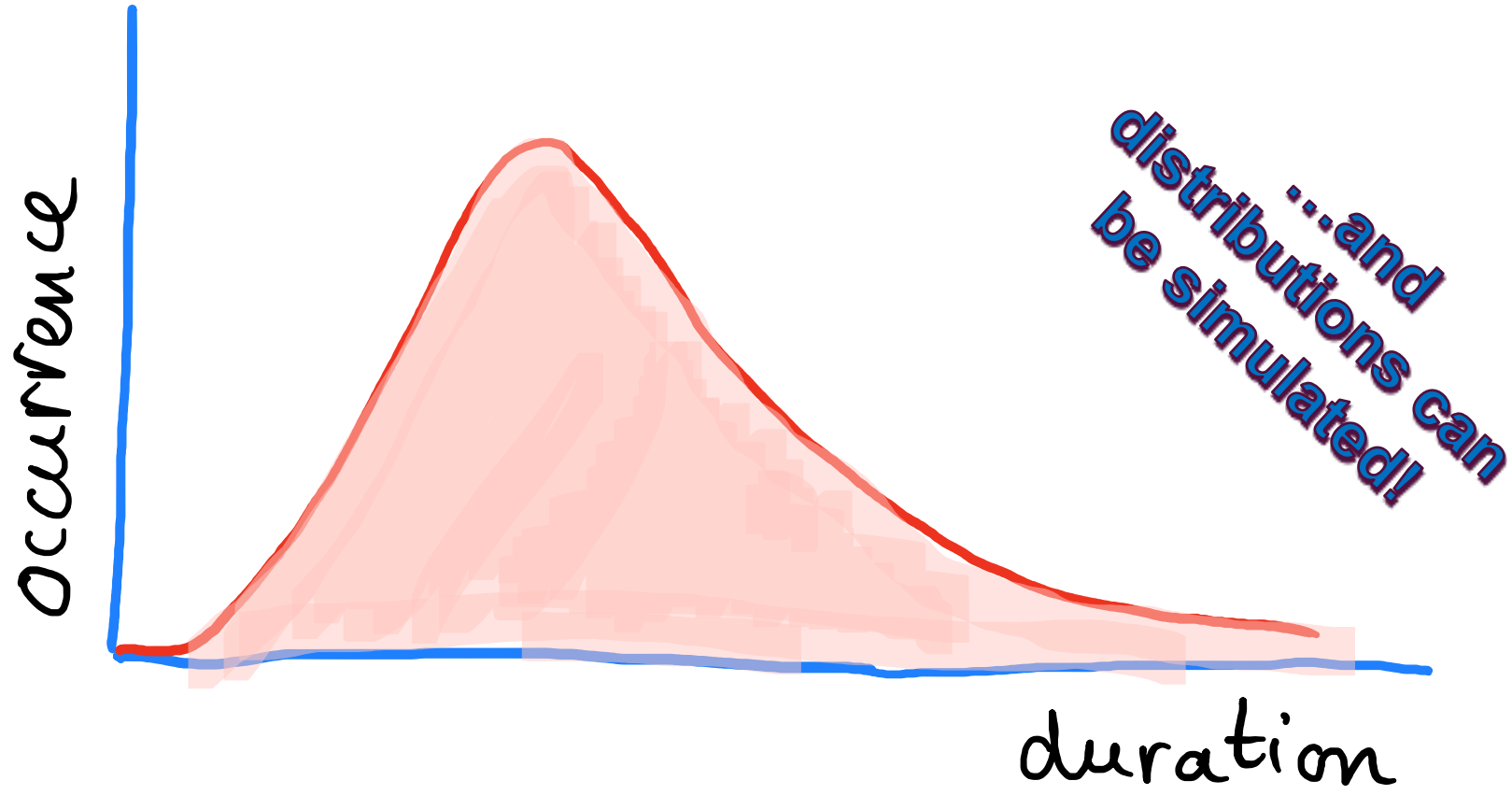
# Tasks are distributions

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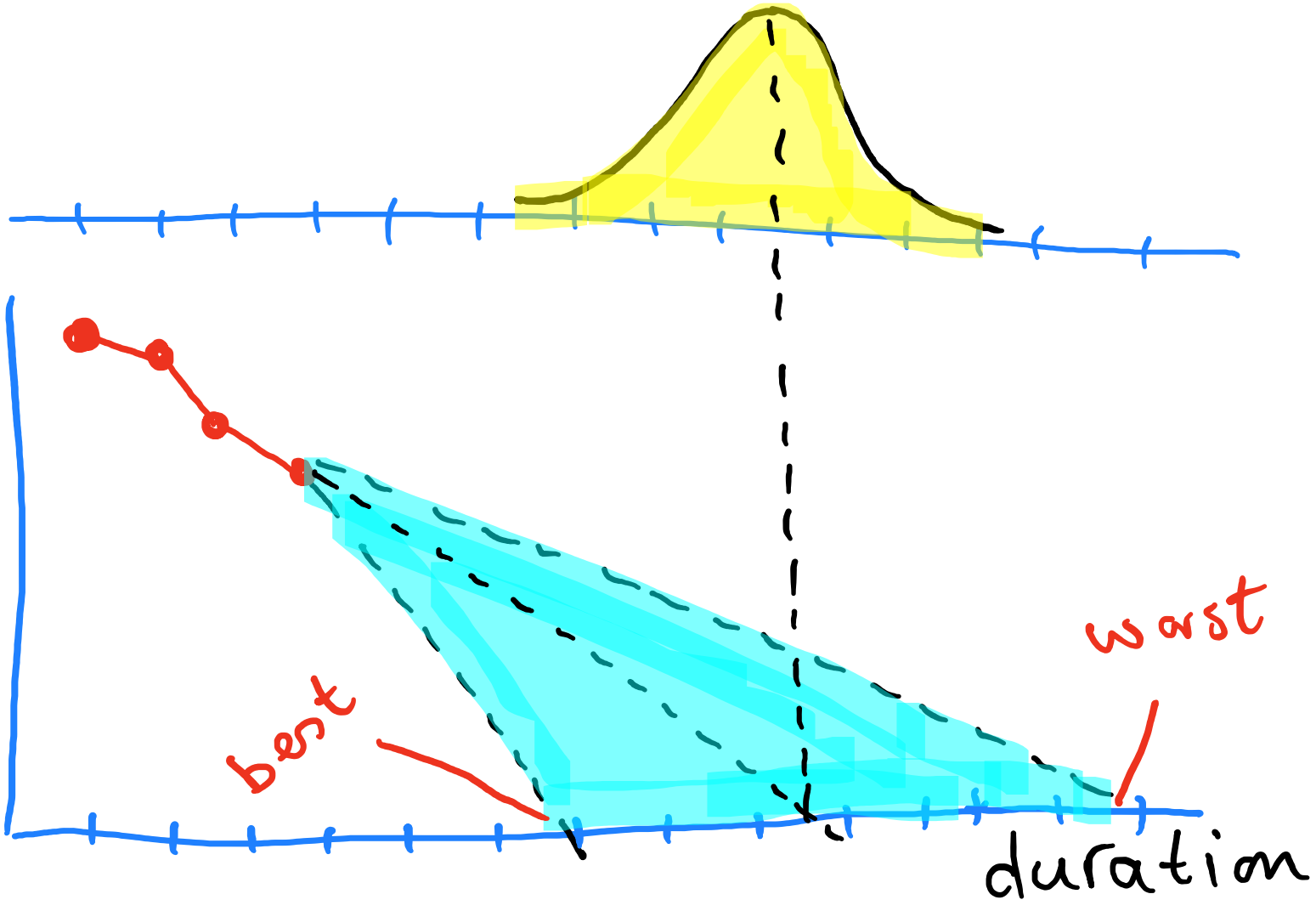
# Forecast project duration

