

# Fisheries Performance Assessment Toolkit (FPAT)

## 3. Closed-loop simulation

Benchmarking and Planning Effective Management

Presenter, Date 2022, Location



Food and Agriculture Organization  
of the United Nations



UNIVERSITY of WASHINGTON



openMSE

[www.openmse.com](http://www.openmse.com)

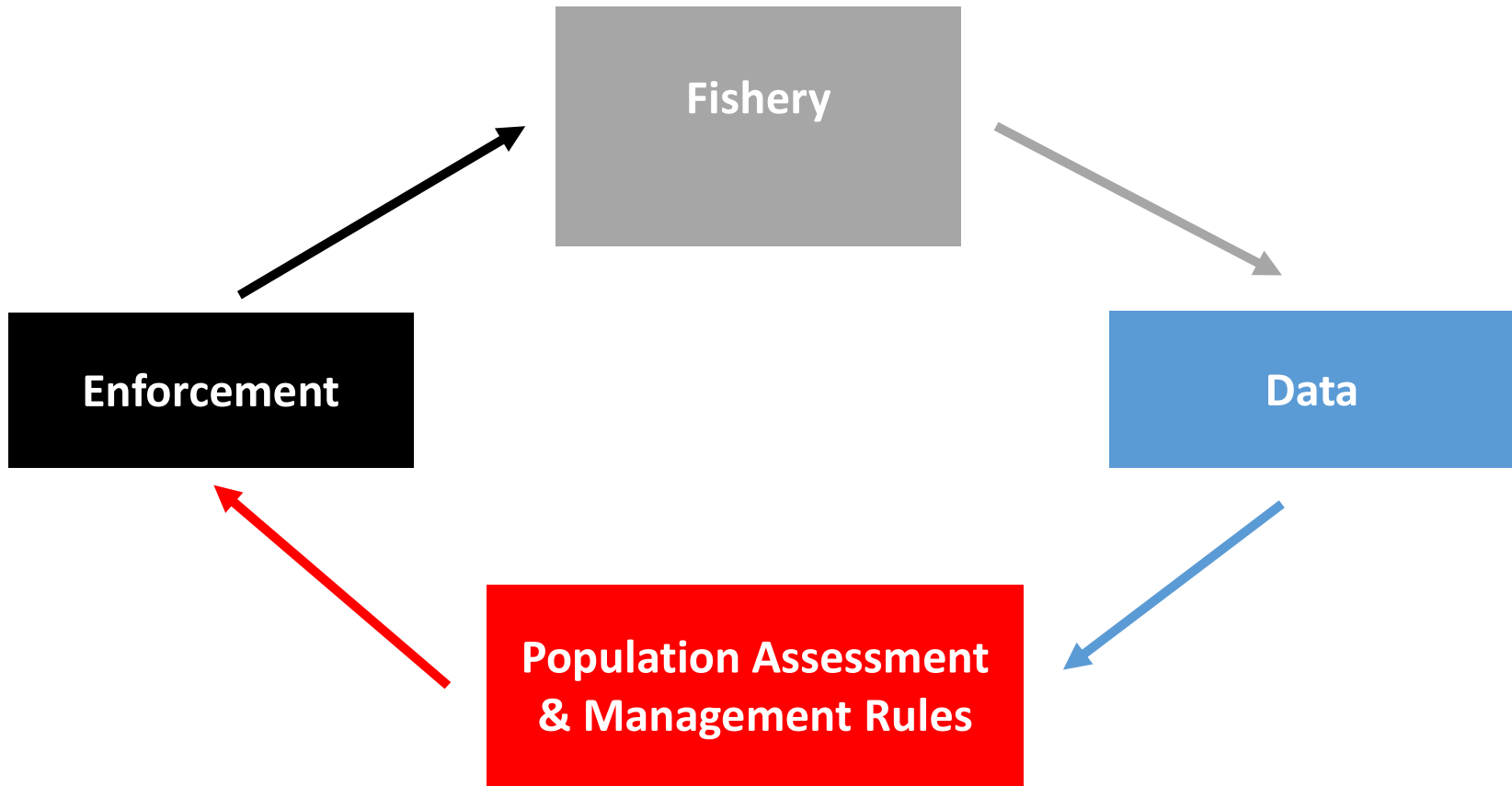
**Fishery Performance Indicators**

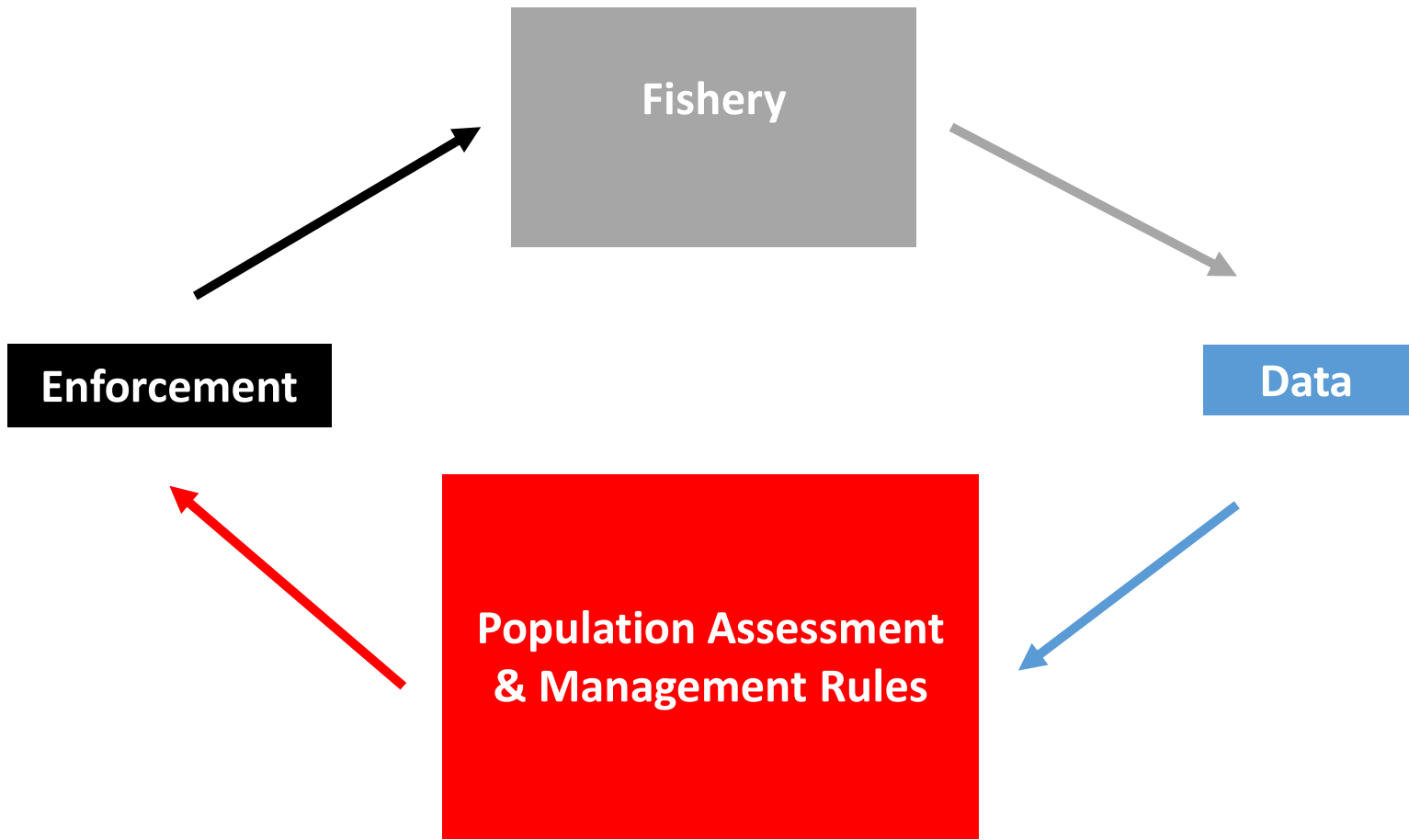
[www.fpilab.org](http://www.fpilab.org)

