

# Healthcare Operation Modelling: a Systematic Literature Review

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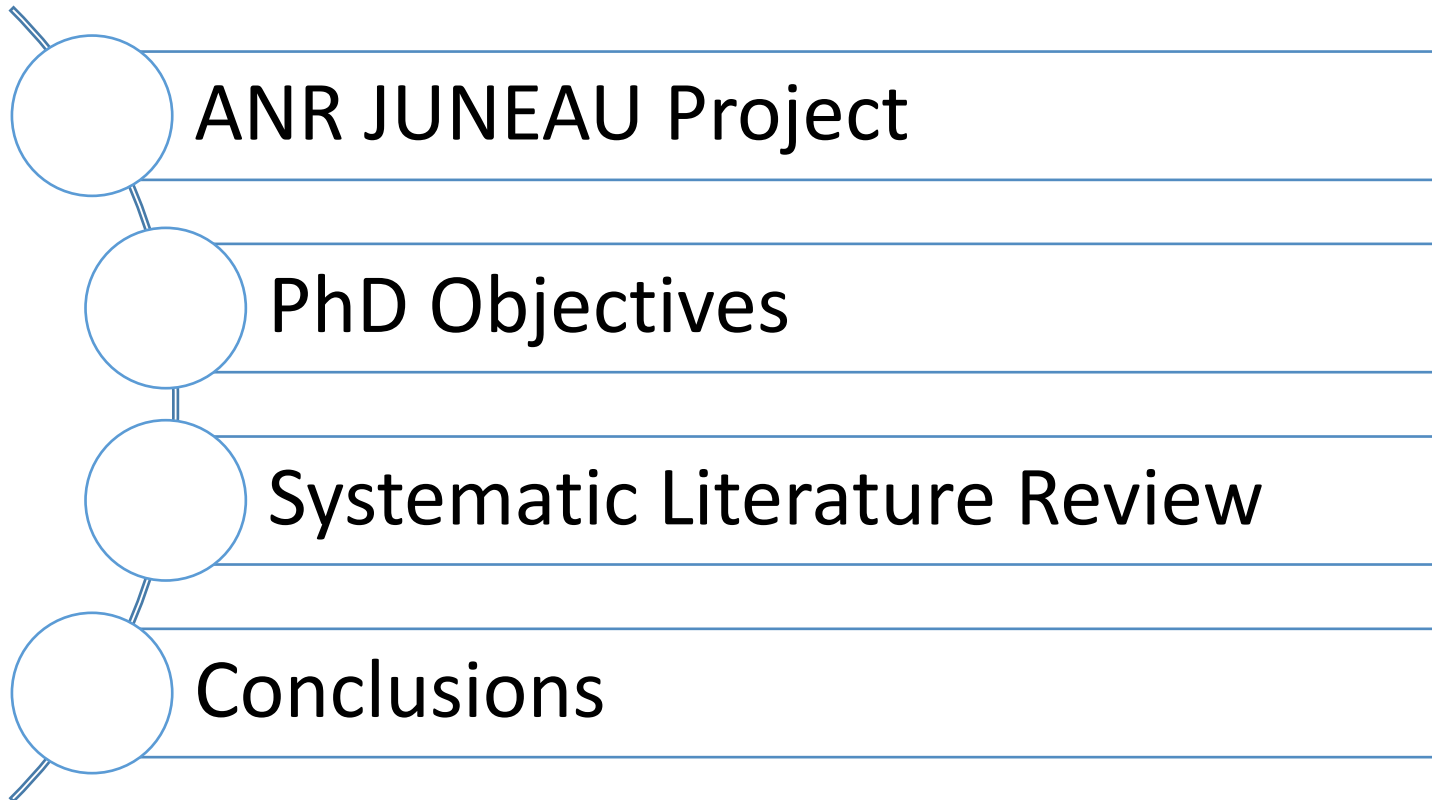
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## Content



# ANR JUNEAU Project



## PhD Objectives

### Generalisable Model

**1**

Research for patterns that guide the construction of a simulation model

Propose a methodology for the development of specific simulation models from generalisable models

**2**

### Digital Twin Update

Identify what to update

Use the proposed methodology to speed up the update of the simulation model within the Human-based Digital Twin