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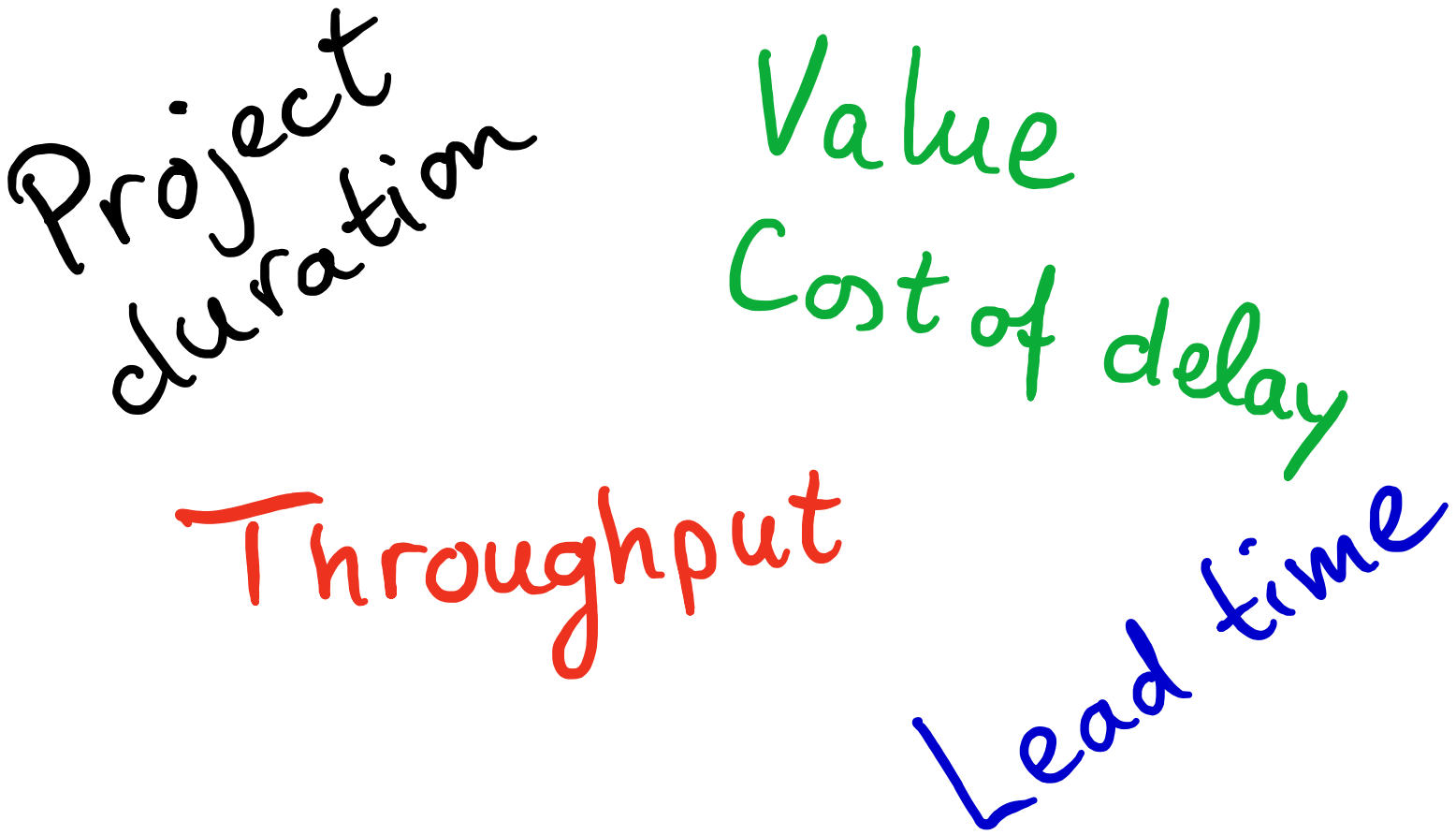
# What are we trying to optimize?

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# Let's do some simulations

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# Fun with policies! GetKanban


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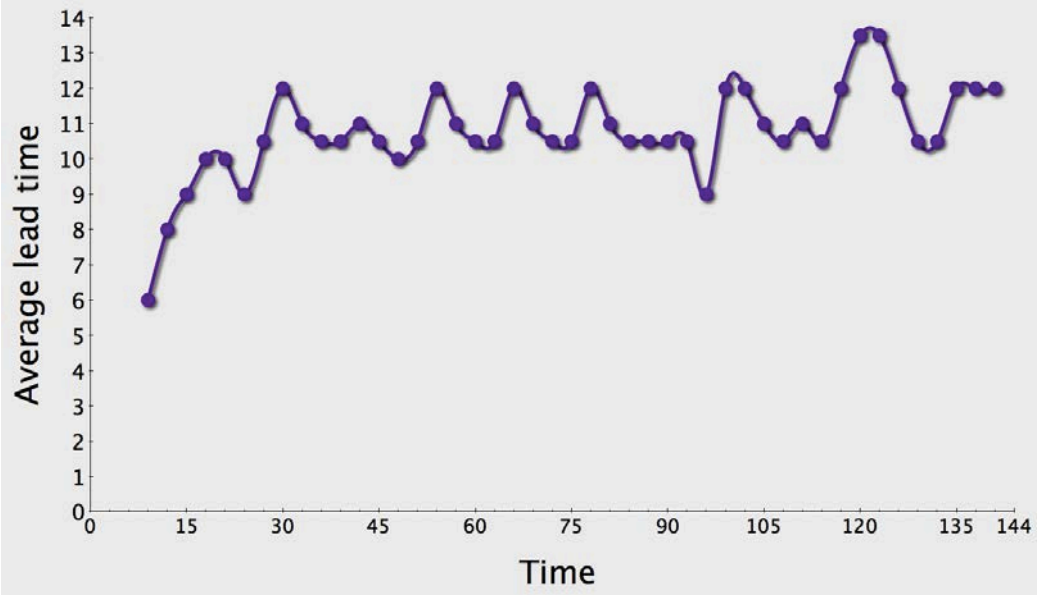
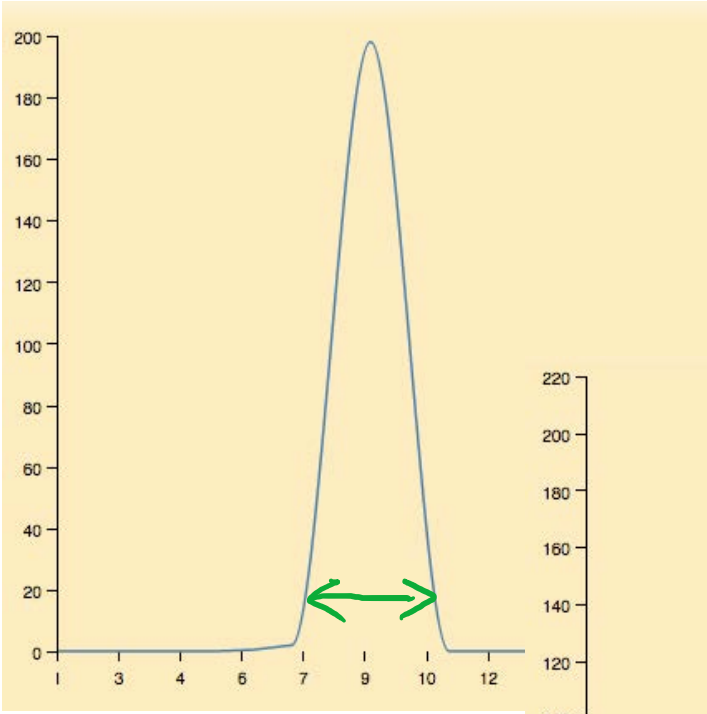
# Policies: wip limits



