



HFES + INTERNATIONAL SYMPOSIUM



on Human Factors and
Ergonomics in Health Care

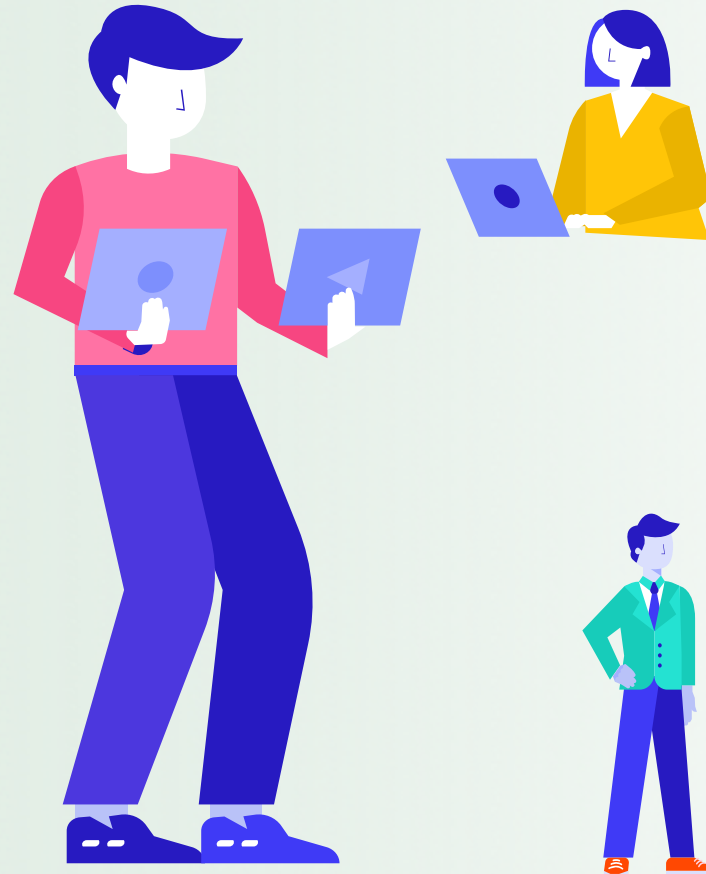
HFES
Systems That Work for **Humans**

2022

UX for healthcare analytics using a mental model
Kimberly Dunwoody, EdD
IBM Watson Health

What is a mental model?

Designer



Mental Model = User's expectation of how something should or does work

Conceptual Model = High-level plan of how a product will work

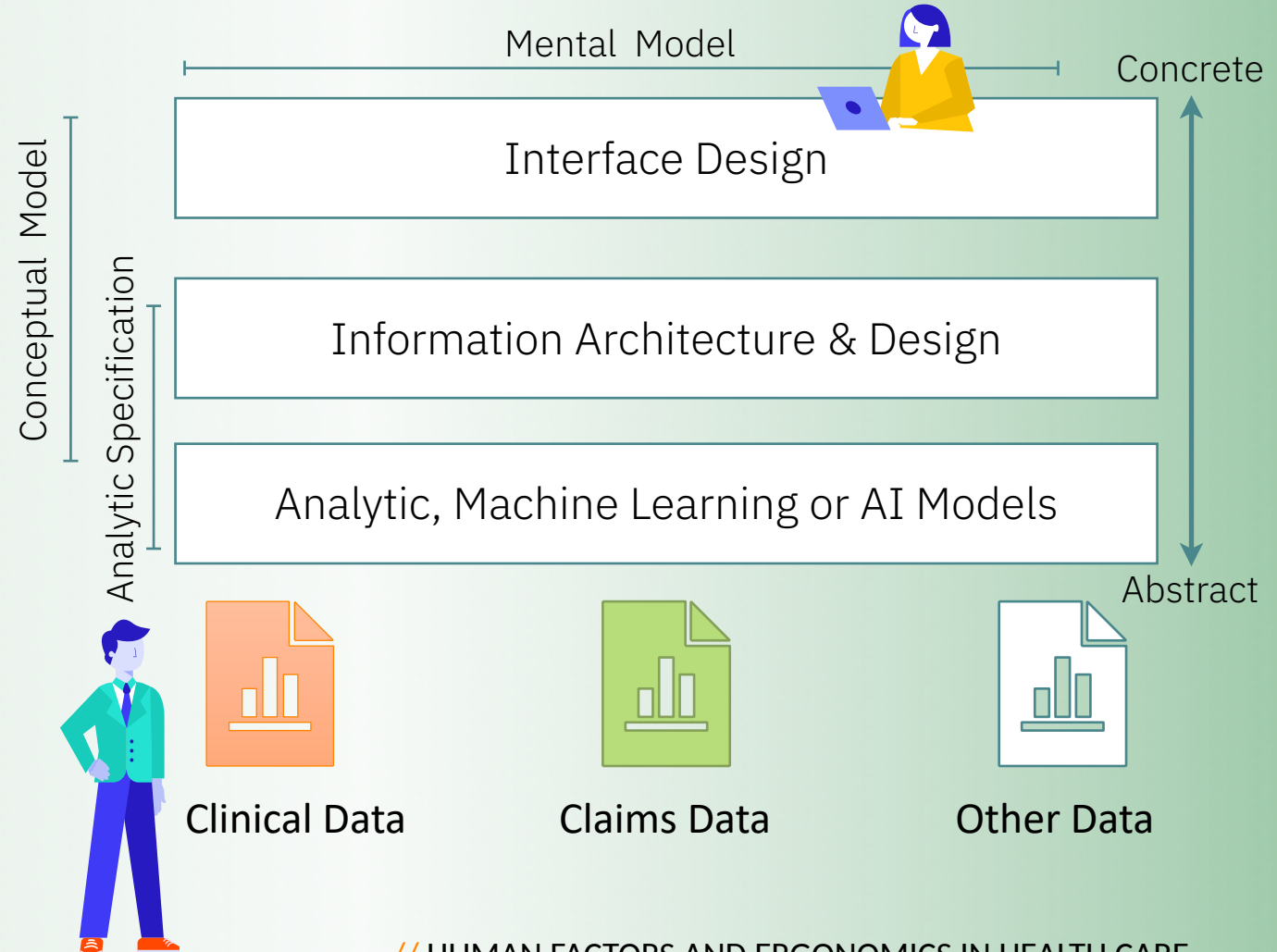
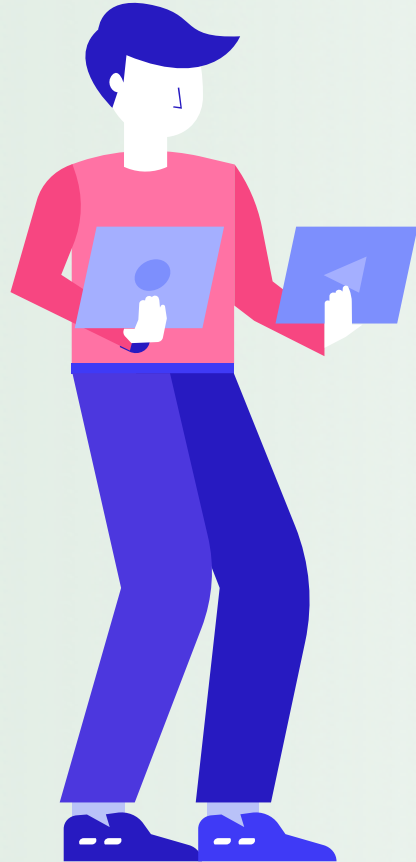
Analytic Specification = Description of how a model does work