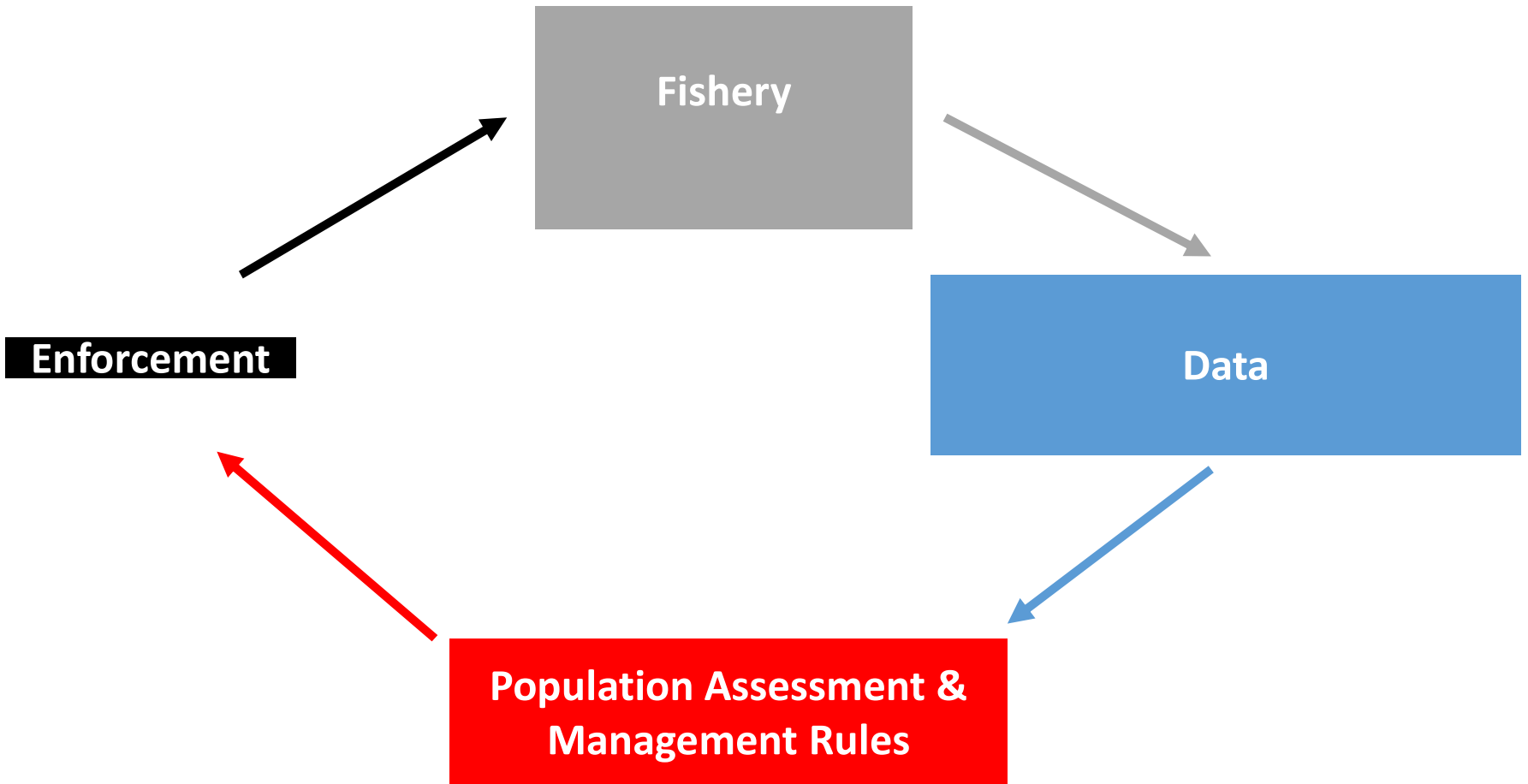
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# 1. The Problem



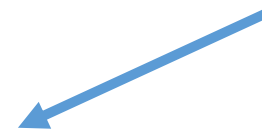
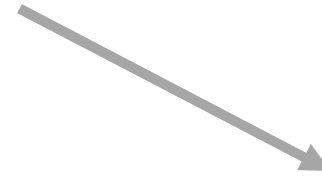
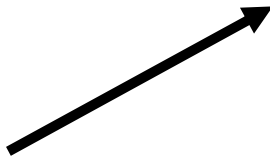




For most fisheries, management decision making could benefit from a more coherent strategy, and increased transparency and accountability.

But when you consider the options, there are good reasons why achieving this has been difficult...