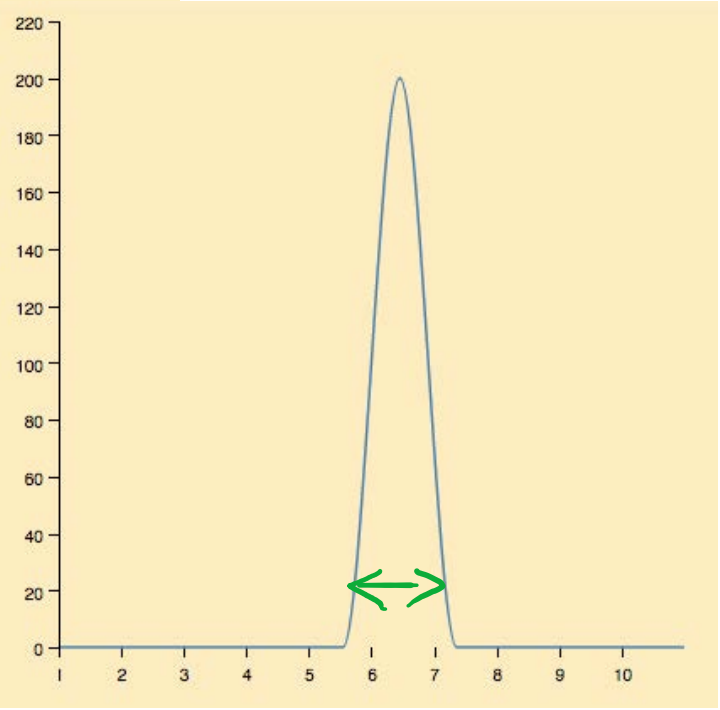

One of many possible runs

wip : 4-2-4-3

Monte Carlo simulation 200 runs



3-2-2-3



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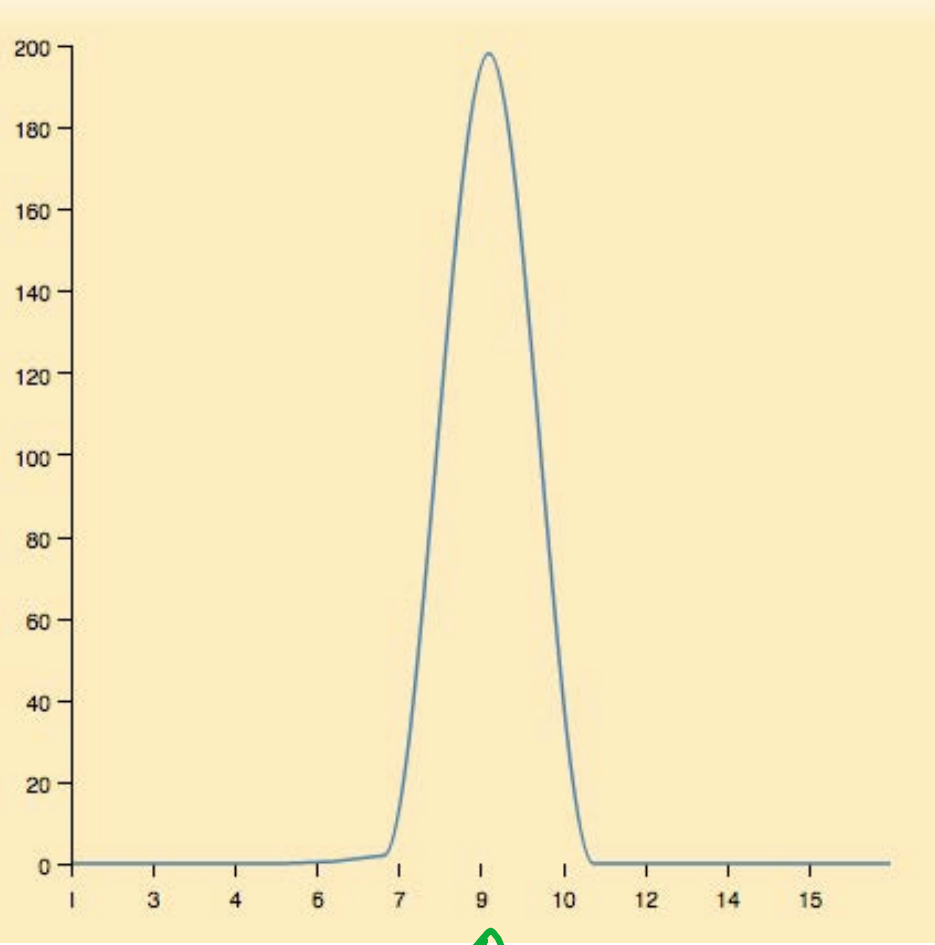
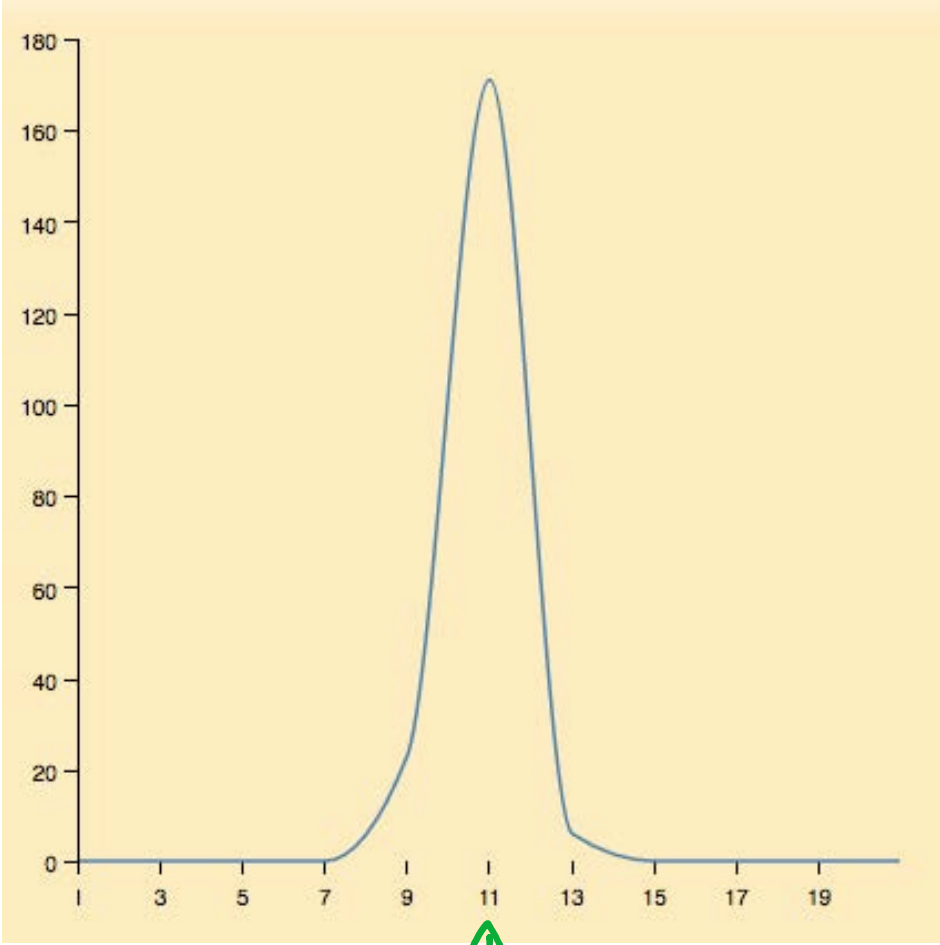
# Policies: Carlos

Carlos

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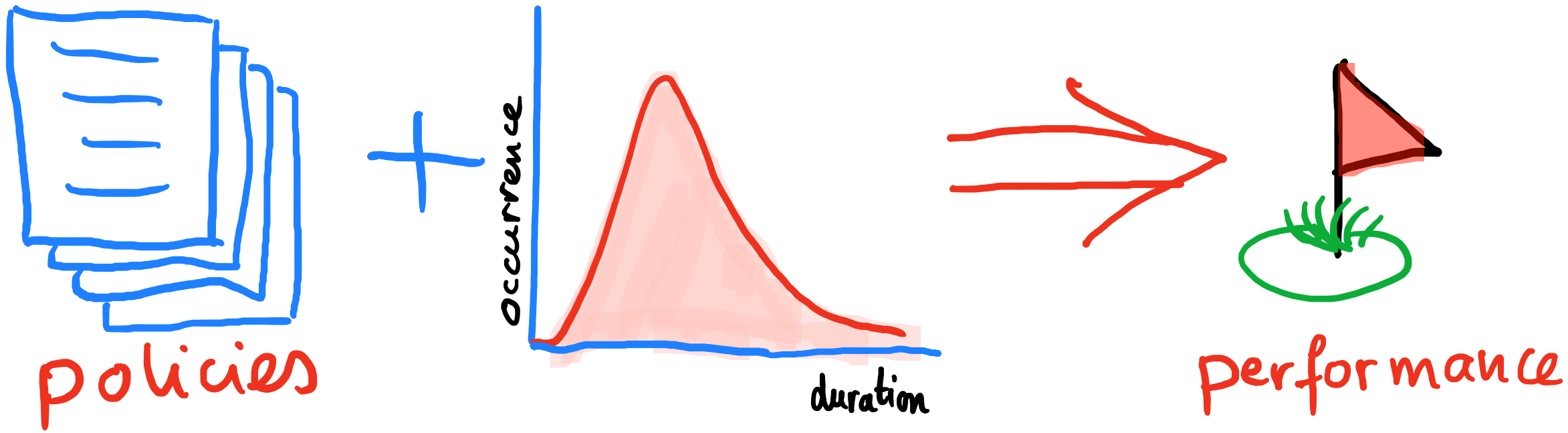
# Benefits of Monte Carlo