## Systematic Literature Review: Objectives

**1.**

### **CONTEXT**

Characterization of the simulation model's context

**2.**

### **MODEL**

Features of the models and its relationship with its abstraction level

**3.**

### **TWINNING**

Connection between the physical and cyber worlds

## Systematic Literature Review: Query

Executed on Scopus and ISI Web of Science

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TITLE-ABS-KEY ( ( "DISCRETE EVENT SIMULATION" OR "DES" OR  
"SIMULATION MODELS" OR "BEHAVIOUR MODELS" OR "BEHAVIOR  
MODELS" ) AND ( "HEALTHCARE" OR "ED" OR "EMERGENCY  
DEPARTMENT" ) )  
AND PUBYEAR > 2016 AND PUBYEAR < 2024
```

## Evaluation Framework: Context

Category	Criteria	Conducting question
Context	Sector	For which sector is the model applied to?
	Type of problem	What is the problem that the model is trying to relieve?
	System of interest	Which is the real system that is being modelled?
	Purpose	What is the purpose of the model?

## Evaluation Framework: Model

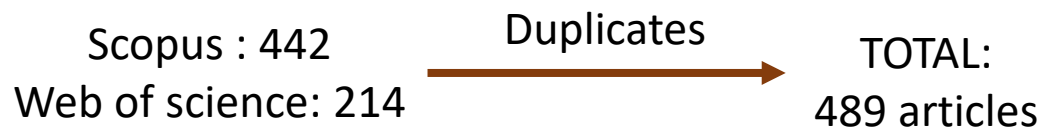