# Test by experiment



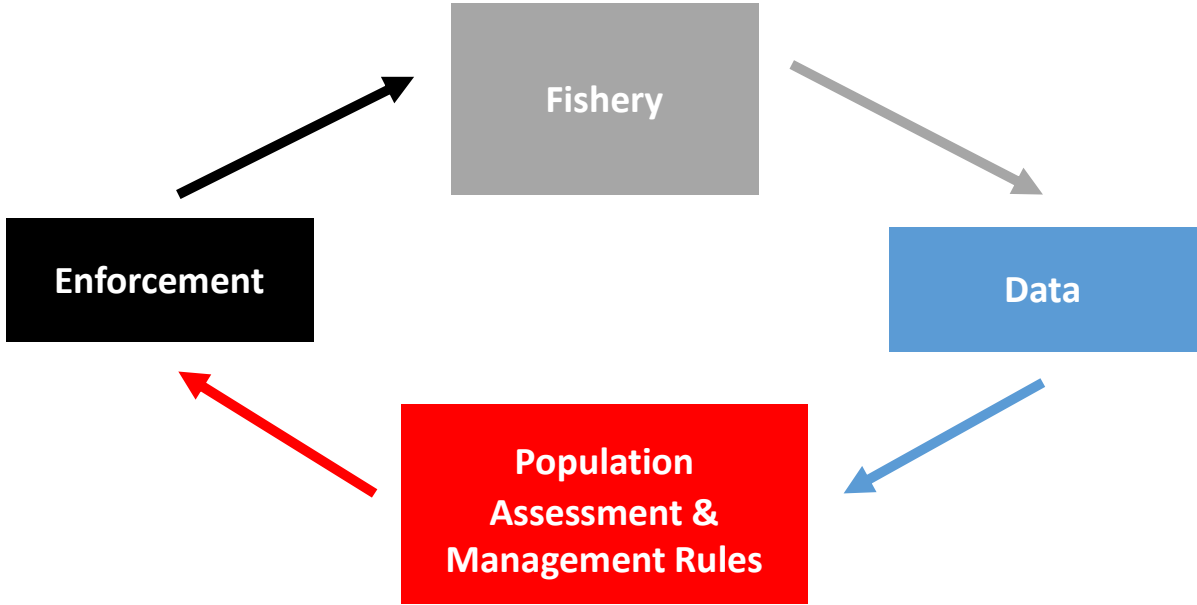


# Test by simulation

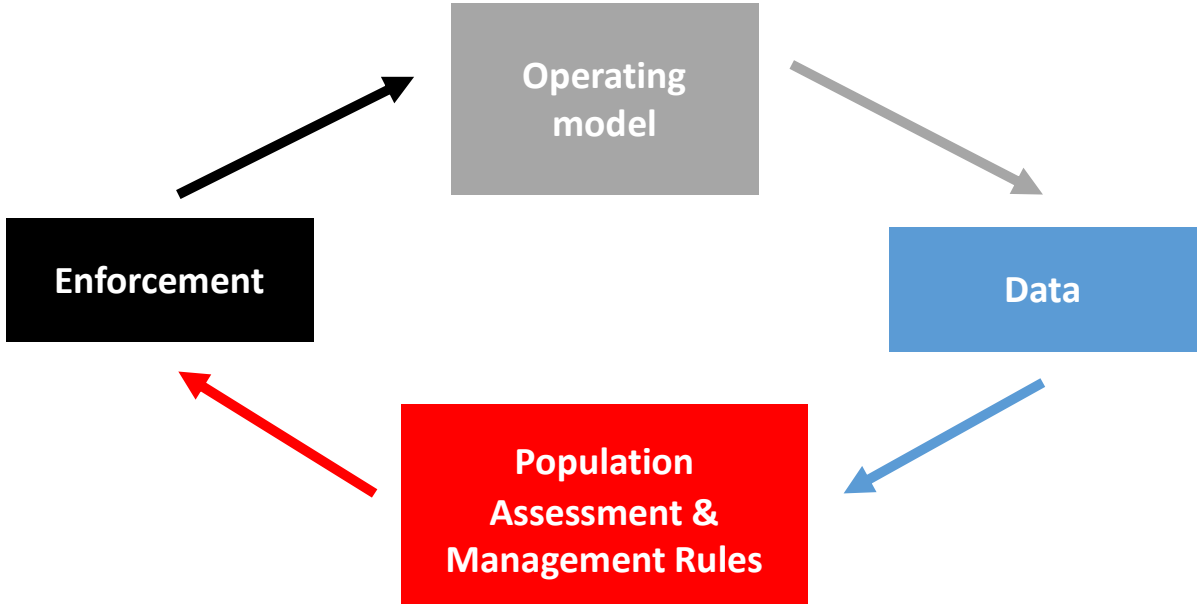


2. What is closed-loop simulation?

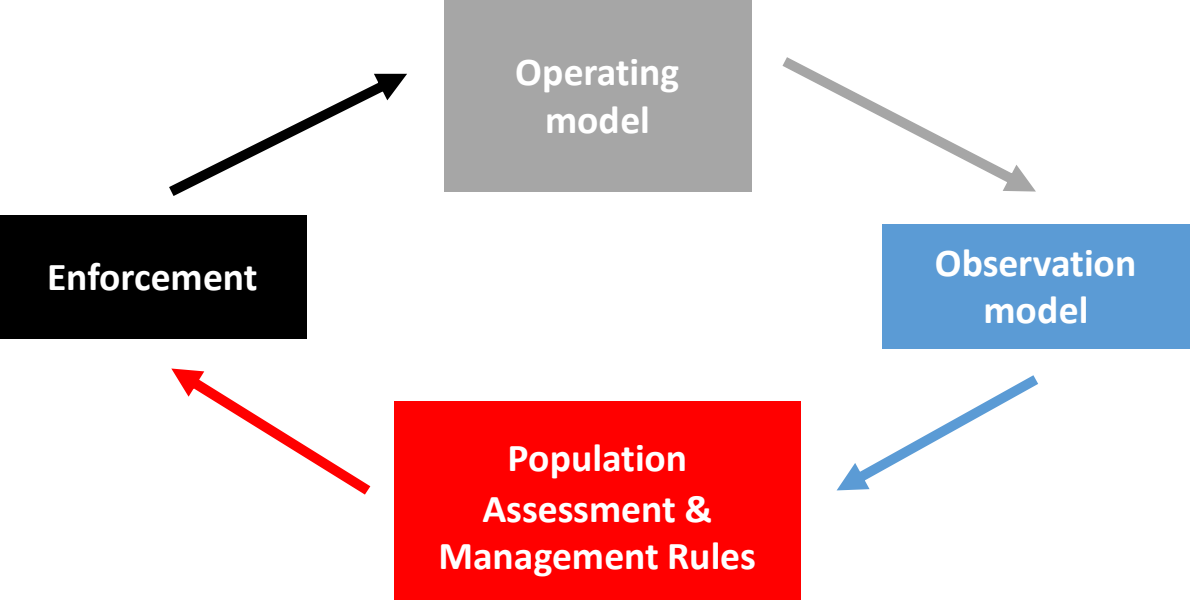
# Test by simulation: the MSE approach



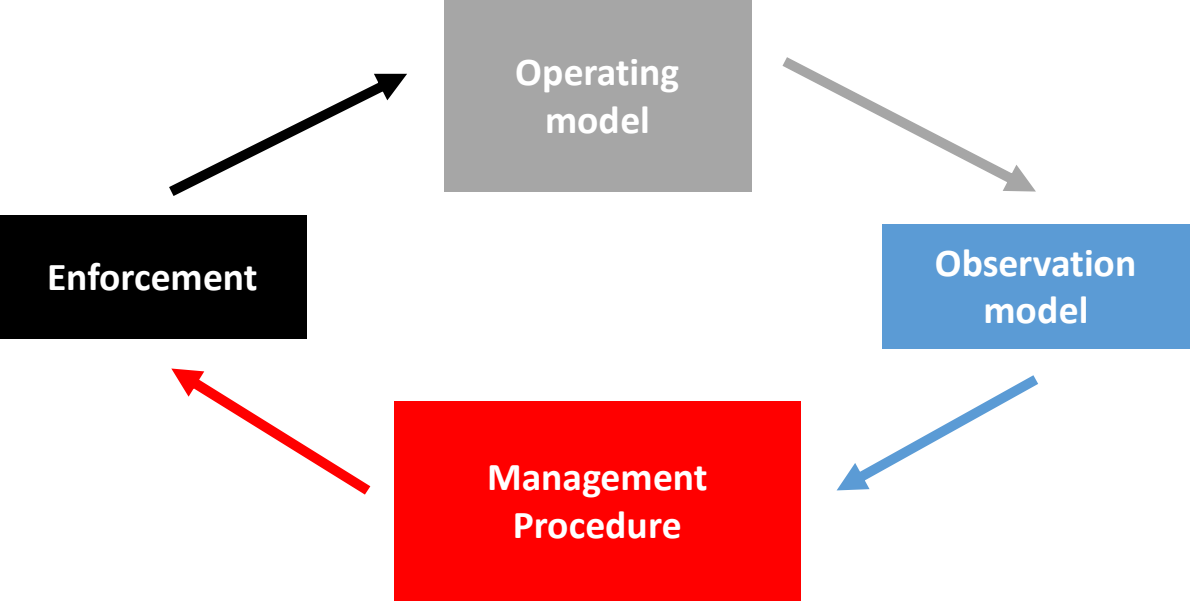
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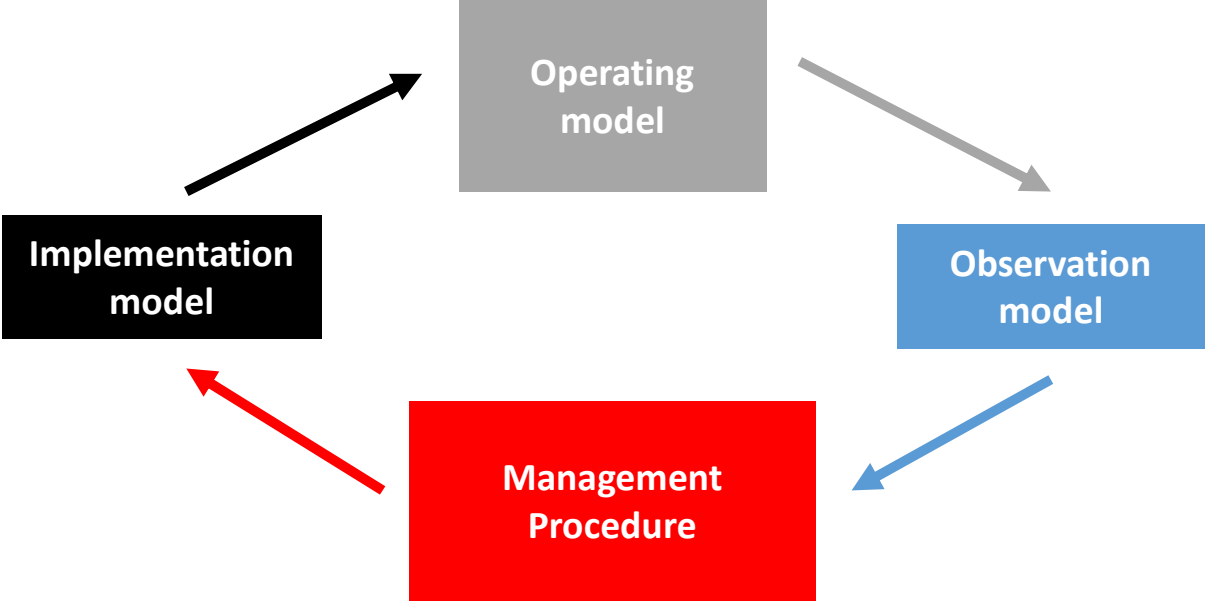
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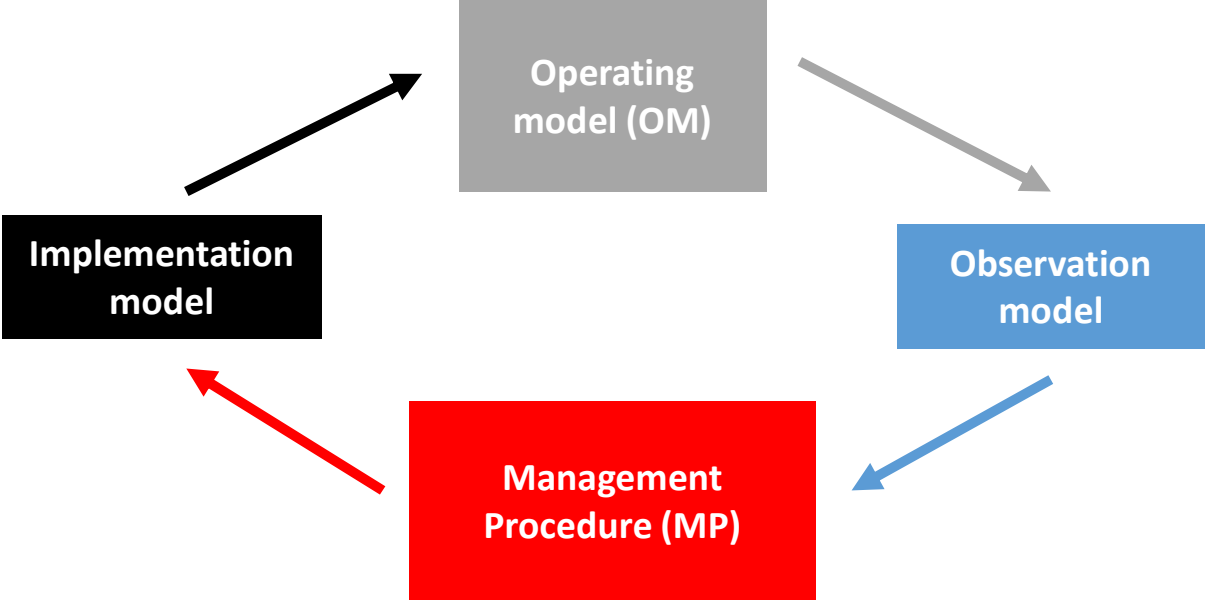
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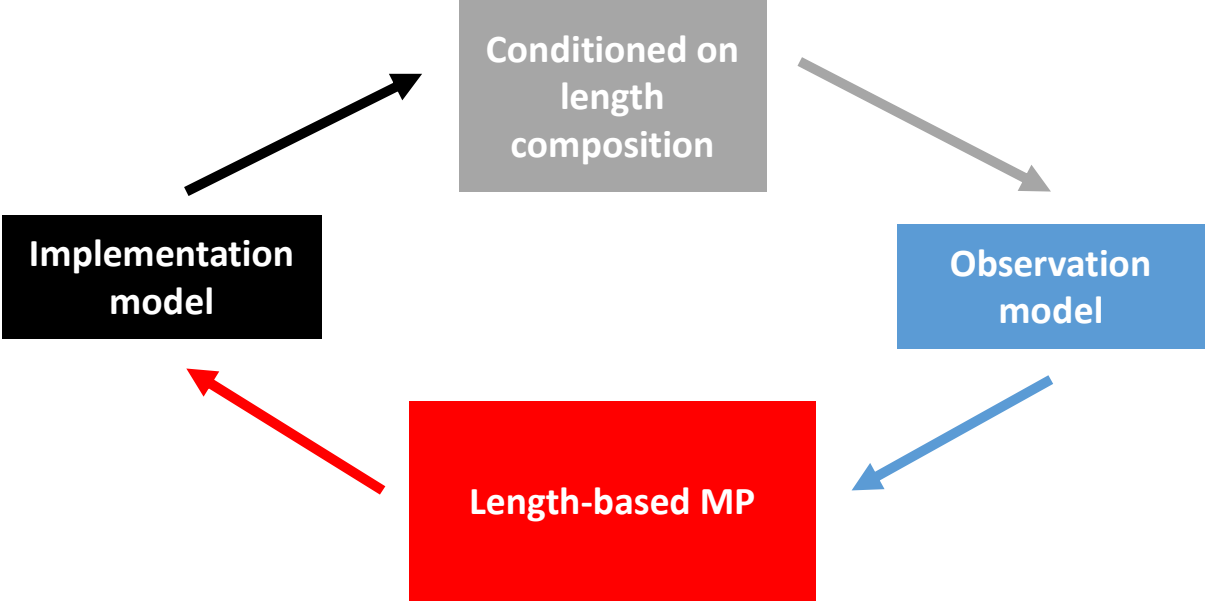