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# Monte Carlo: errors caused by

- Lack of understanding
  - Unknown policies
  - Policies wrongly modeled
  - Policies not correctly followed in practices (lack of discipline)
  - Changing environment
- Monte Carlo
  - Statistical, outliers
  - Artifacts from the used algorithm/method
  - Random number generators

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# Understanding the system

Relevant policies ›

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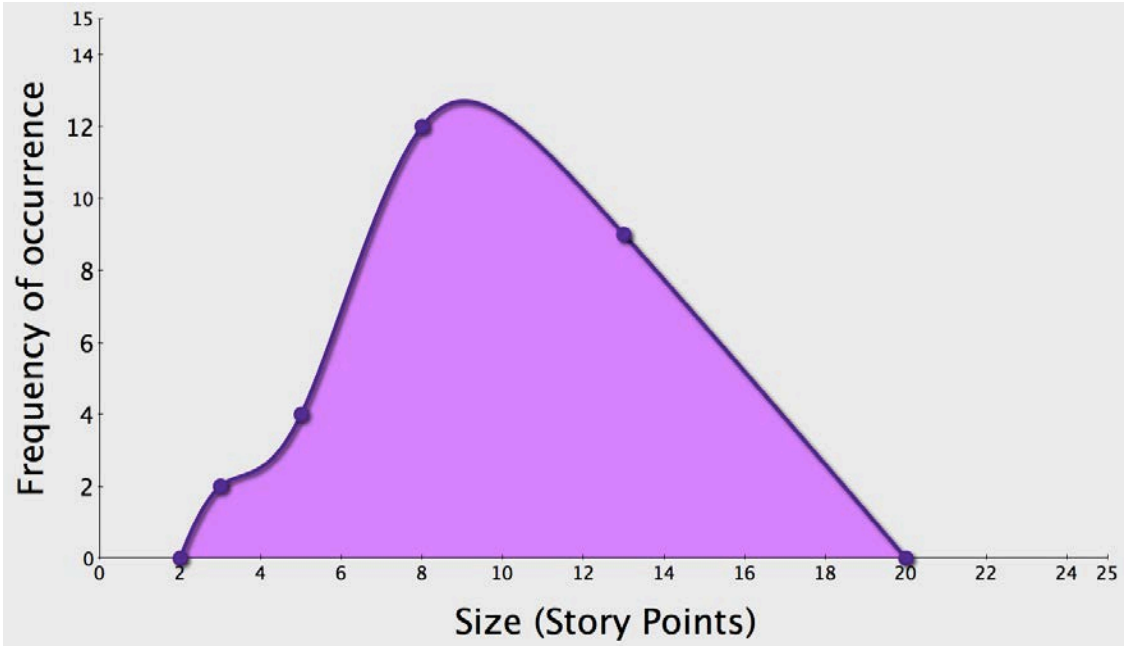
# Case: project duration

- Velocity: 47, 26, 26, 40 SP
- Sprint = 2 weeks
- Sprint backlog size = 60 SP

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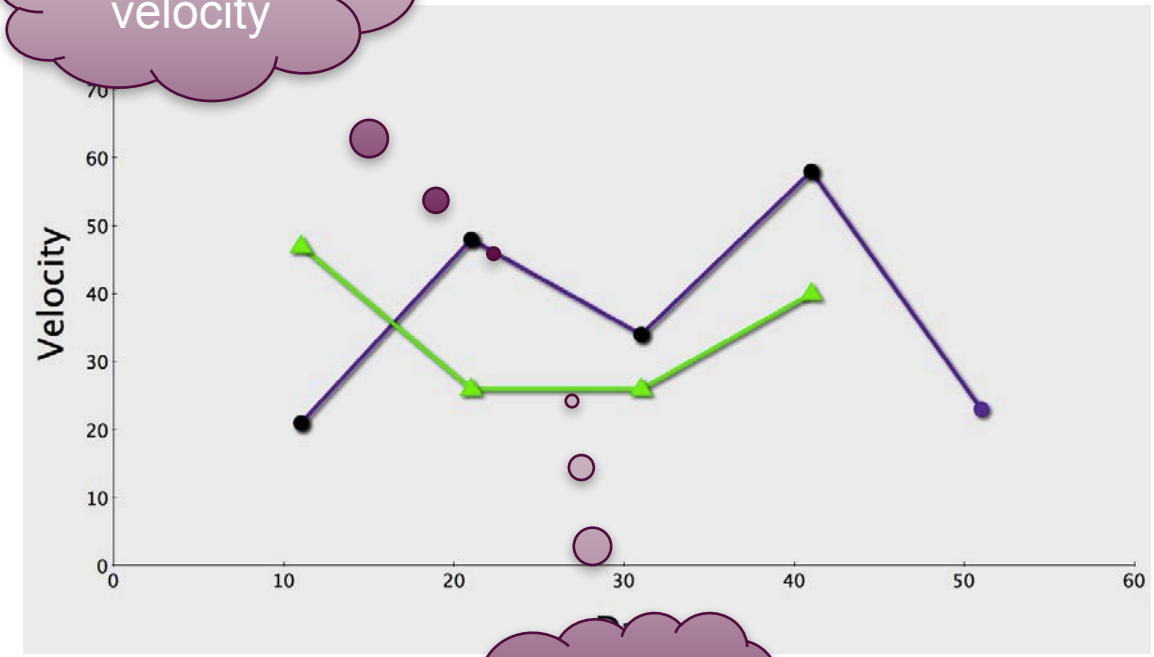
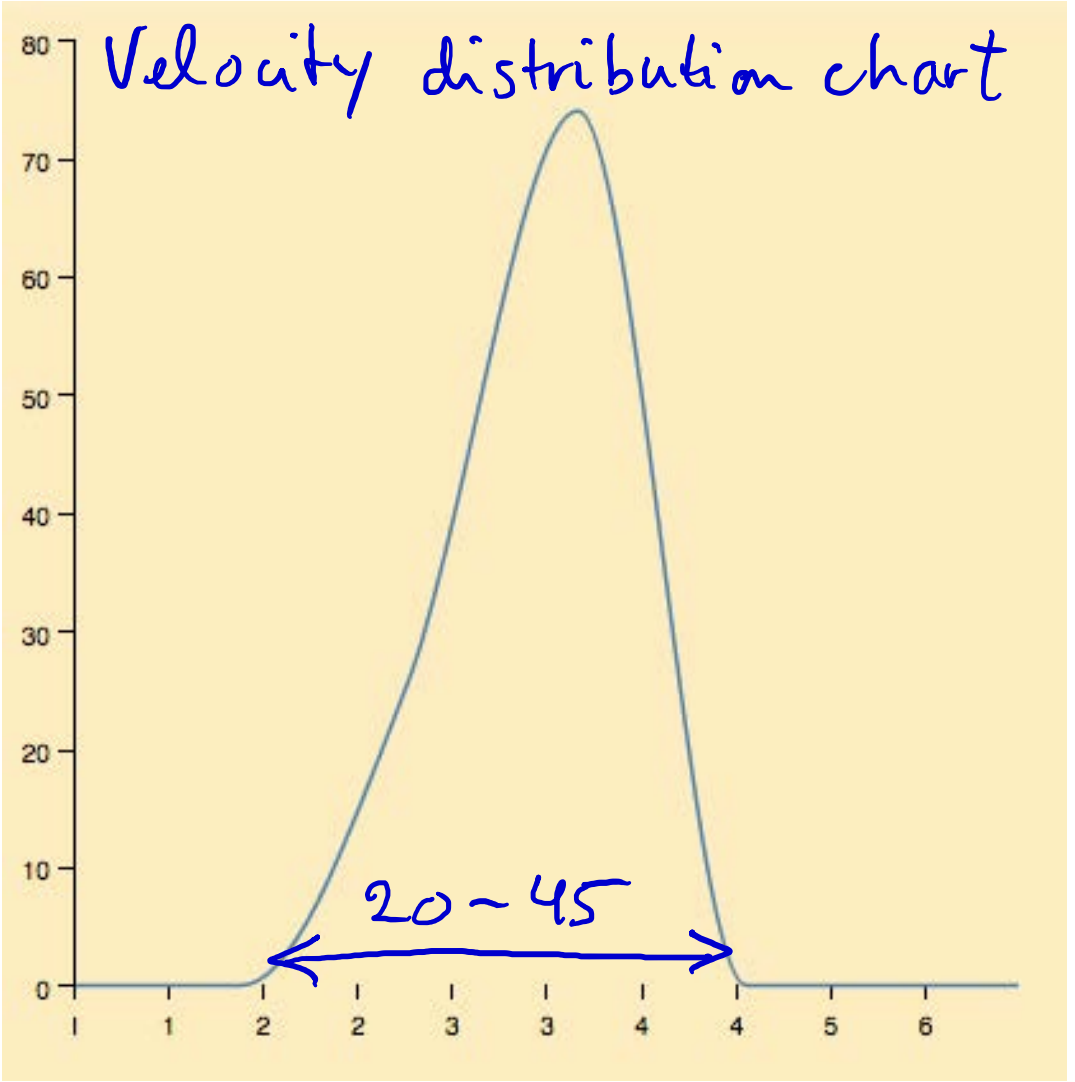
# Case: understanding velocity

Simulated velocity




Team velocity

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# Relevant policies

- Distribution of story sizes
- Distribution of work accomplished every day
- Sprint length, replenishment, and delivery frequencies
- Capability of the team (velocity)
- Dealing with unfinished stories
- Taking up additional work during sprint (replenishment)
- …..