Category	Criteria	Conducting question
Model	Modelling technique	Which modelling technique is used?
	Abstraction level	Which is the level of abstraction of the model? (generic, generalisable or specific)
	Update	How can the model be updated and when?
	Reusability	How can the model be reused and under what conditions?



## Evaluation Framework: Twinning

Category	Criteria	Conducting question
Twinning	Data exchange	What type of data is being exchanged?
	Type	What type of twinning is supported by the model? (Digital Twin, human-based DT, Digital Shadow, Digital Model)
	Connection	What kind of connection do the physical and the virtual world have? (No connection, Unidirectional, Bidirectional)
	Real time	Is the connection between the physical and cyber world in real time? How is it made?

## Systematic Literature Review: Search



**1**

**2**

**3**

489 articles

281 articles

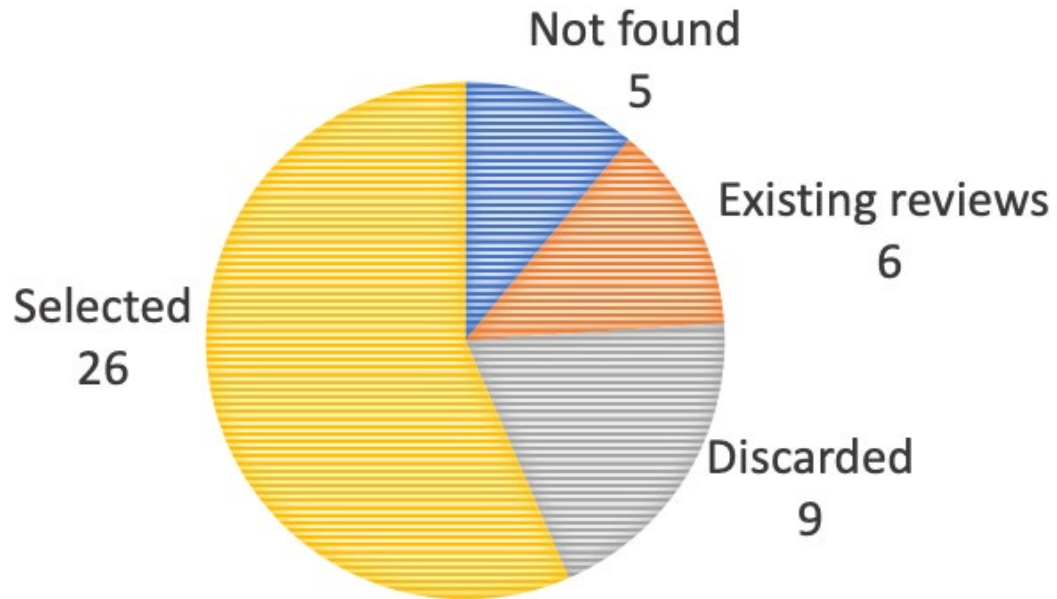
46 articles

Title  
Source

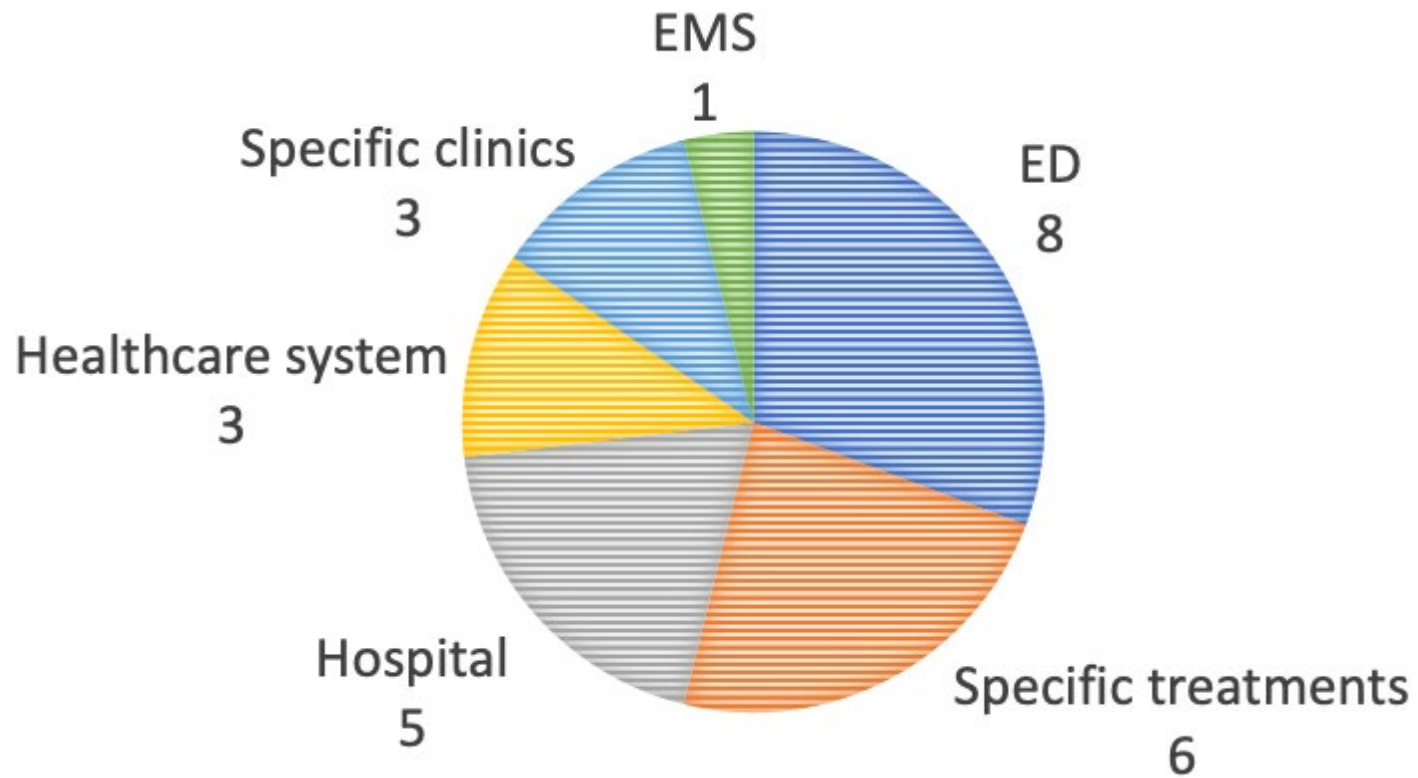