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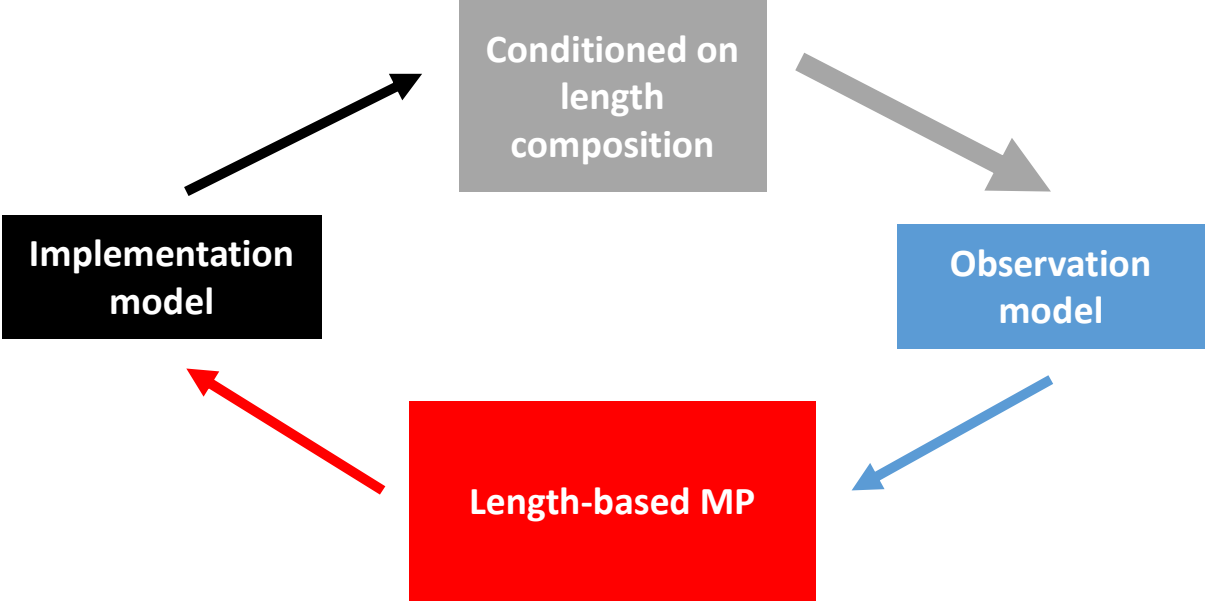


# Test by simulation: the MSE approach



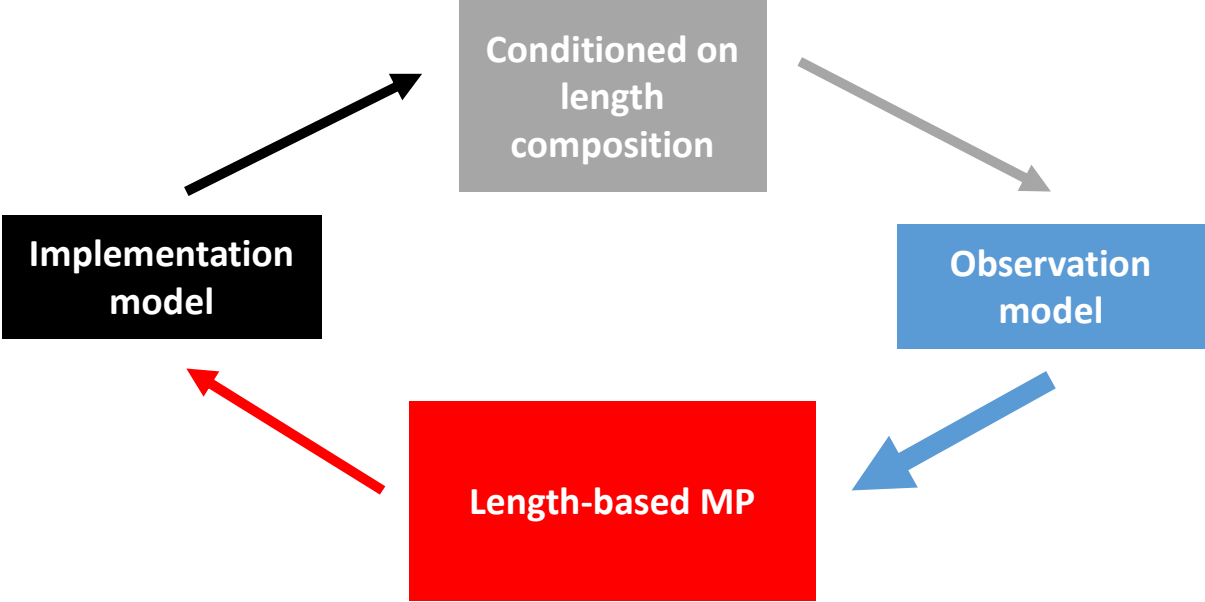
# Test by simulation: the MSE approach

**Projection year: 2021**



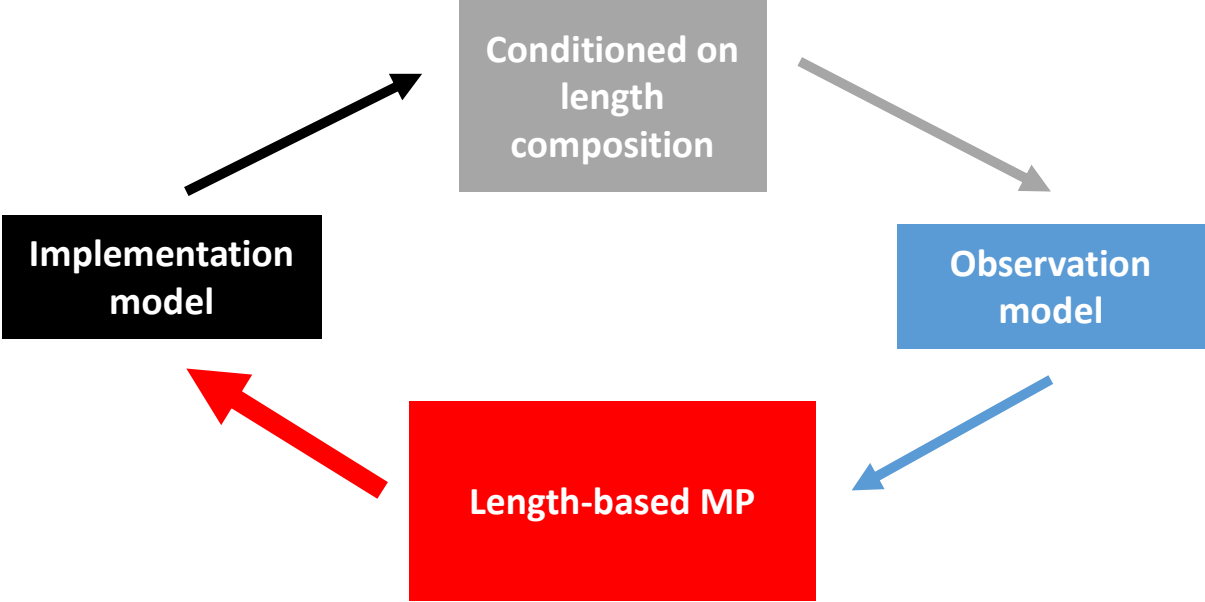
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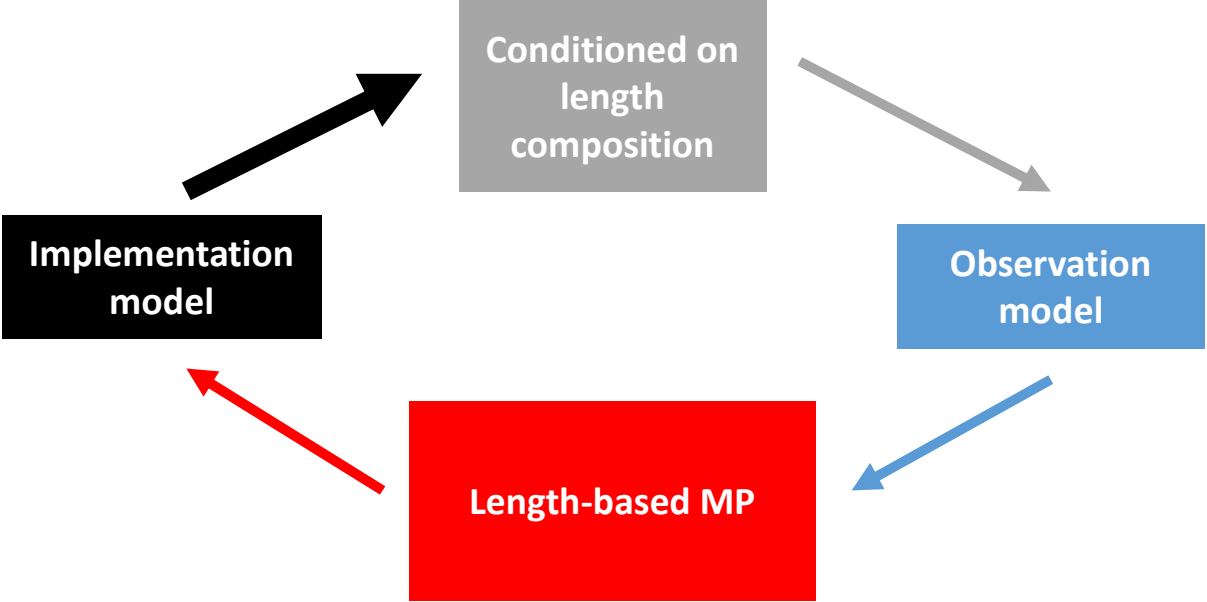
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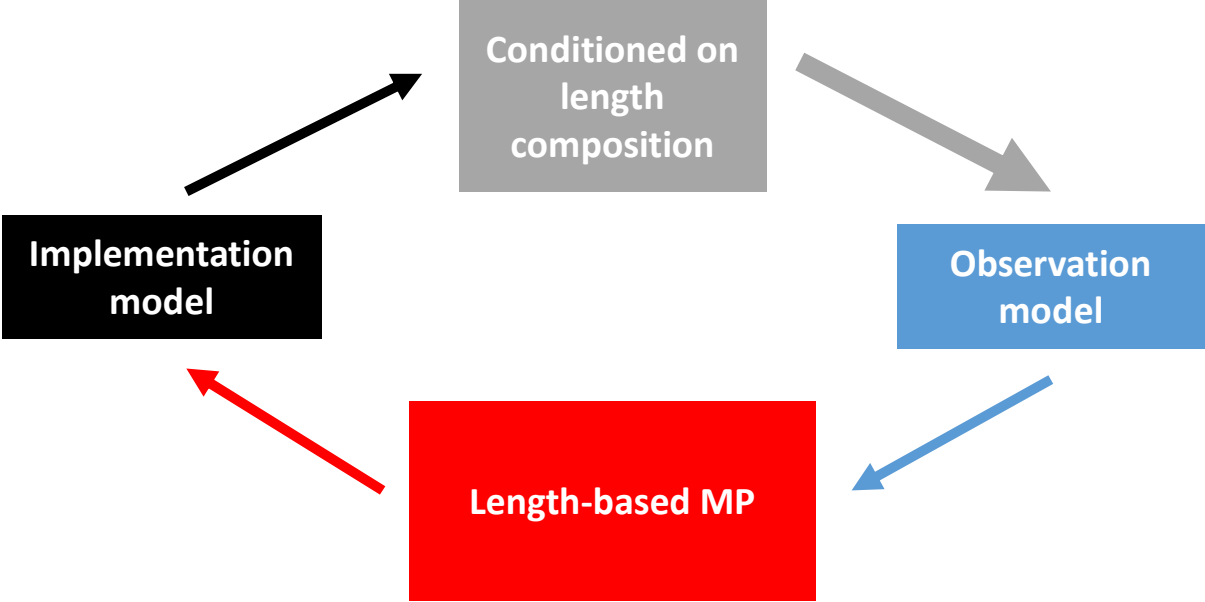
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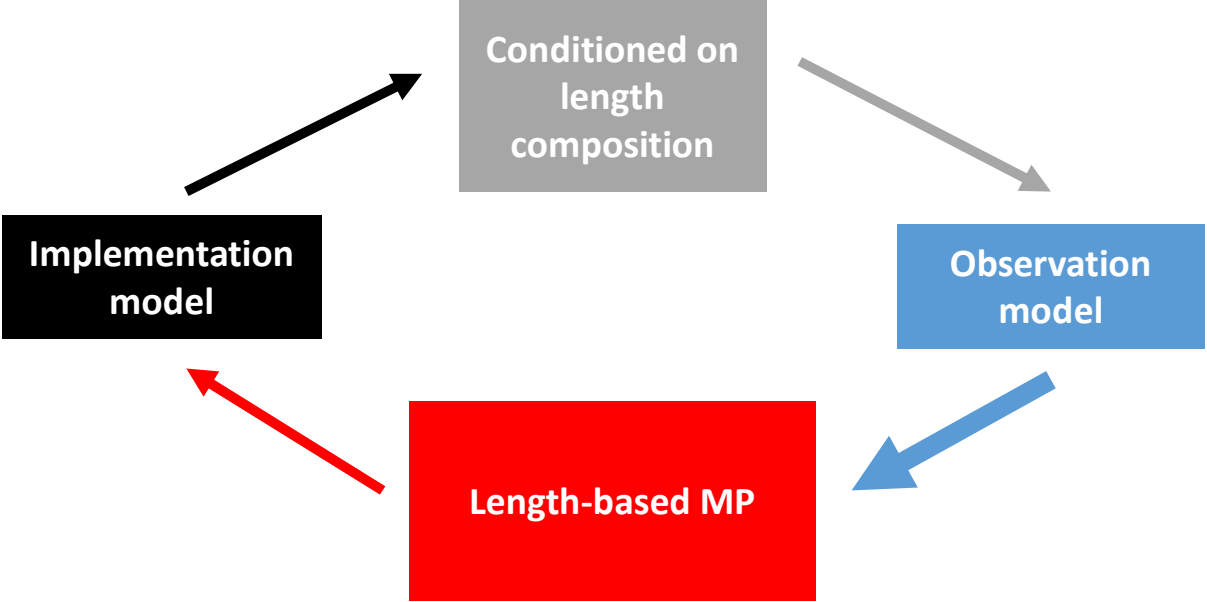
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Projection year: 2022