# Optimal policies?

Walking the fitness landscape 

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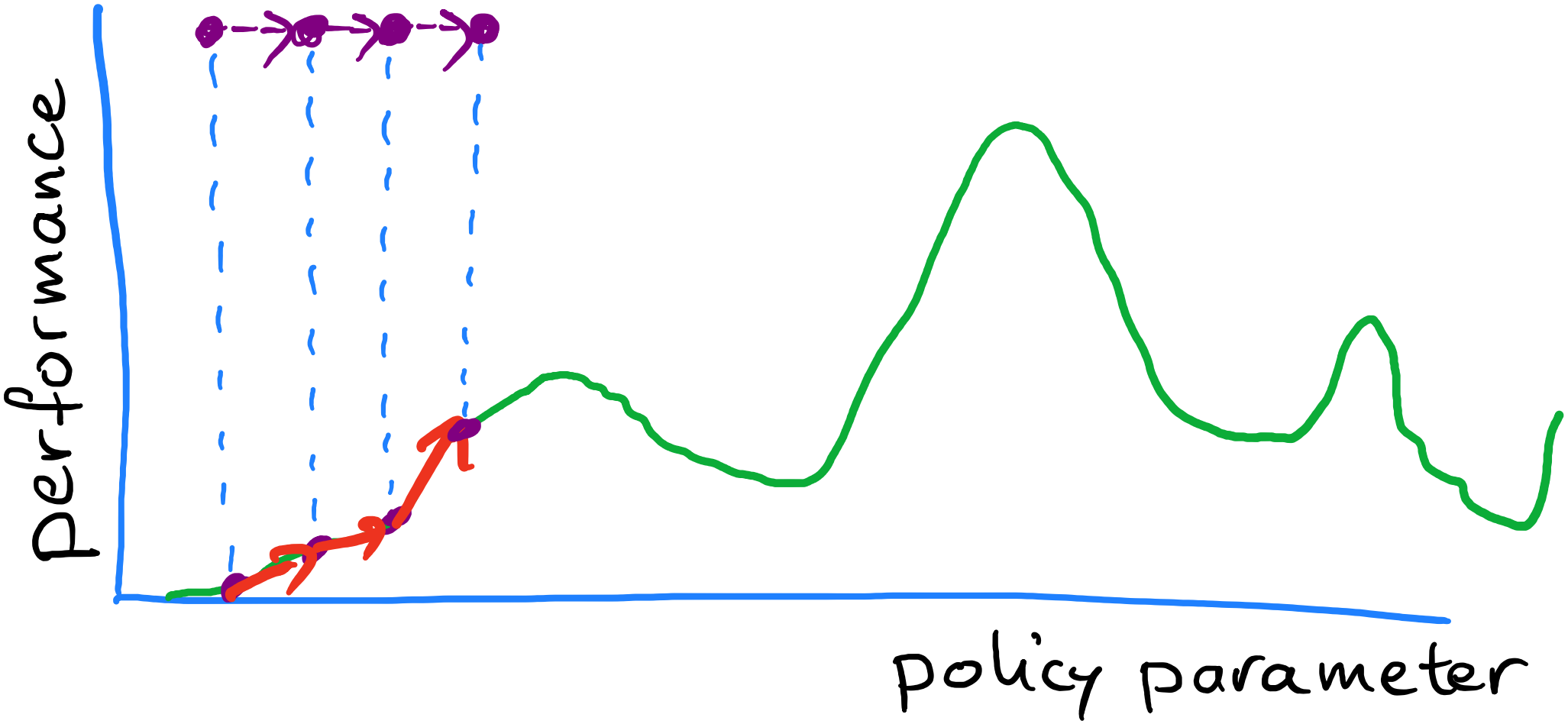
# Fitness landscape

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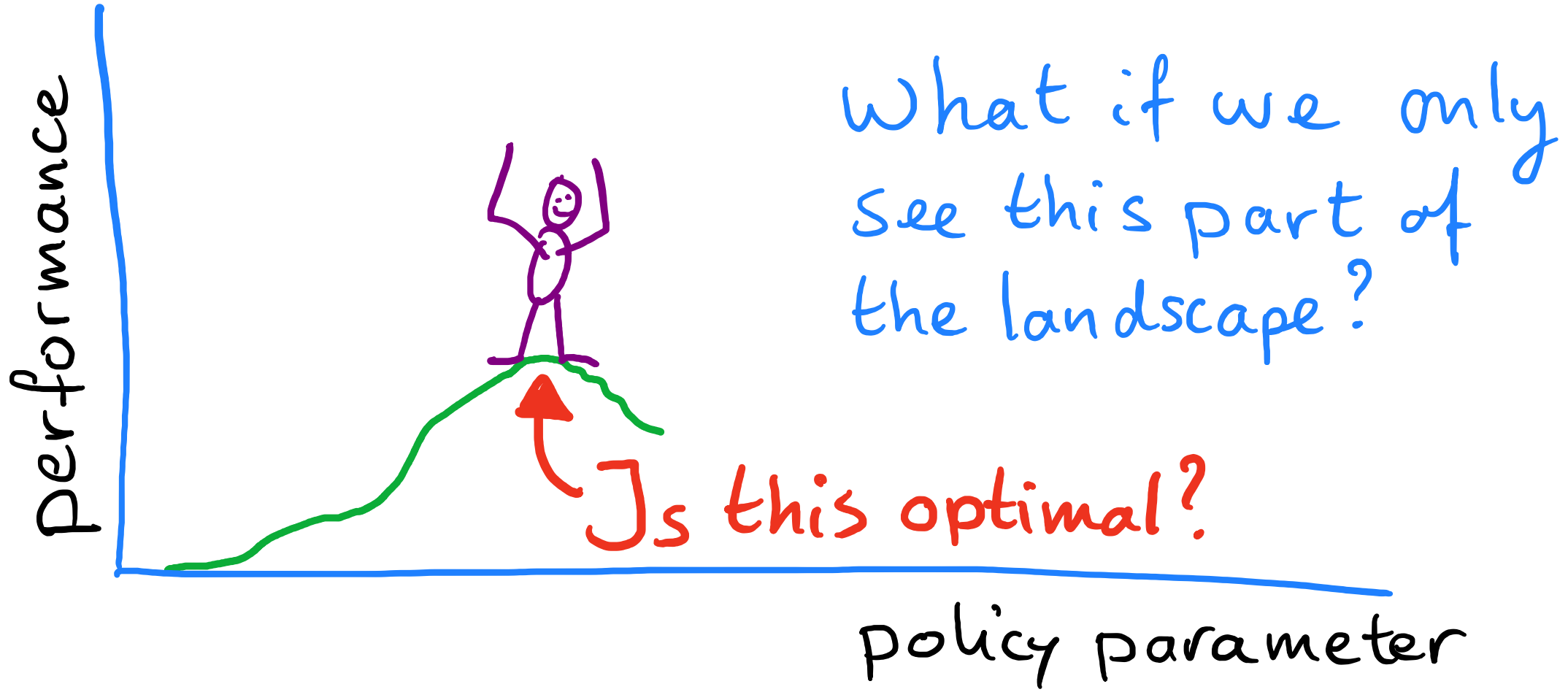
# Finding the optimum