Concrete

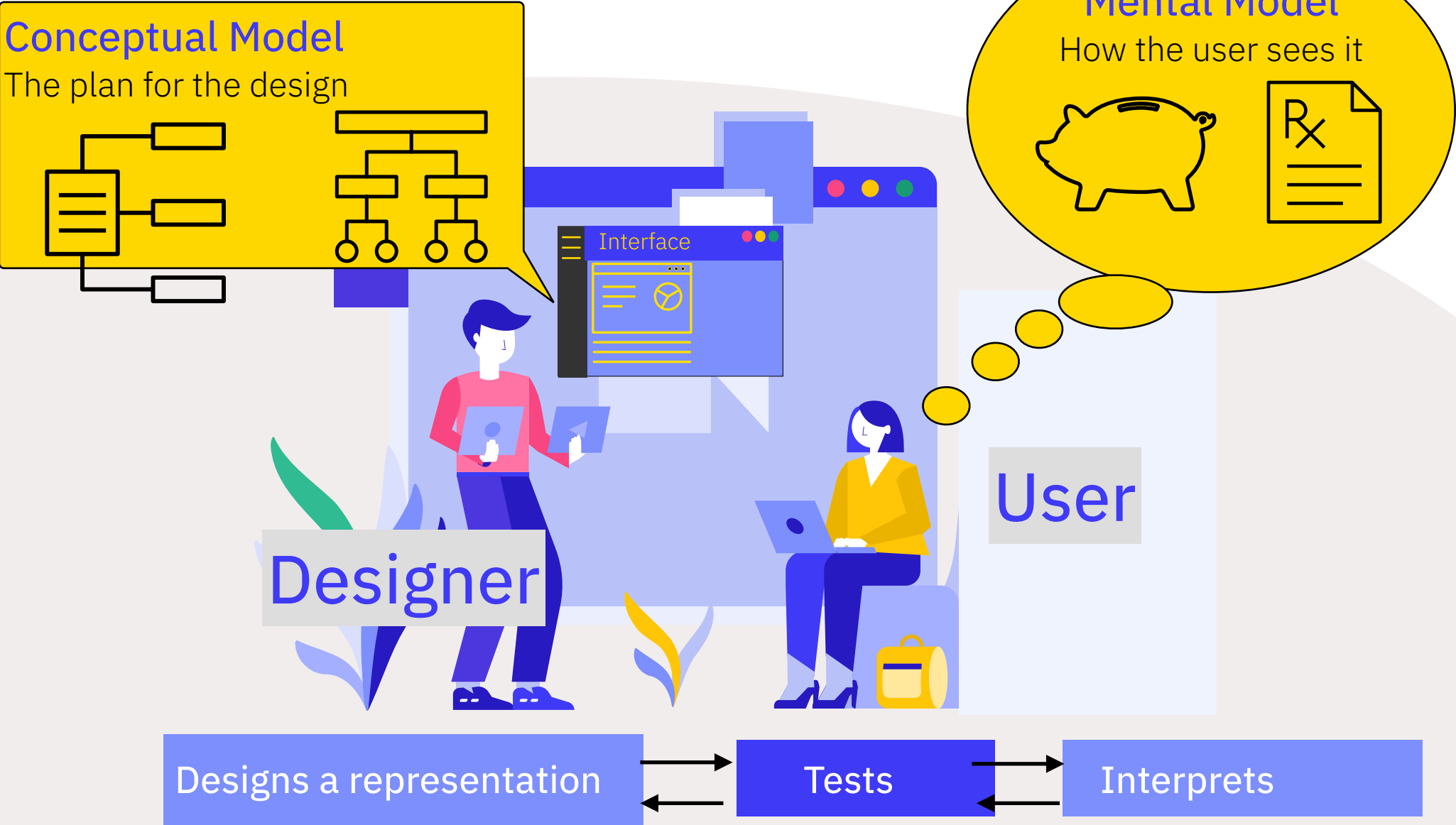
Abstract

Mental models in a UX context

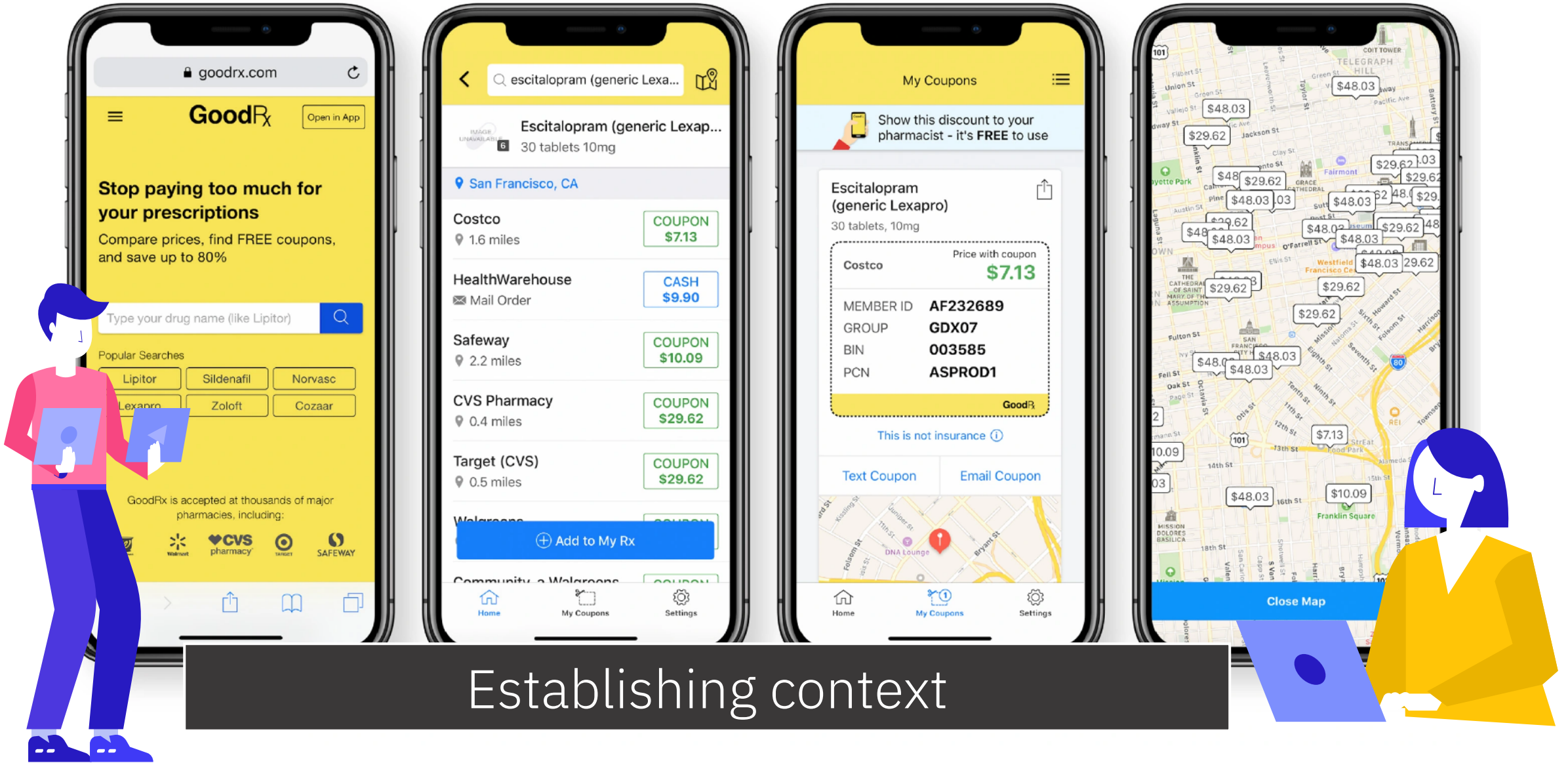
Designer



Prescription Cost Estimate

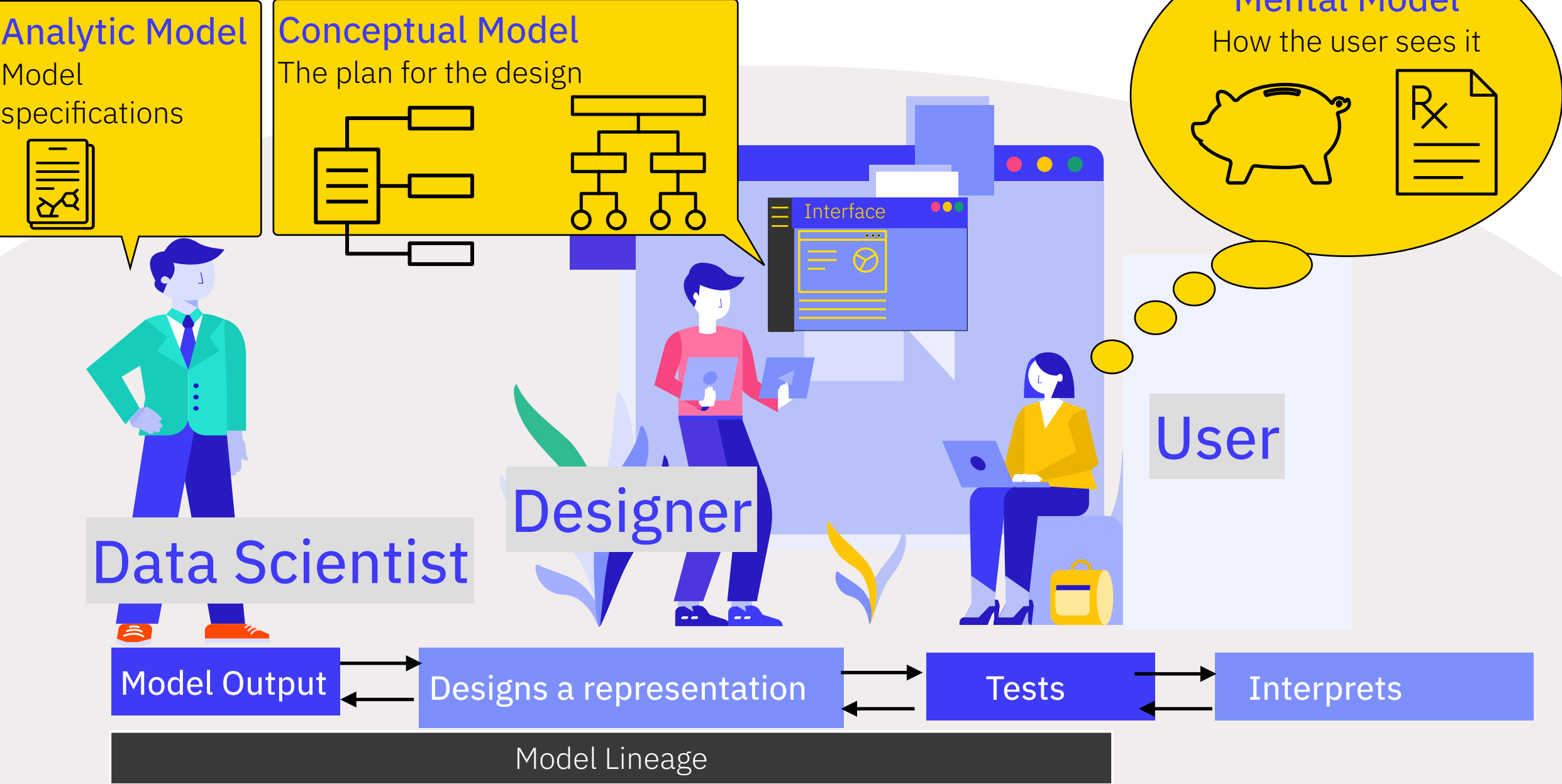


Prescription Cost Estimate



Establishing context

Prescription Cost Estimate using Episode of Care Model



Aligning the Analytic Model to the Conceptual Model