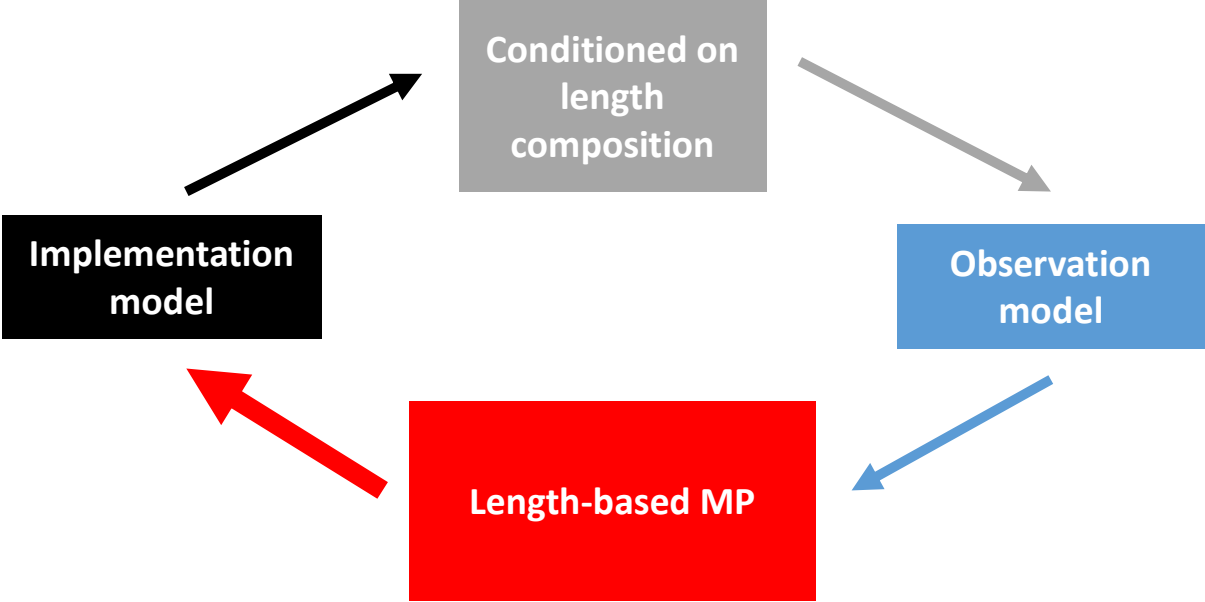
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# Test by simulation: the MSE approach