Abstract  
Key words

## Systematic Literature Review: Search

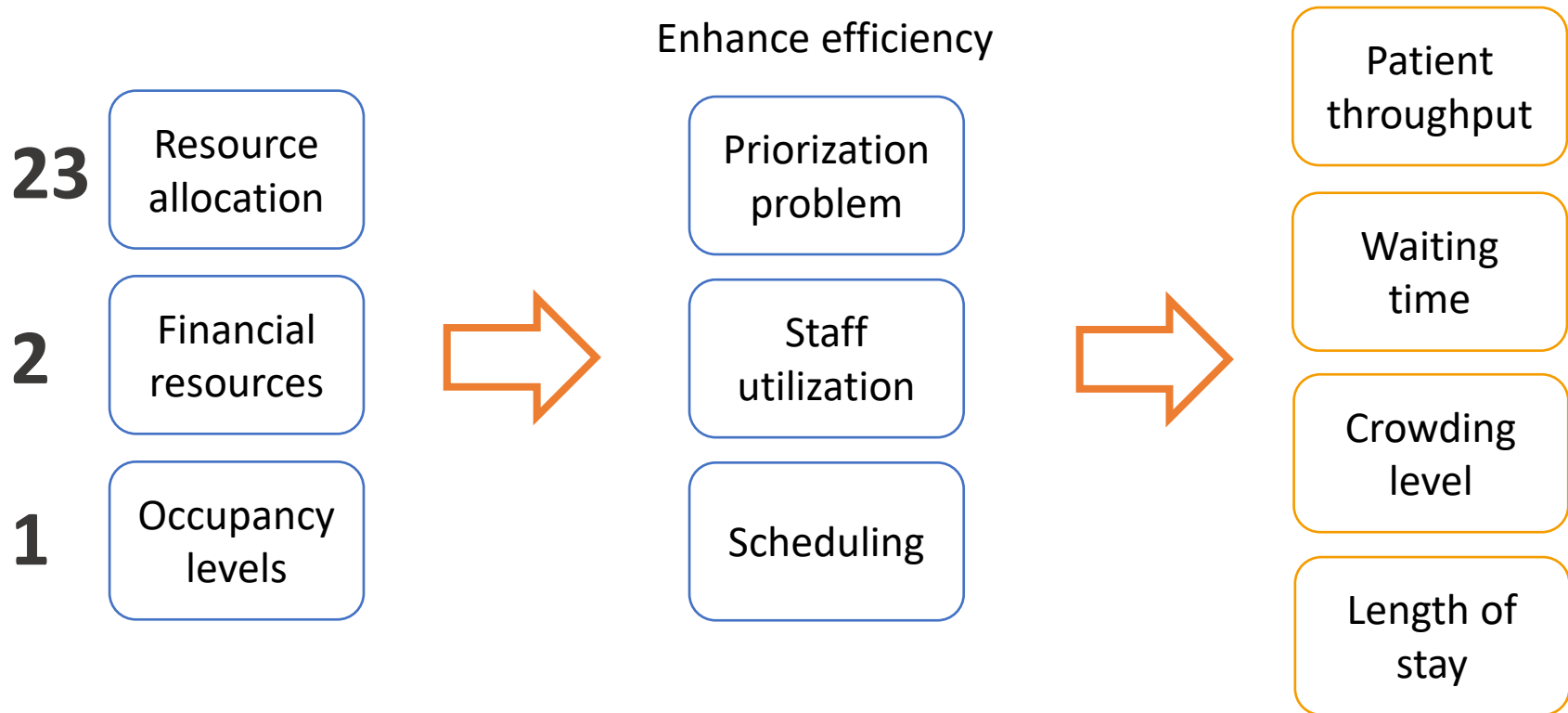
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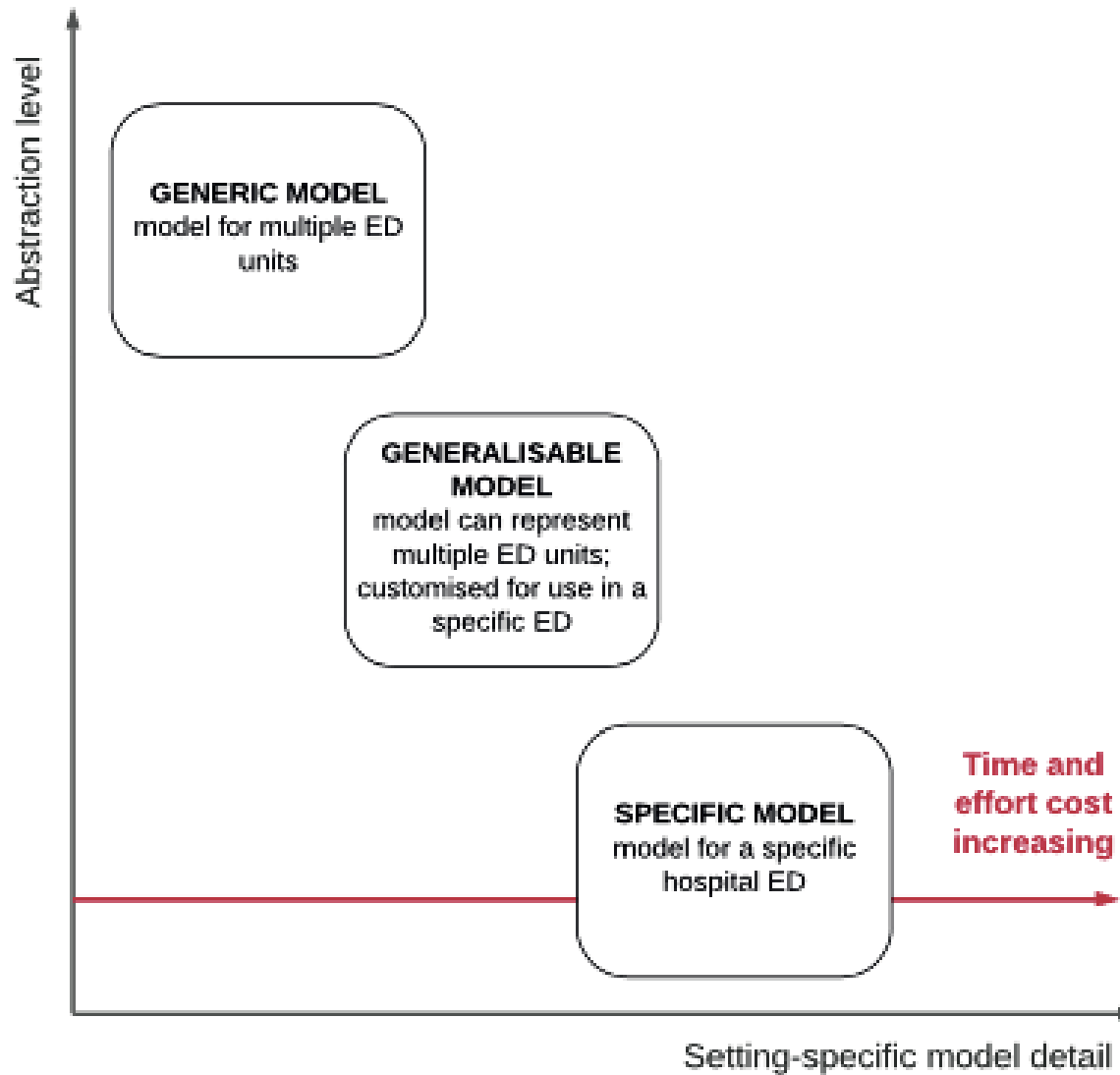


## SECTORS

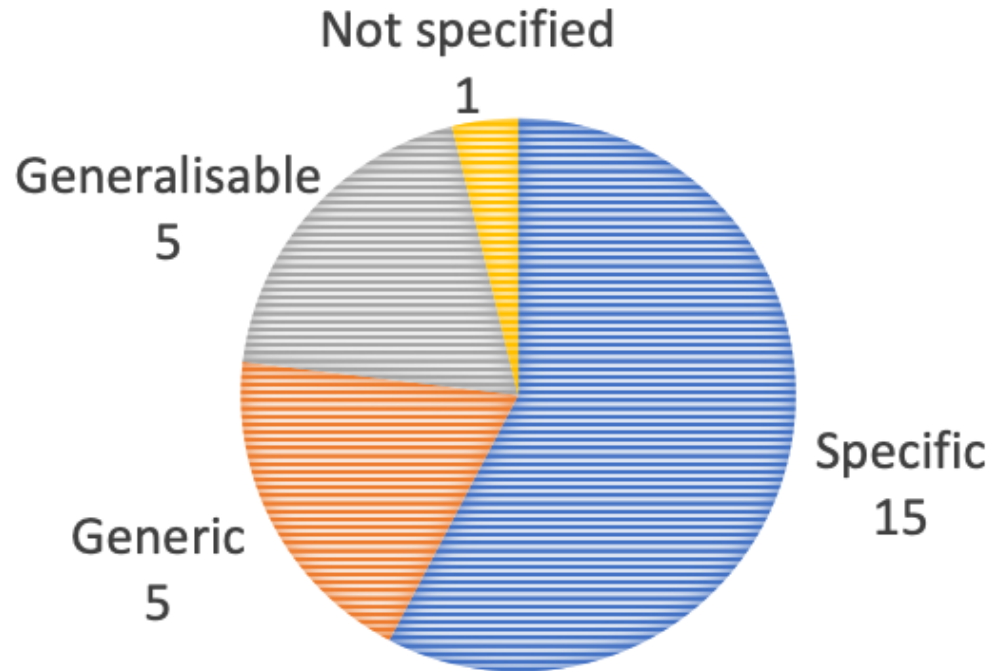


## Purpose & KPIs

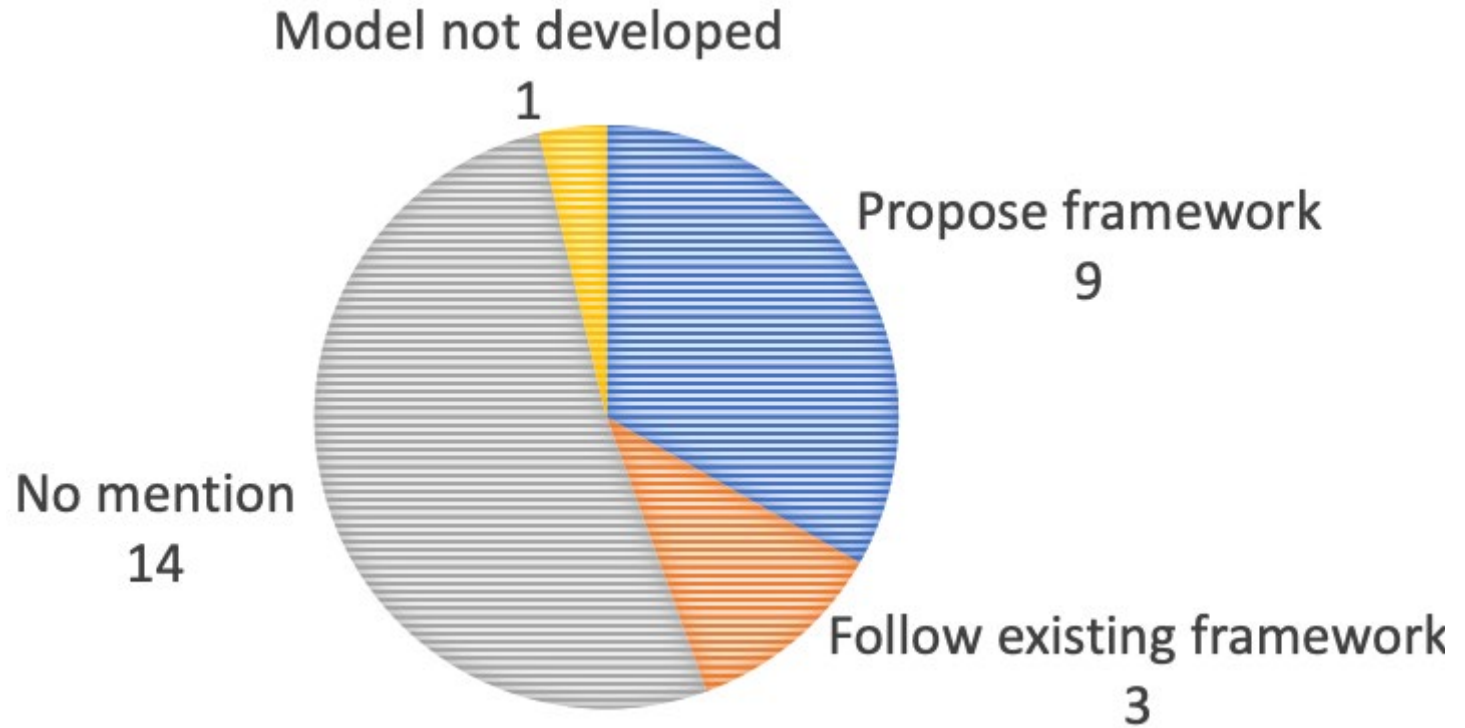




# ABSTRACTION LEVELS

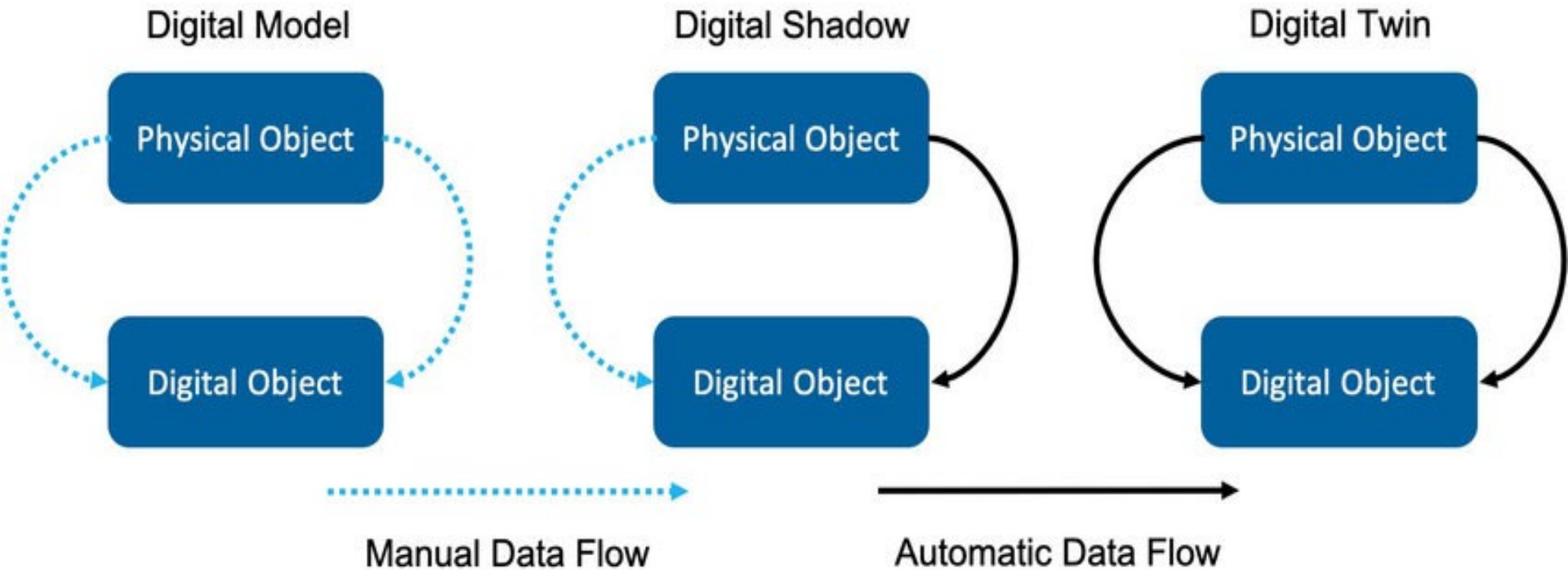


# MODEL CONSTRUCTION





# TWINNING



## Conclusions

### Abstraction levels

- Most of the models are in the specific level
- Some generic and generalisable models

=> **Limited reusability**

### Patterns

- Existing generalisable models are not exploited to build specific models
- Available toolboxes and frameworks for generic and generalisable model development

=> **In-depth study of them and adaptation possibilities**

### Twinning

- Few Digital Twins in Healthcare
- Update on the digital twins is not mentioned.

=> **Exploring other sectors is required.**

Thank you for your attention

Questions?