Establishing context

To create a more accurate estimate my model needs to know:

- What is the Episode of Care?
- What is the Setting of Care?
- Does this patient have other comorbidities?

To help answer those questions let's start narrowing down the user context.

Will this estimate cover inpatient or outpatient episodes?

aka use cases

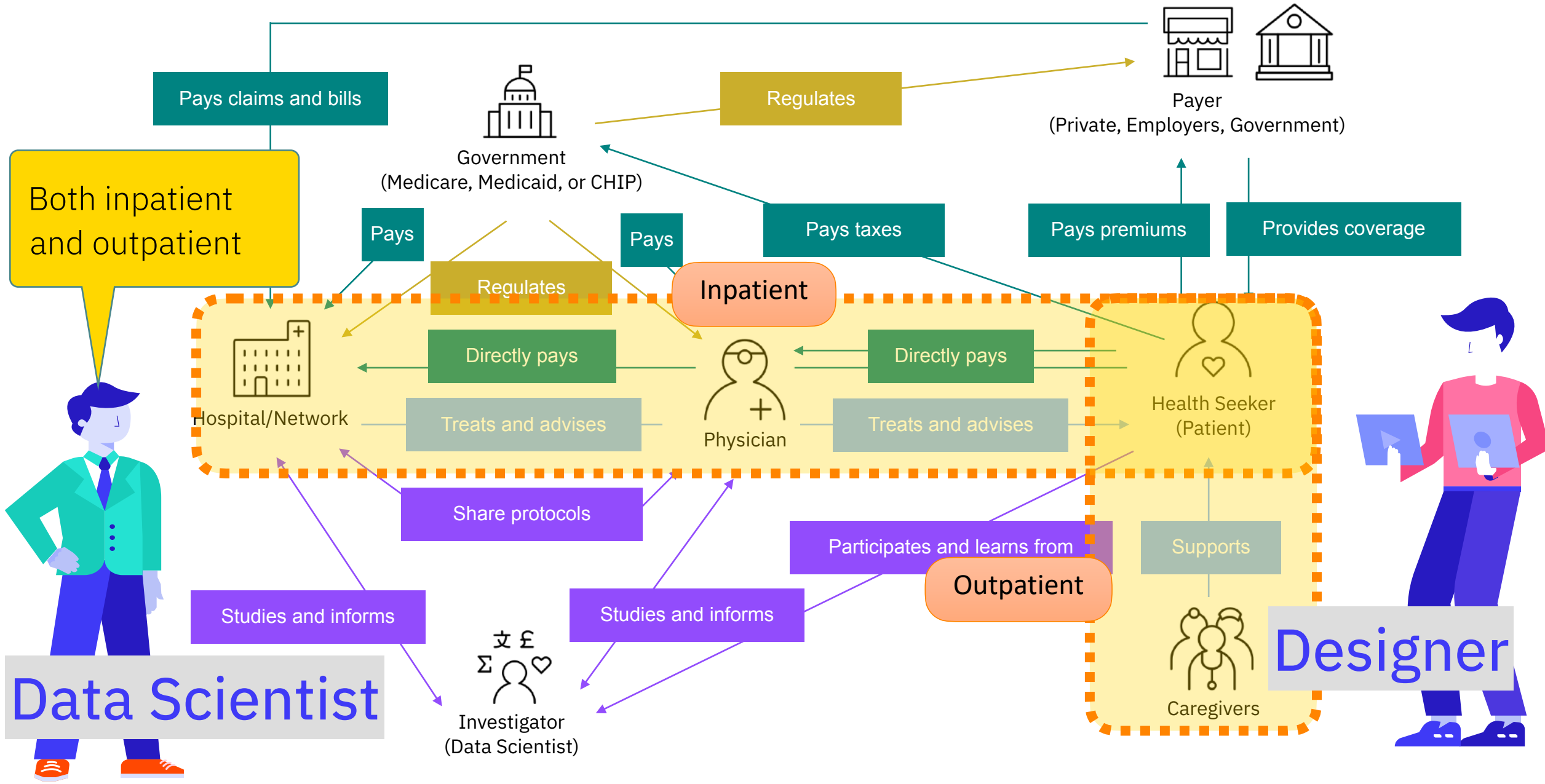
Data Scientist

Model Output

Designs a representation

Designer

Healthcare User Logic Context



So the user's **Mental Model** will ultimately need to include:

- Both Inpatient and Outpatient
- A specific episode of care and
- Any related comorbidities

Interprets

Tests

Next let's build our **Healthcare Conceptual Model** for this design:

Utilization

Financial

Quality

User

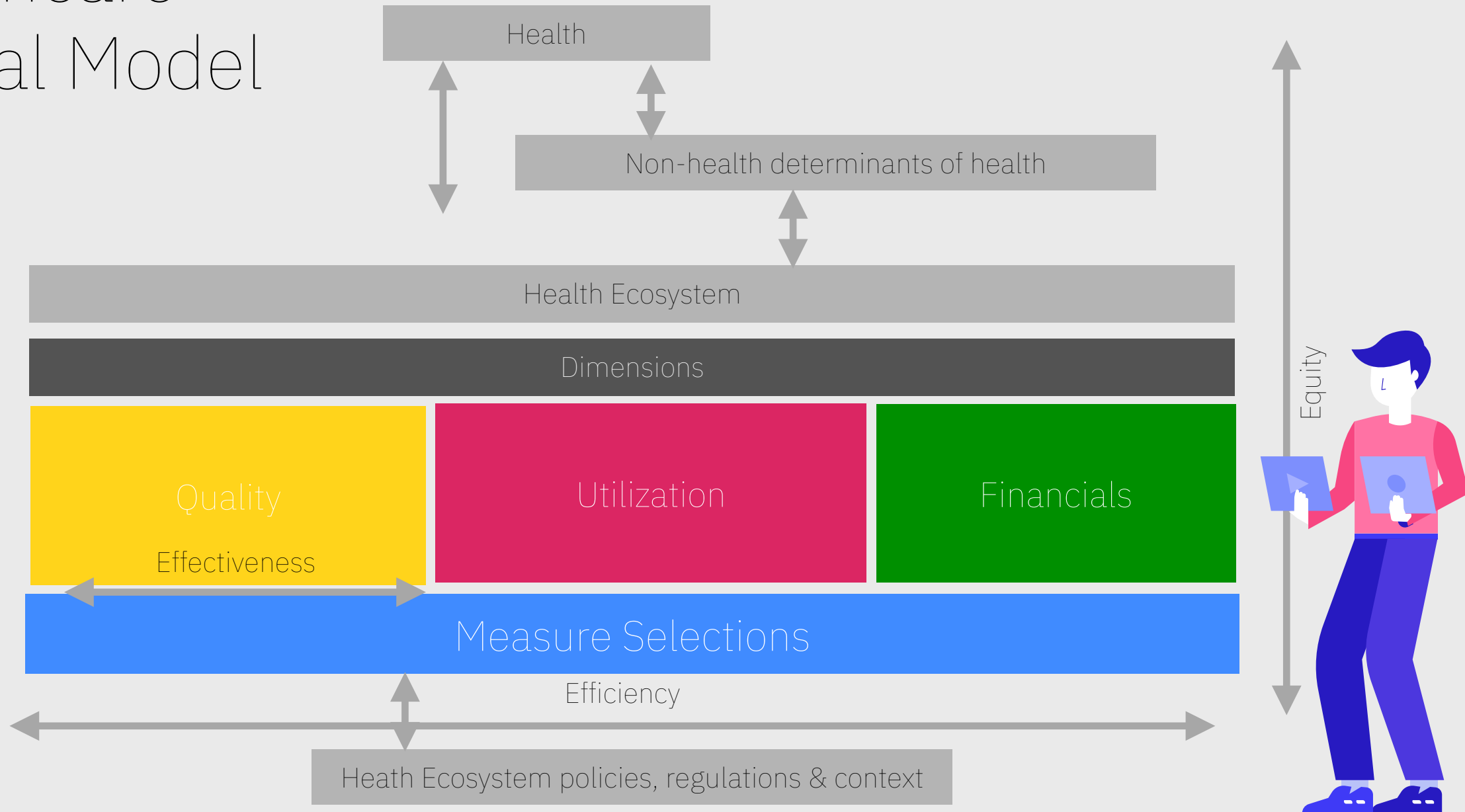
Data Scientist

Model Output

Designs a representation

Designer

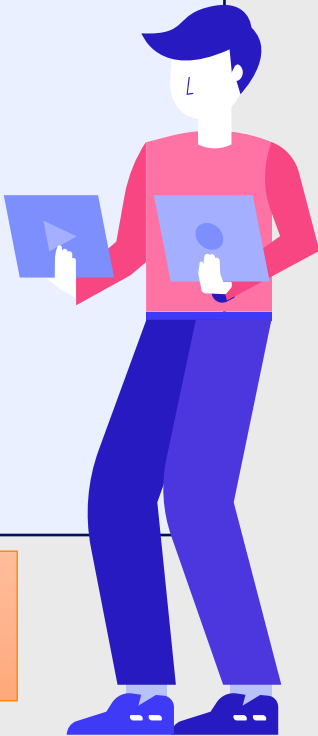
Healthcare Mental Model



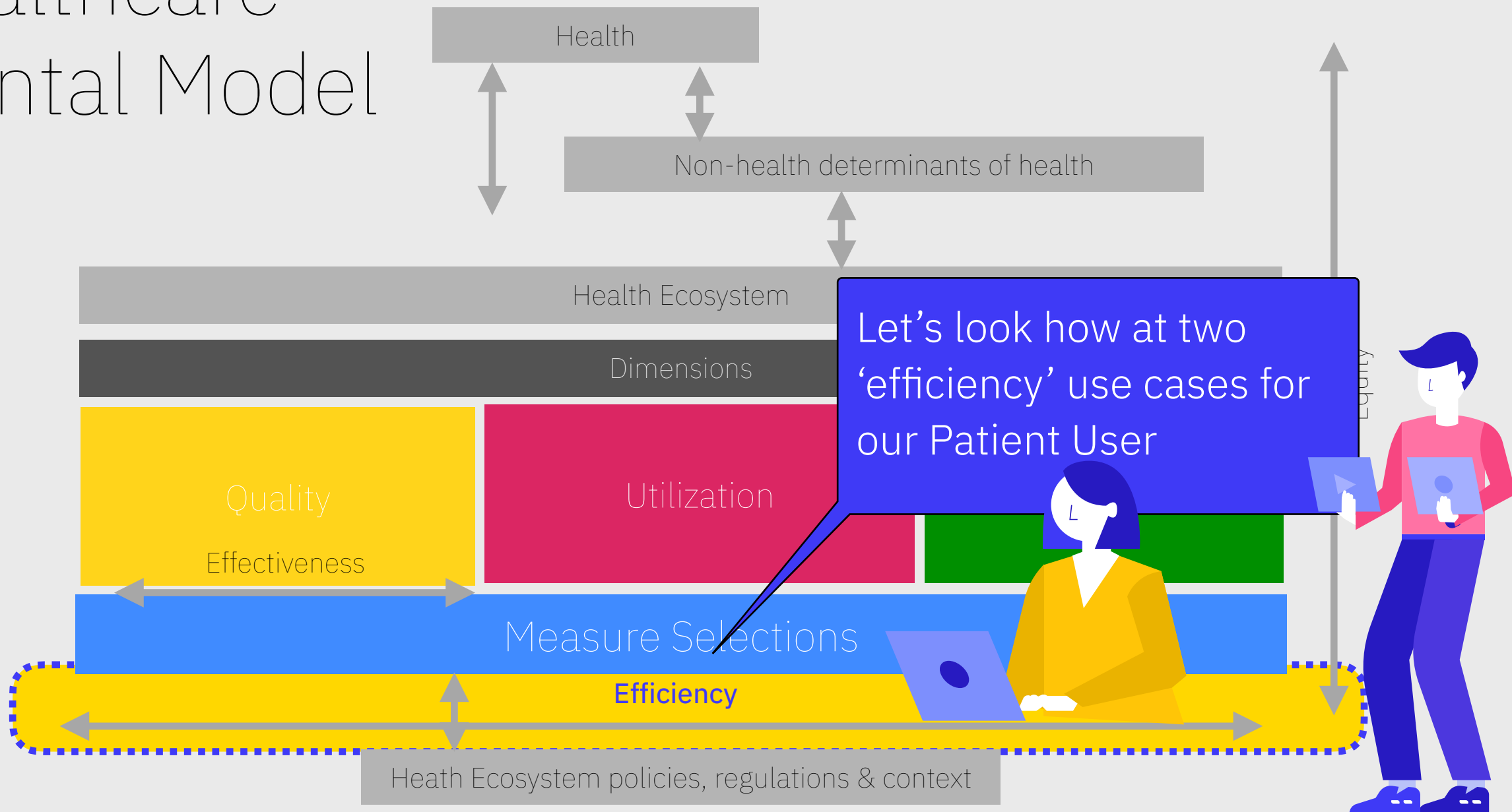
Healthcare Conceptual Model Information Architecture

Effectiveness	Efficiency	Equity
Quality	QualityUtilizationFinancial	
<p>Effectiveness measures seek to measure the quality of care based on scientific knowledge and evidence-based guidelines.</p> <p>The Centers for Medicare & Medicaid Services (CMS) uses outcome measures to calculate overall hospital quality. In a 2018 report, CMS explained how it arrived at its 2018 hospital star ratings. CMS grouped outcome measures into seven categories weighted by importance:</p> <ul style="list-style-type: none">• Mortality (22 percent)• Safety of care (22 percent)• Readmissions (22 percent)• Patient experience (22 percent)• Effectiveness of care (4 percent)• Timeliness of care (4 percent)• Efficient use of medical imaging (4 percent)	<p>Efficiency seeks to compare healthcare deliver output such as:</p> <ul style="list-style-type: none">• Physician Visits• Relative Value Units (RVU)- measure