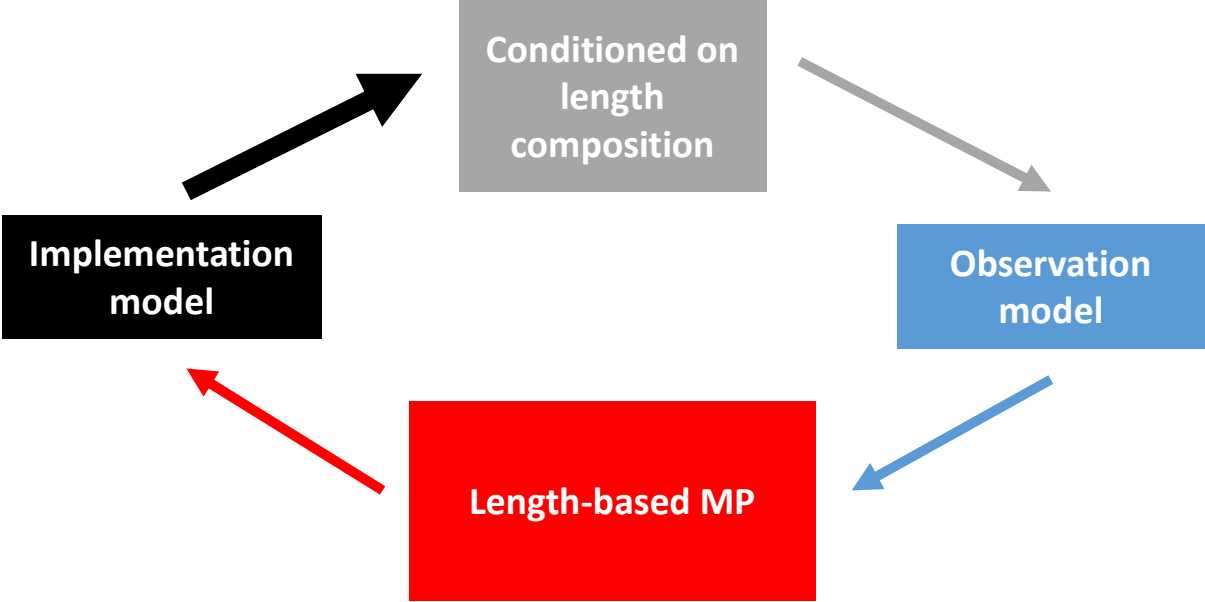
Projection year: 2022



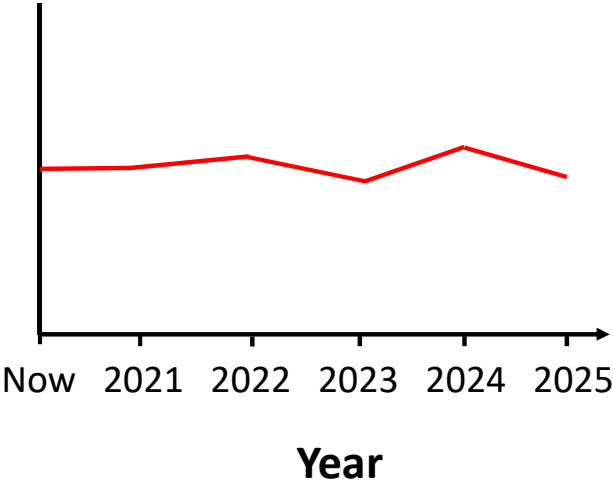
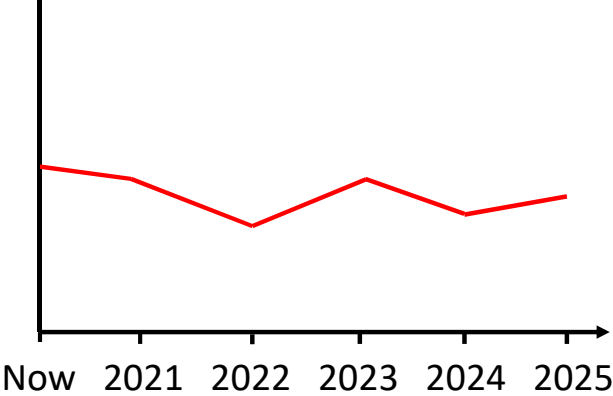
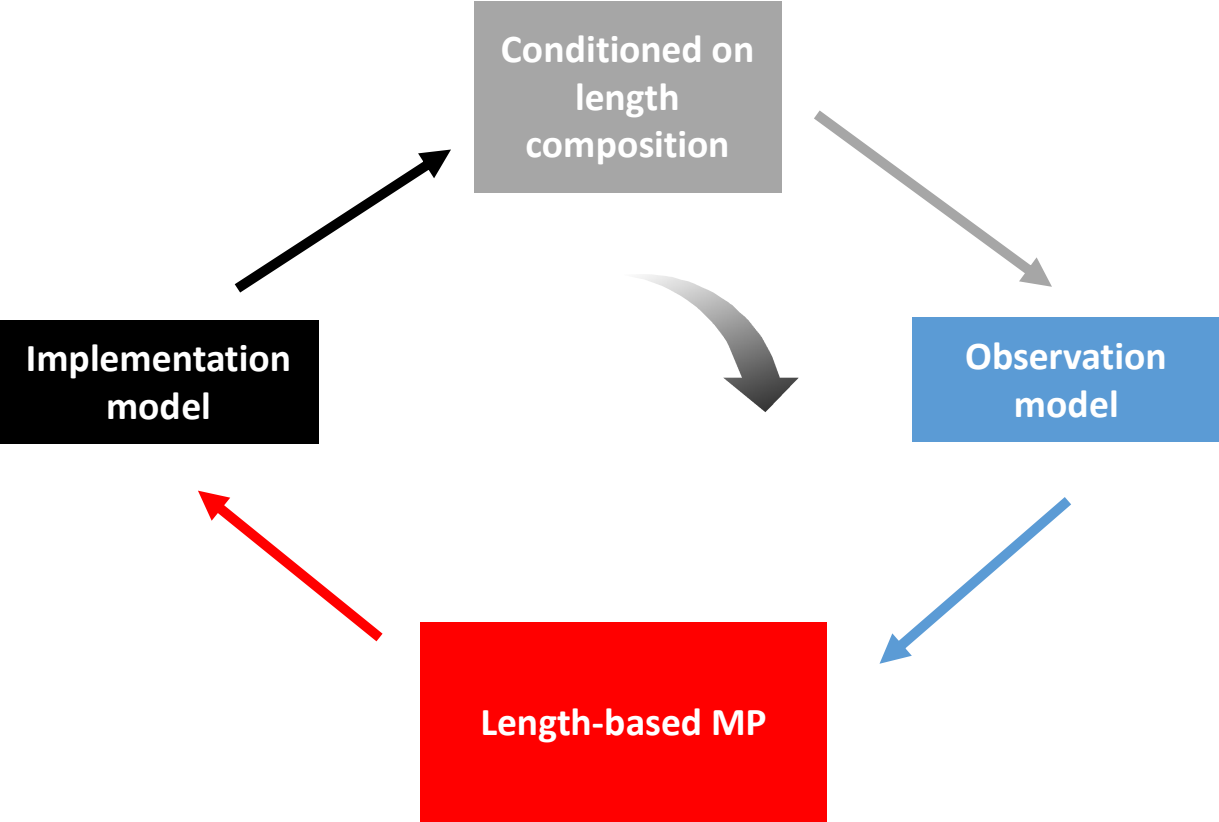


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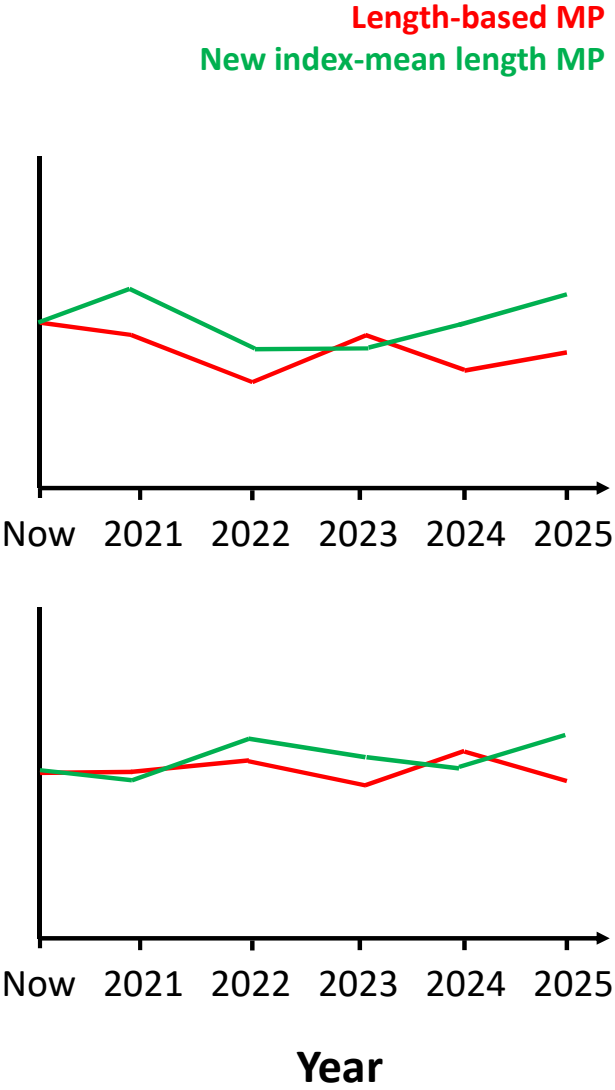
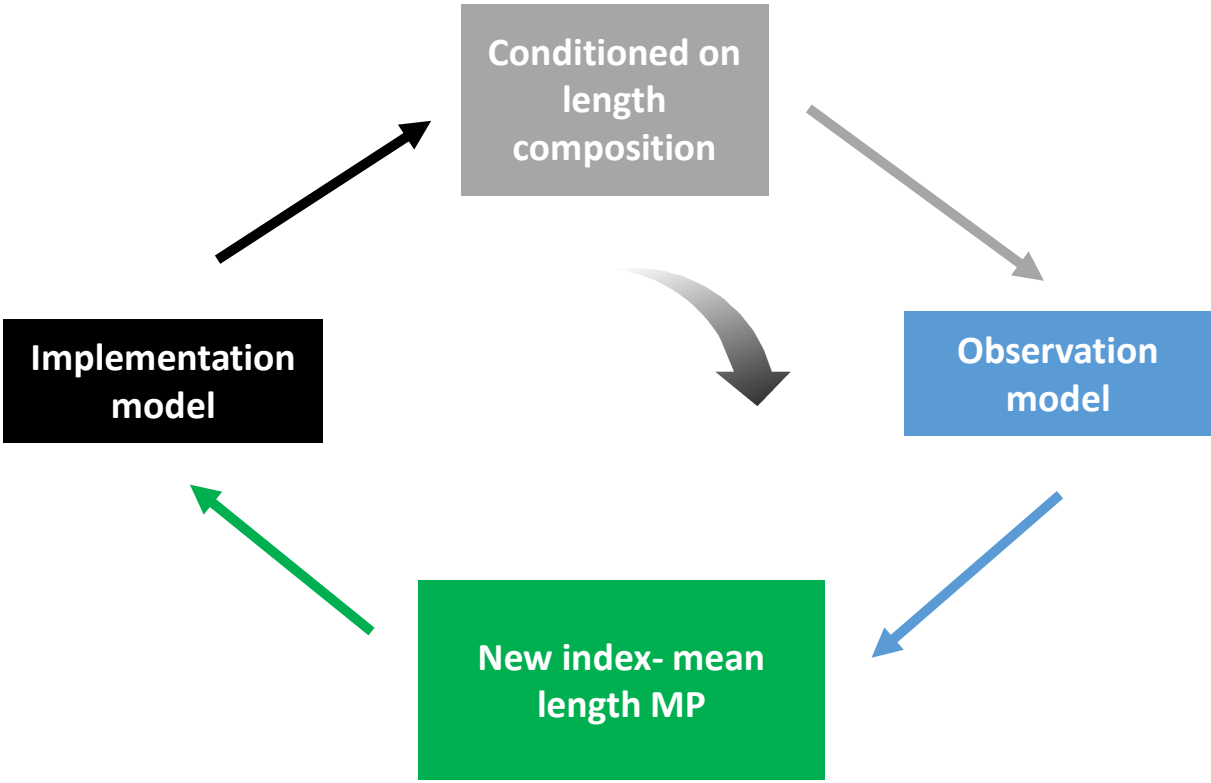