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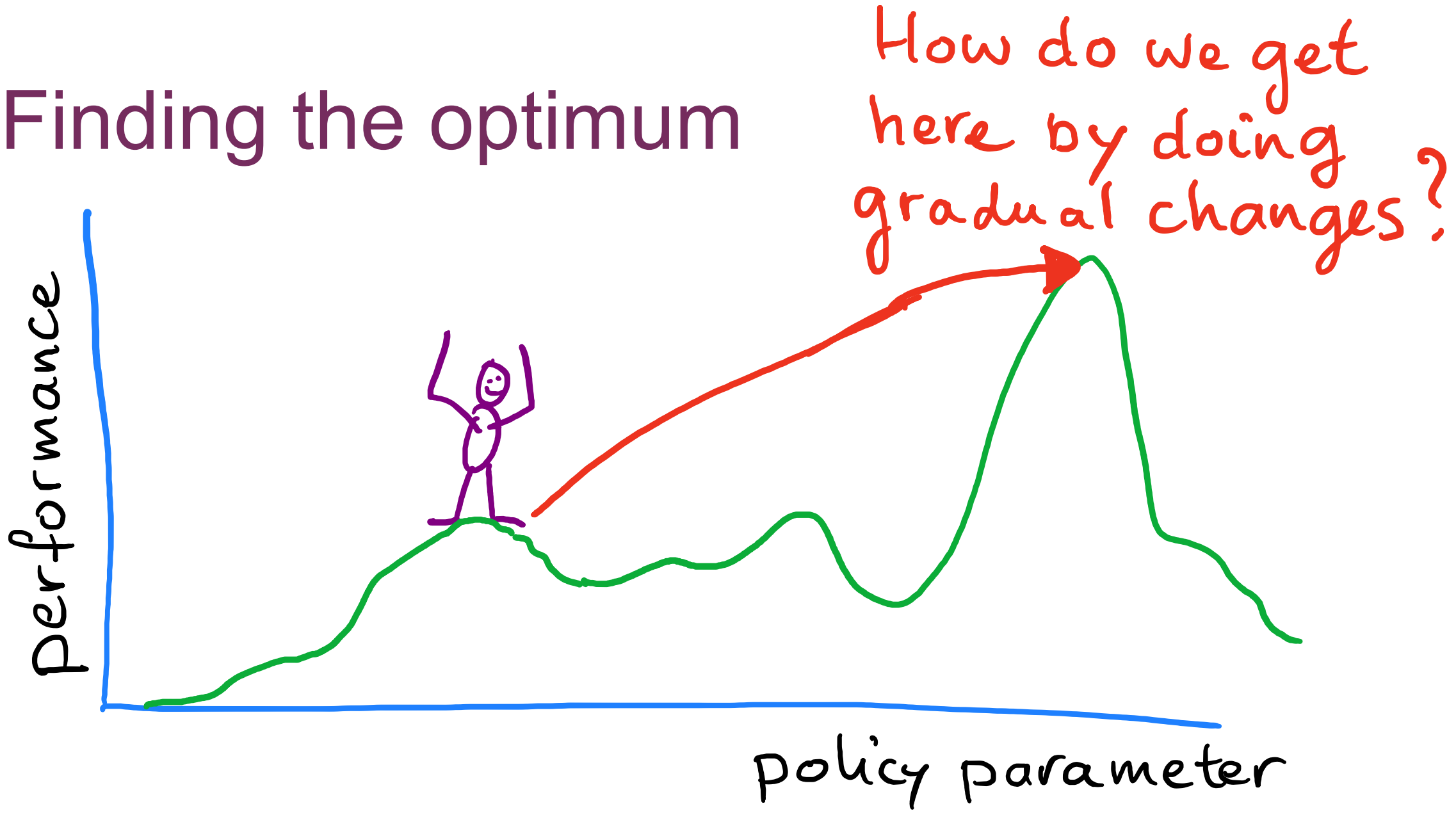
# Finding the optimum

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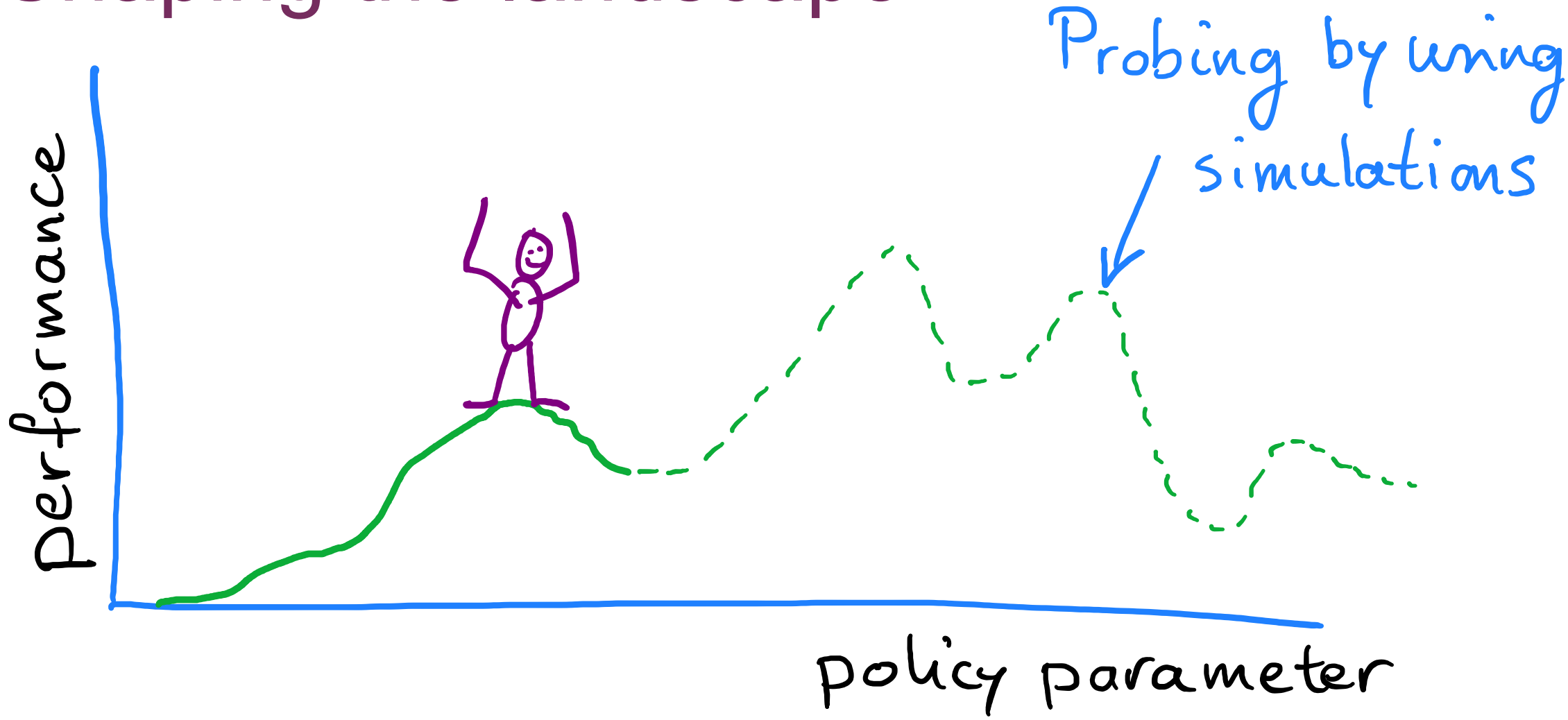
# Shaping the landscape