of value used in the United States Medicare reimbursement formula for physician services• Health Outcomes• Cost• Time• Material <p>Often reported as a ratio of outputs vs. inputs or comparison to optimal productivity. These comparisons must be normalized in order to be useful. For example, if hospital A discharges 100 people at an average cost of \$8000, while hospital B discharges 100 at \$7000, the presumption may be that B is more efficient, but hospital B may be discharging patients with poorer health that will require readmission and net higher costs to treat.</p>	<p>Health equity means giving patients the care they need when they need it. Or as the Institute of Medicine (IOM) report put it, health equity means “providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.”</p>

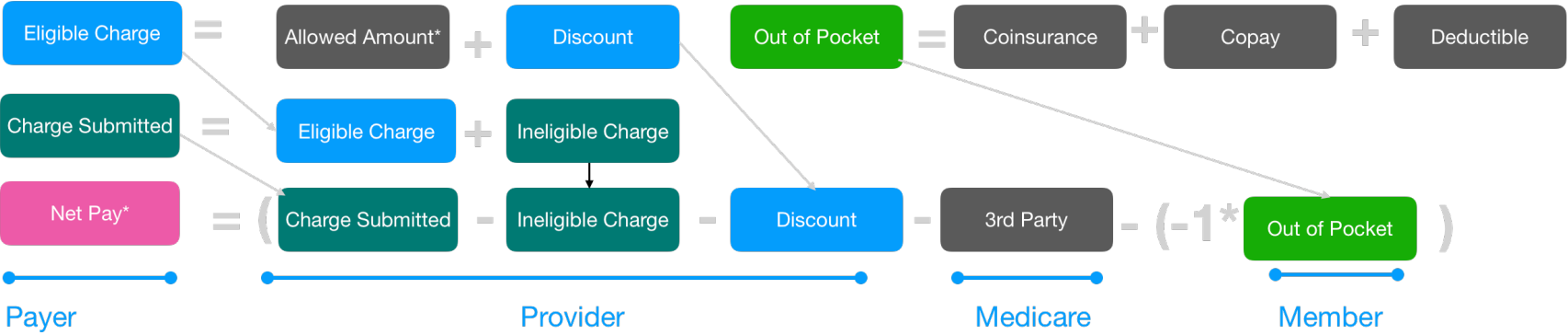
Note: Effectiveness, Efficiency, and Equity are [critical to](#) organizing our information architecture used for our [metadata strategy to locate assets across multiple experience modalities](#).



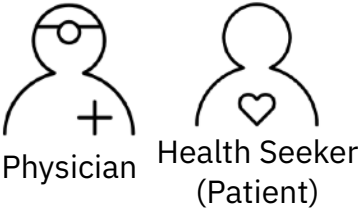
Healthcare Mental Model



Financial Measure Information Design



Healthcare Logic Context



Who bears cost?