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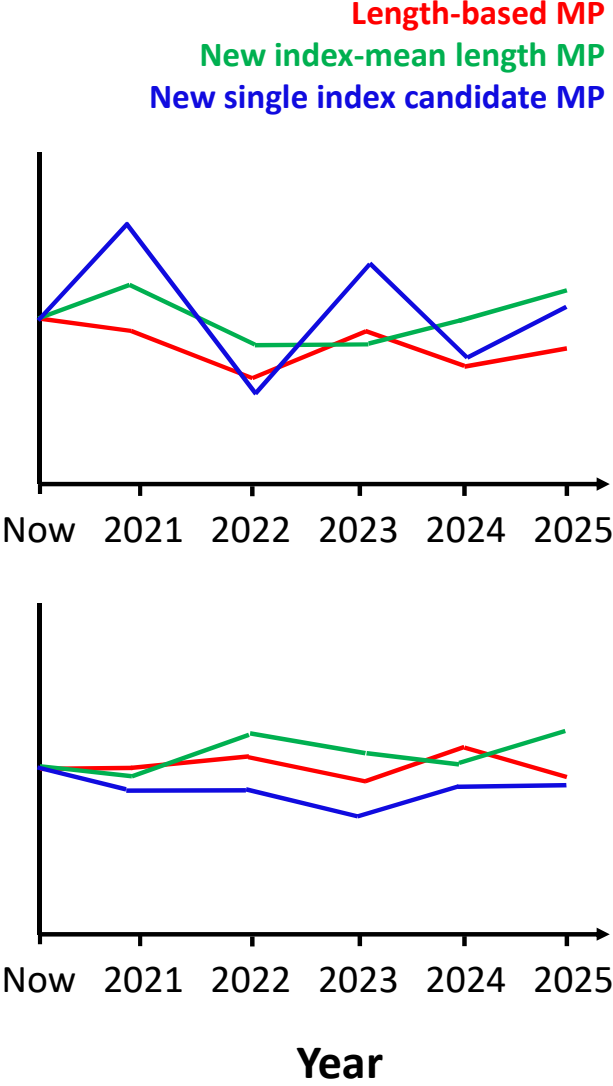
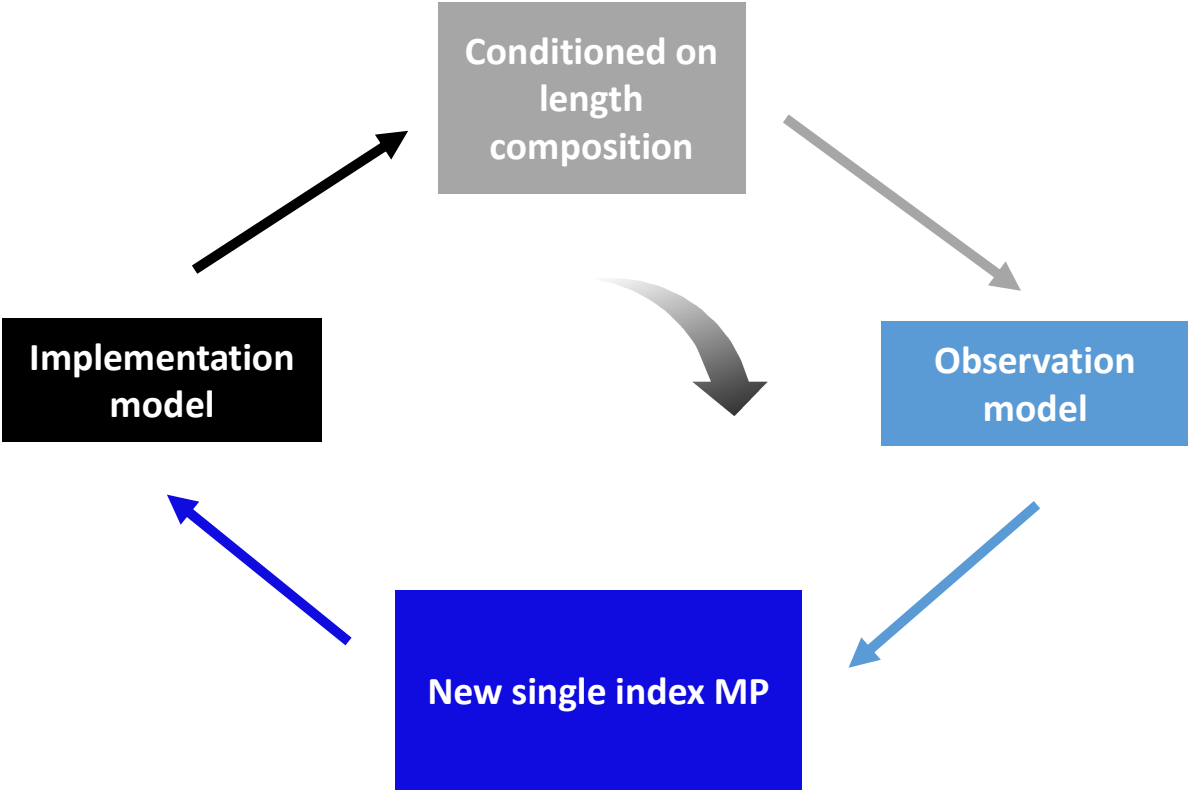


3. How closed-loop simulation can be used to evaluate management policies.

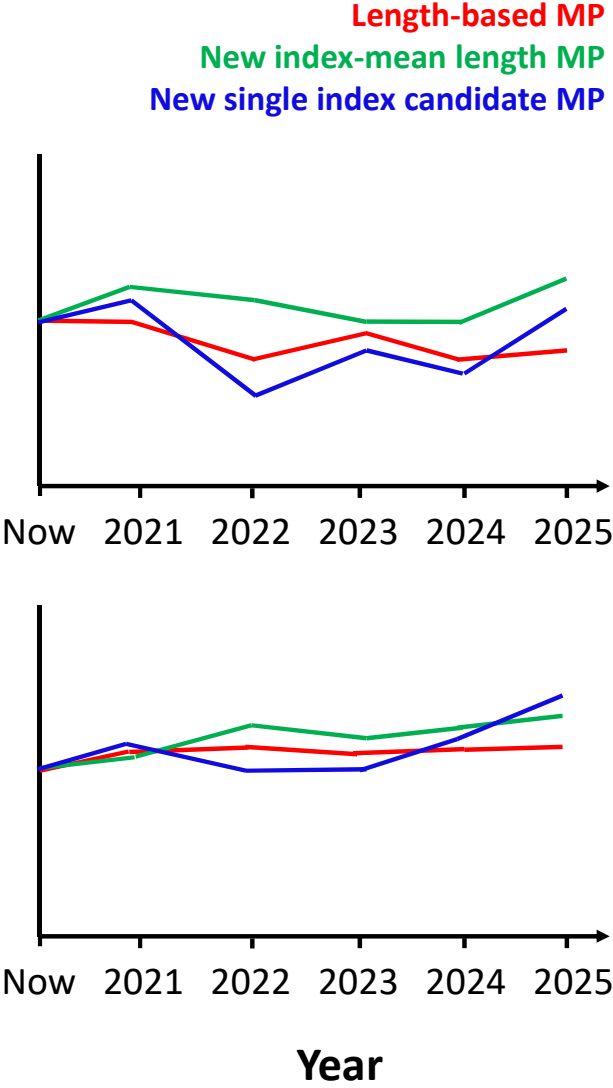
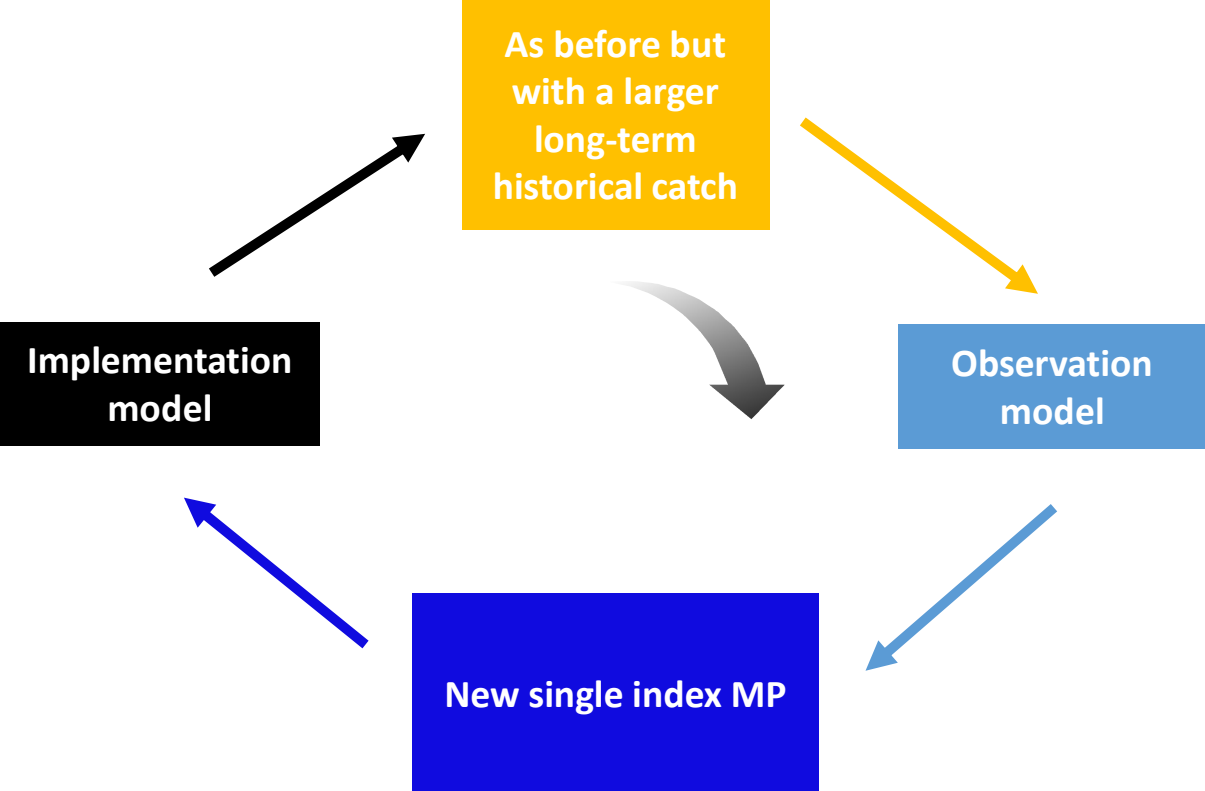
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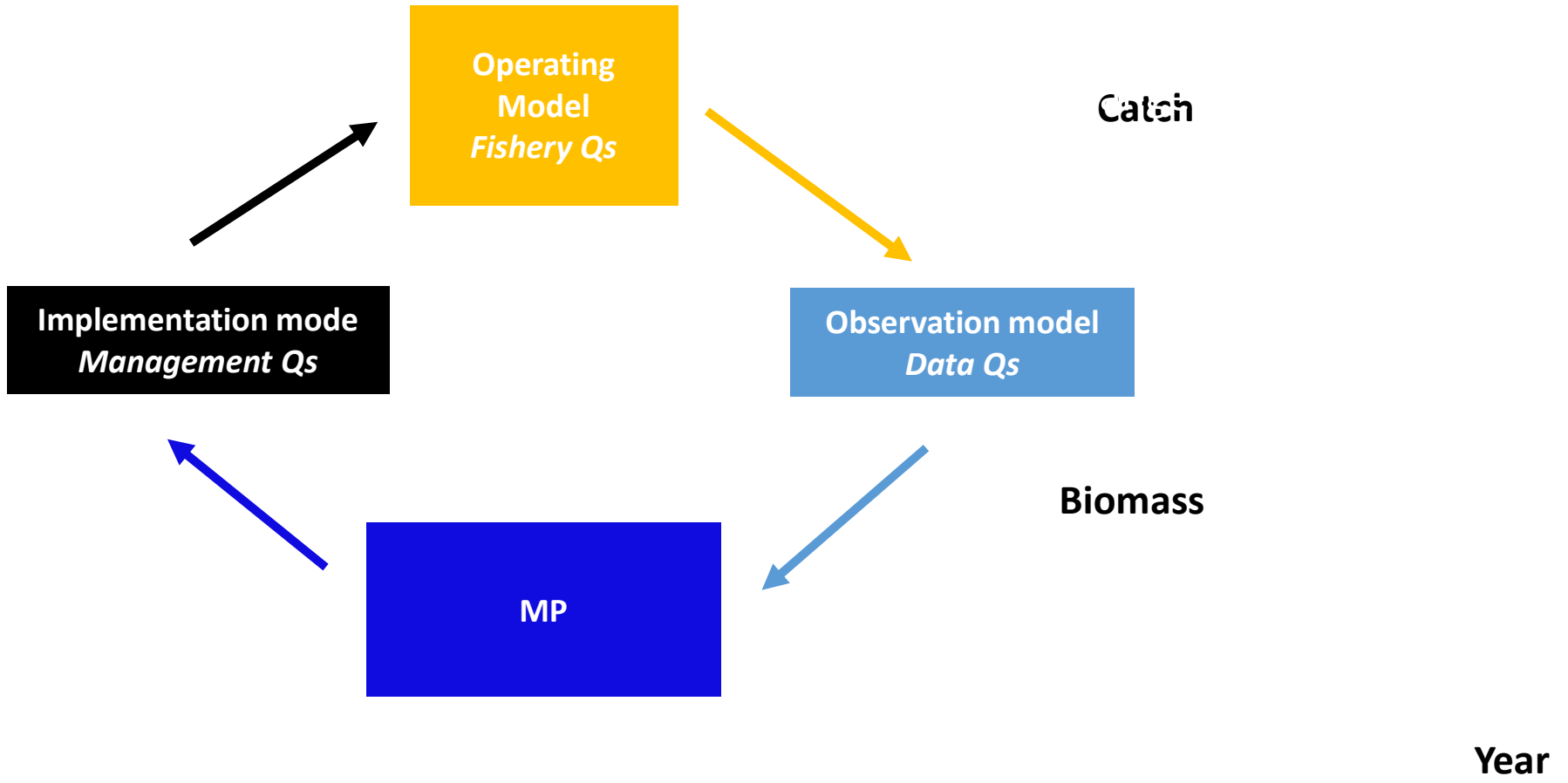