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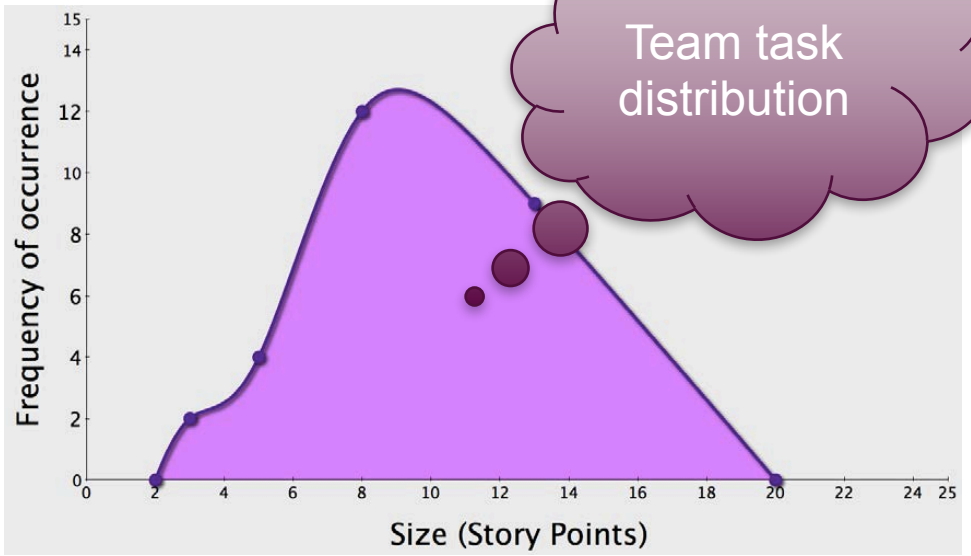
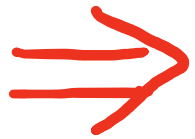
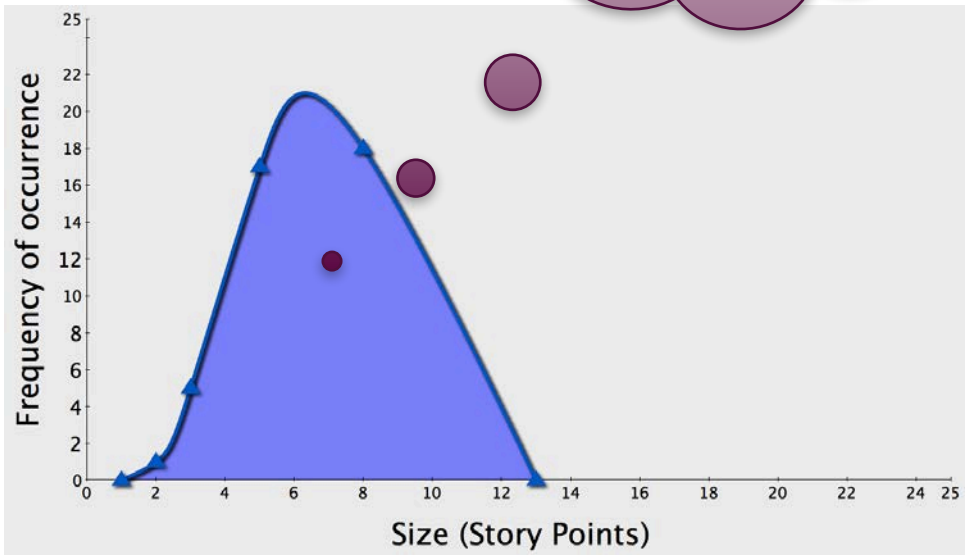
# Fitness landscape

- Issue of local optimum
  - How do you know whether you're in local optimum only?
  - How to get to the global optimum?
- With gradual steps, first results get worse, before they improve
- Use simulations to guide what will work
  - Reinforcement learning techniques, or
  - Monte Carlo methods

# Case: story size policy






Policy : no more 13!!

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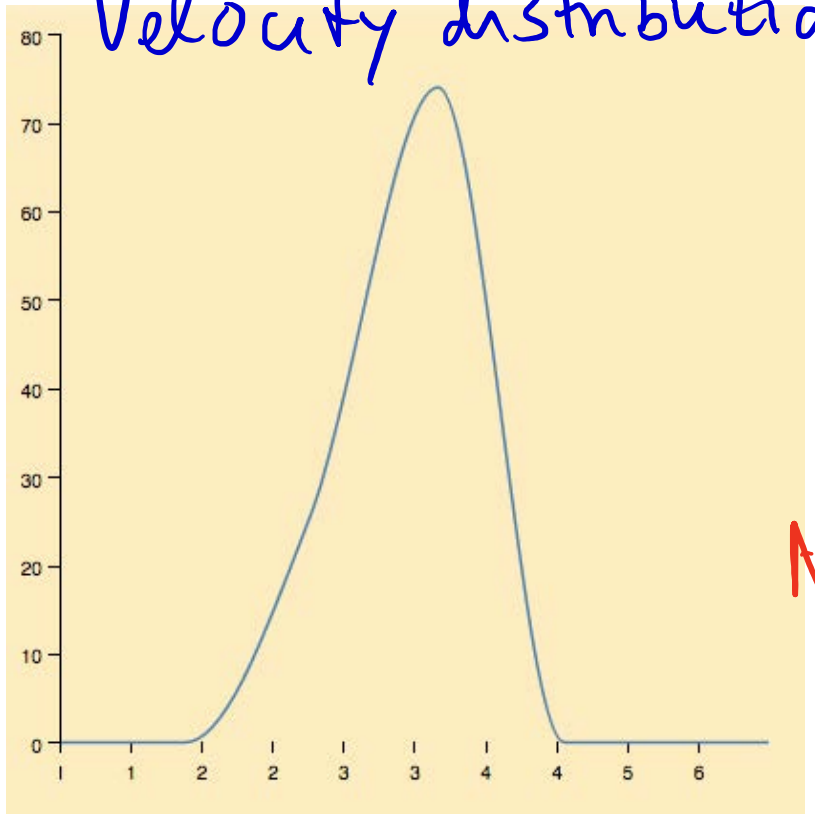
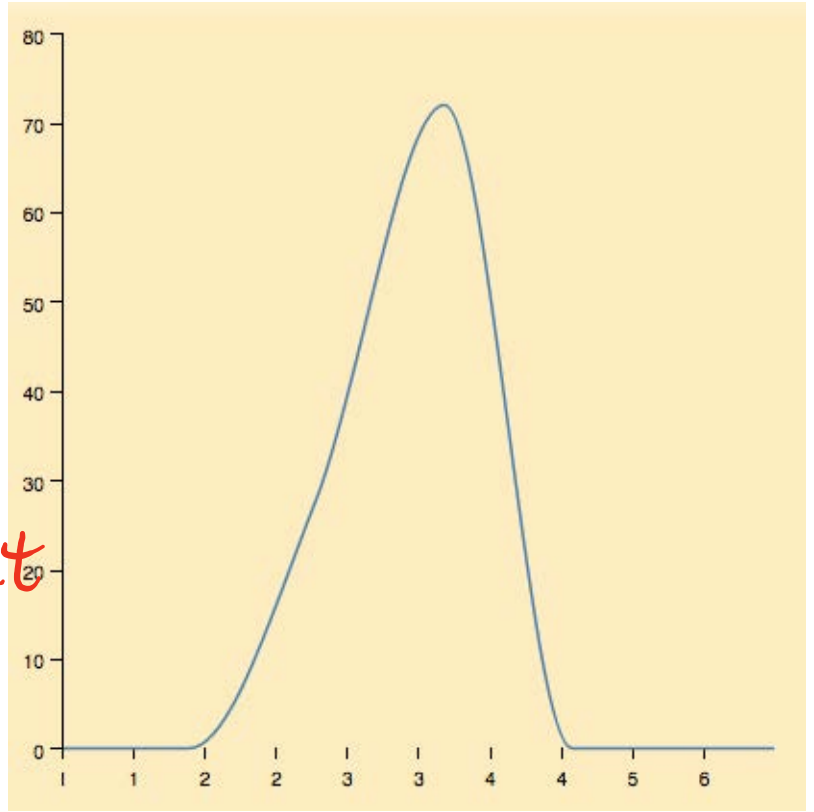
# Case: 'story size < 13SP' policy