Simple Estimate *Efficiency*

Conceptual Model:

- Retail Pharmacy
- Out of Pocket <\$50

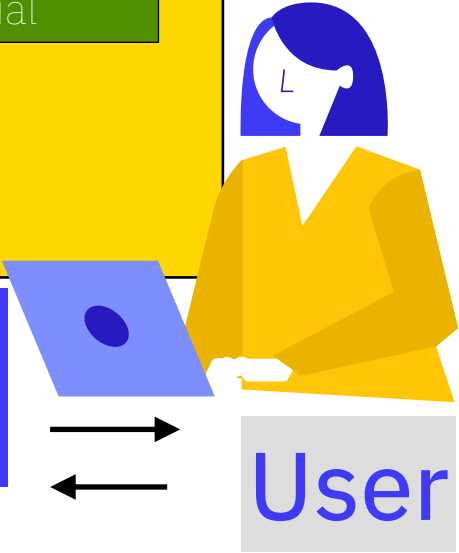
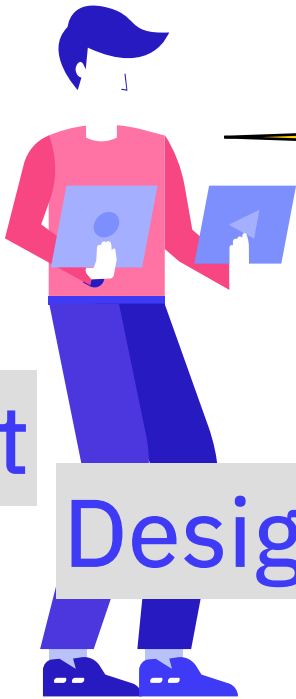


Data Scientist

Designer

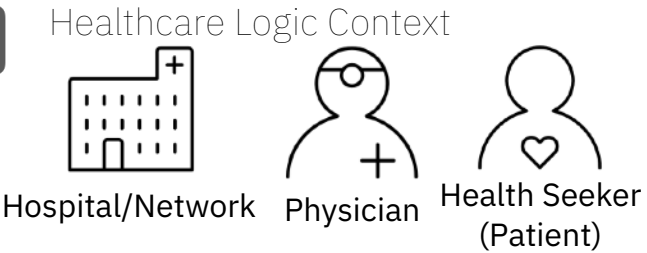
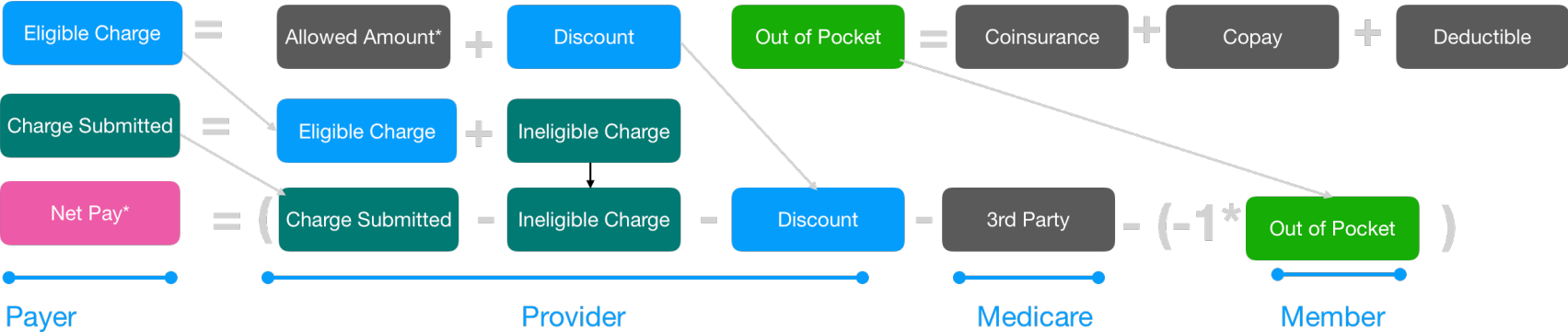
Design Hypothesis: Limited testing, tool similar to other estimation tools

User



Financial

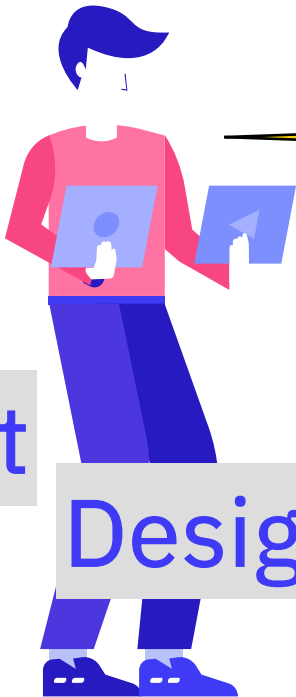
Measure Information Design



Who bears cost?



Data Scientist



Designer

Episode Estimate *Efficiency*

Conceptual Model:

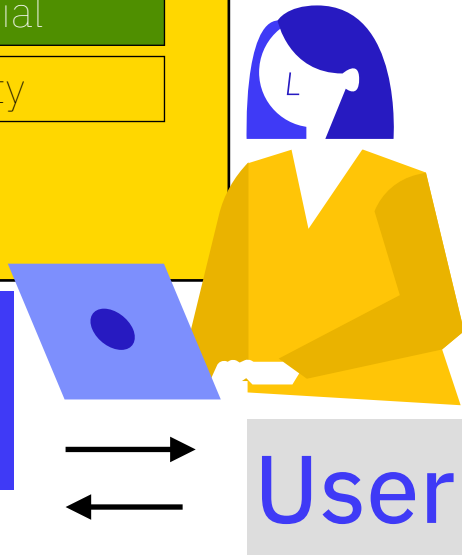
- Inpatient Pharmacy
- Out of Pocket
- Intravenous Drug

Utilization (pink box)