# Test by simulation: the MSE approach



# Test by simulation: the MSE approach





4. openMSE



# openMSE: Open Source Software for Management Strategy Evaluation

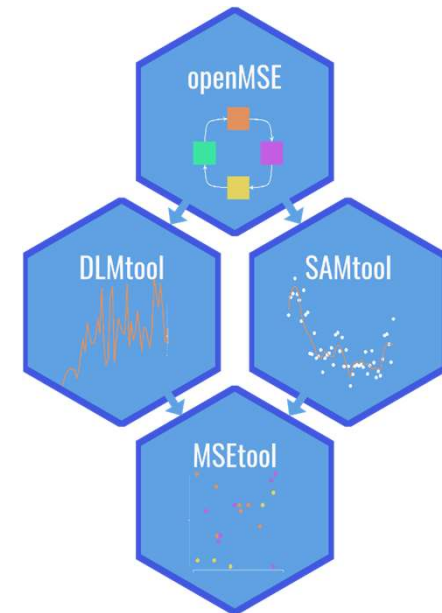
## openMSE

An umbrella R package for:

- Building Operating Models
- Analyzing fishery data
- Conducting Management Strategy Evaluation (MSE)

## Dependency Packages

- *MSEtool*: core openMSE package – building OMs and running MSE
- *DLMtool*: collection of data-limited management procedures
- *SAMtool*: collection of assessment methods and data-intensive MPs



# openMSE: Open Source Software for Management Strategy Evaluation

## Structure & Features

- Age-structured, spatial operating model
- Built with R (with C++ and parallel processing)
- Open-source: all code is freely available (<https://github.com/Blue-Matter>)
- 100+ MPs (data-limited, moderate, & rich)
- Extensible
- *Options for multi-stock/fleet OMs*
- *Unlimited spatial areas (+ movement by age)*
- *Option for bio-economic model*

# openMSE: Open Source Software for Management Strategy Evaluation

## Design Principle: Data-Poor to Data-Rich

### Design objectives:

- Build defensible & reproducible OMs across the spectrum of data availability
- Platform for testing management procedures (simple & complex) on a level playing field

### Limited Data:

- Quickly build OMs that capture main system dynamics and key uncertainties
- Parameters populated manually (e.g., expert opinion) with ranges
- Today

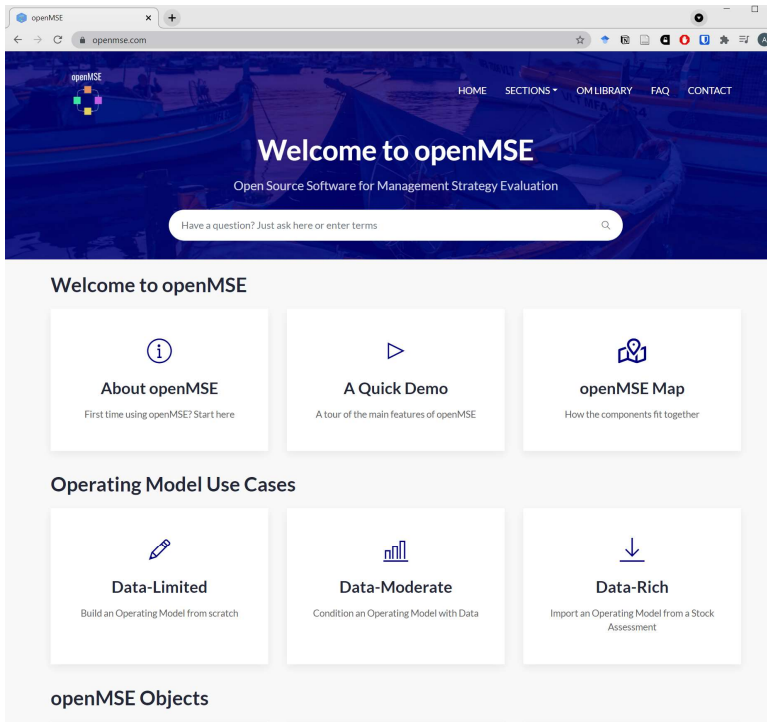
### More Data:

- Condition OMs with data
- Customize the OM (e.g., time-varying)
- Tomorrow and Friday

# openMSE: Open Source Software for Management Strategy Evaluation

## Getting Help

General Help - <https://openmse.com/>



## Function Help

In R console:

```
?runMSE
```

Online:

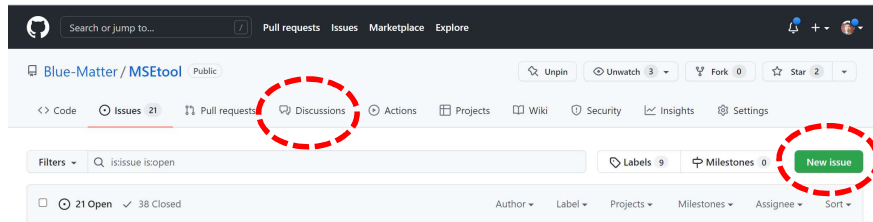
- <https://msetool.openmse.com/>
- <https://dlmtool.openmse.com/>
- <https://samtool.openmse.com/>

# openMSE: Open Source Software for Management Strategy Evaluation

## Getting Help

### Report a Problem

<https://github.com/Blue-Matter/MSEtool/issues>



### Questions & Discussion

<https://www.reddit.com/r/openMSE/>