Velocity distribution chart




No significant improvement

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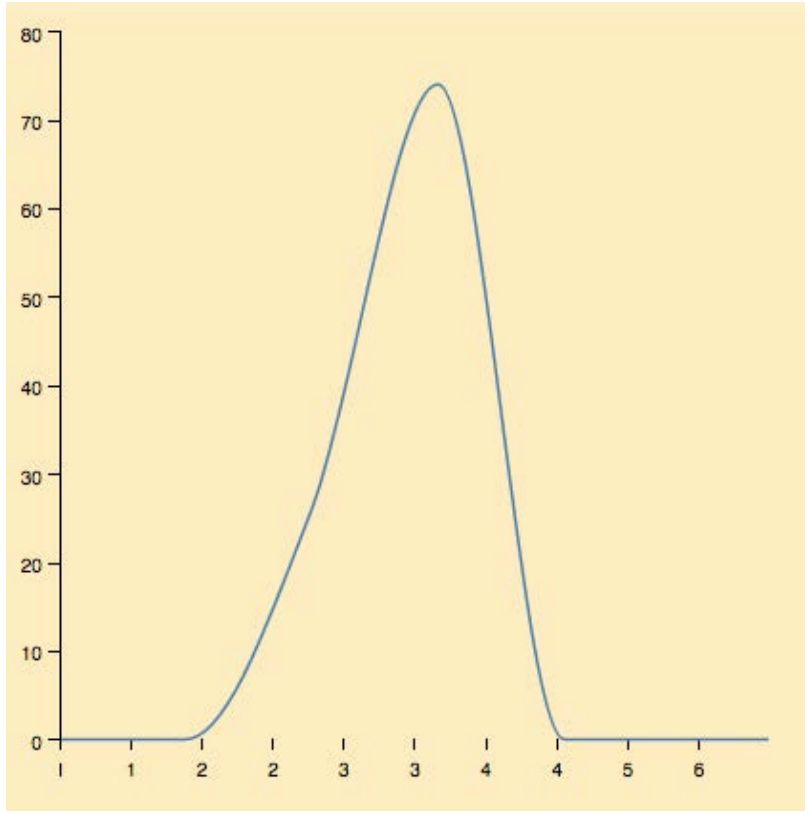
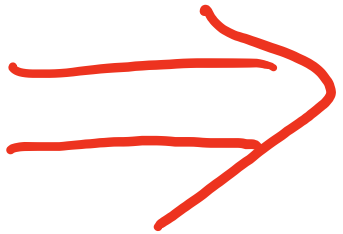
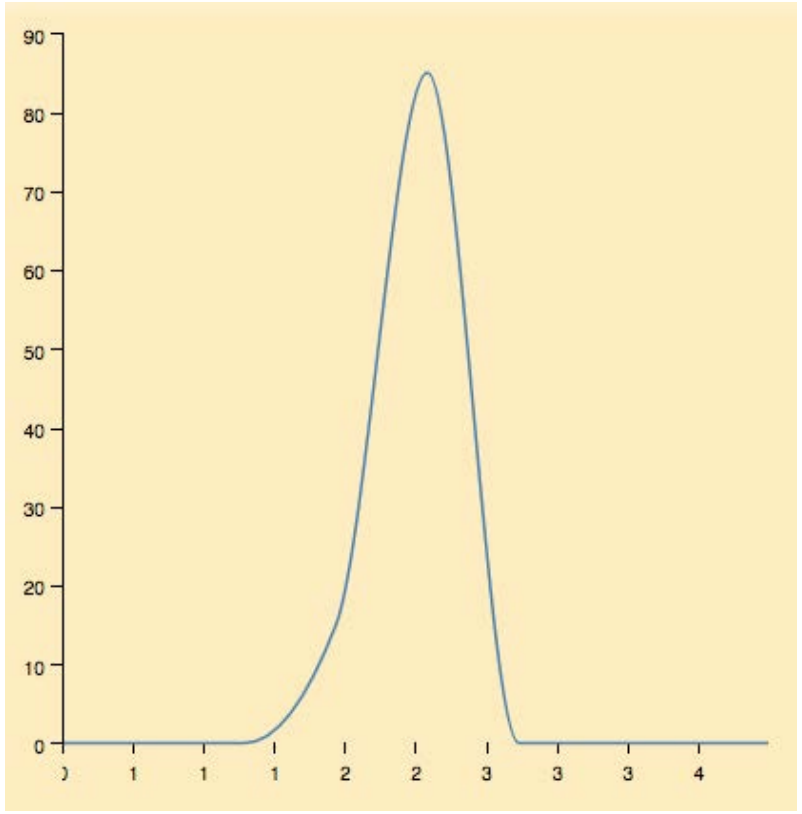
# Case: 'no more than 4 stories' policy




velocity: 20-45






velocity: 15-30

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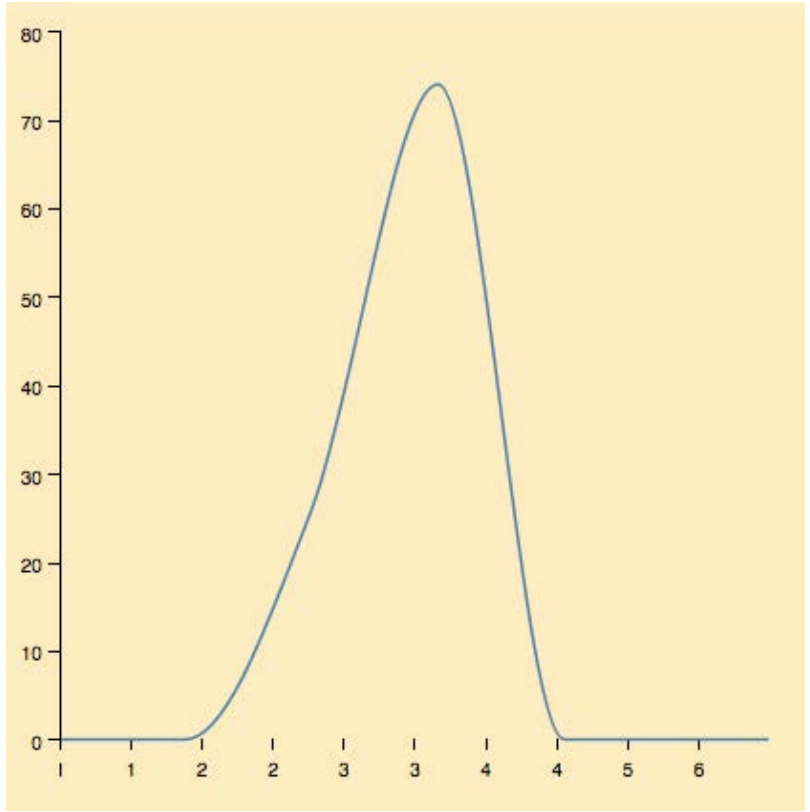
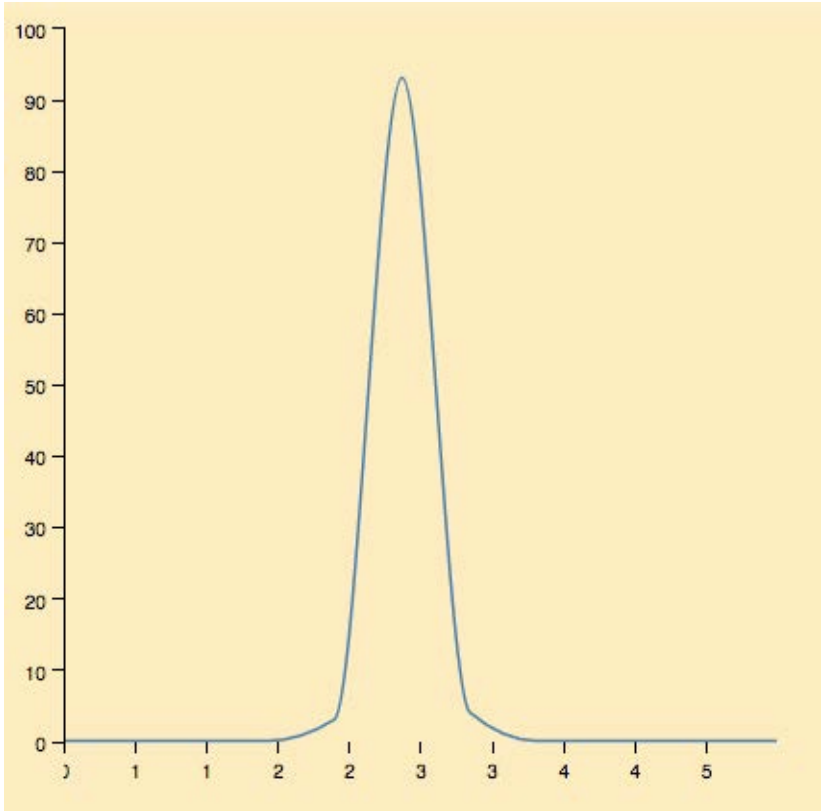
# Case: 'take up only 35 SP' policy




velocity: 20 - 45




velocity: 25 - 35

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# Summary

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# Summary

- Learning takes time for complex problems
- Speed up by running simulated experiments

- Benefits:
  - From months to seconds
  - Helps to understand the system
  - Helps to explore the fitness landscape
  - Helps to choose most promising change

- Beware of systematic errors and interpretation of results

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