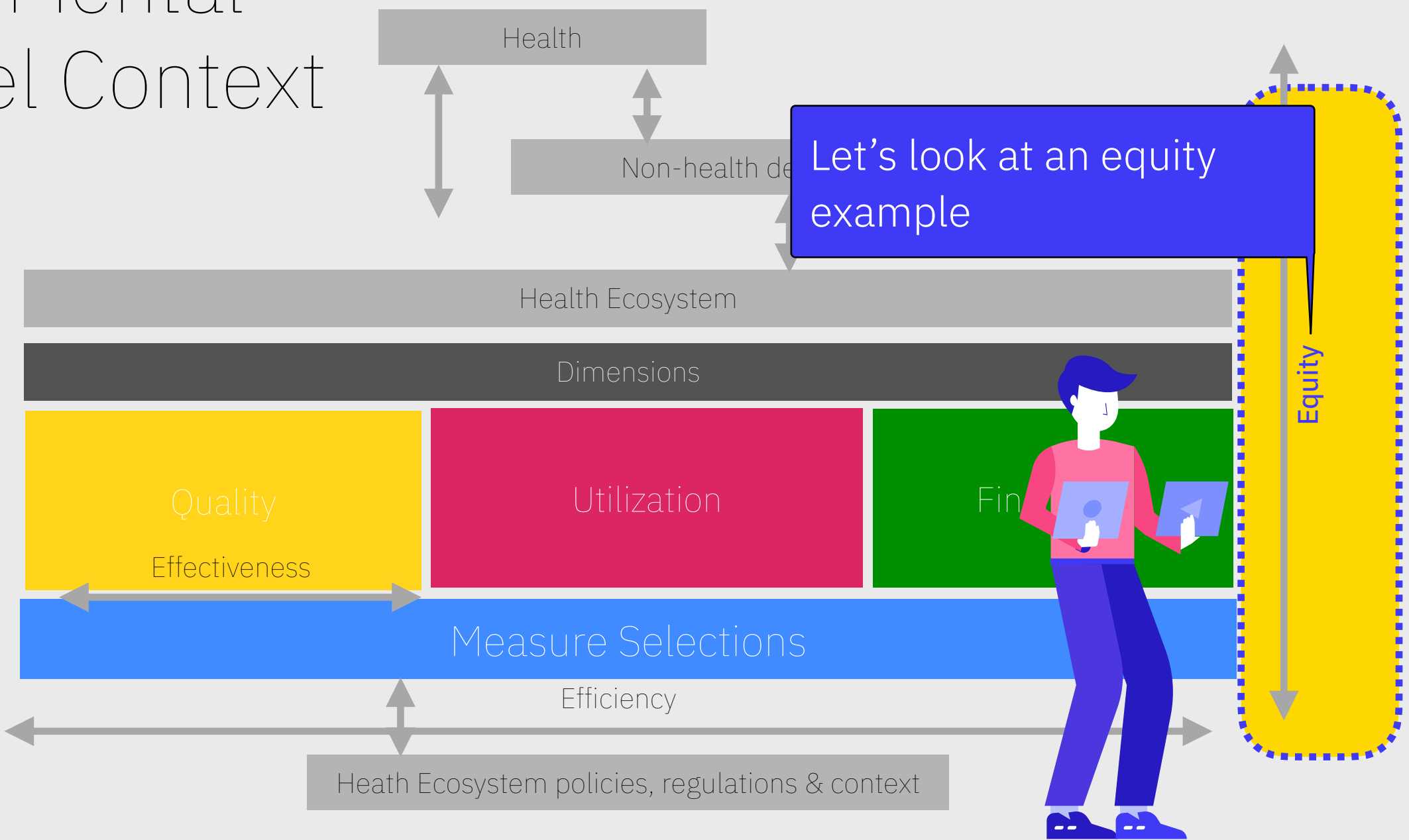
Financial (green box)

Quality (yellow box)

Design Hypothesis: Increase testing as estimate becomes more complex

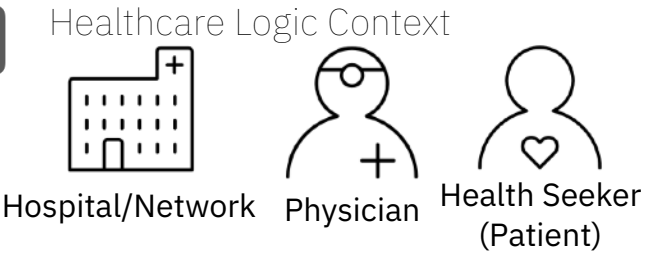
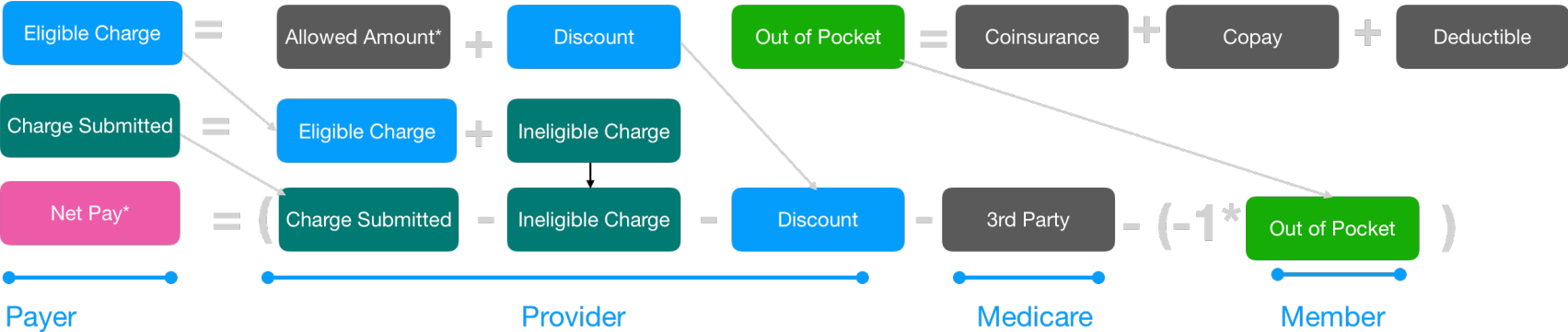


Core Mental Model Context



Financial

Measure Information Design



Who bears cost?

Episode Estimate *Equity*
Conceptual Model:

- Rx Cost as a % of employee's monthly take home pay

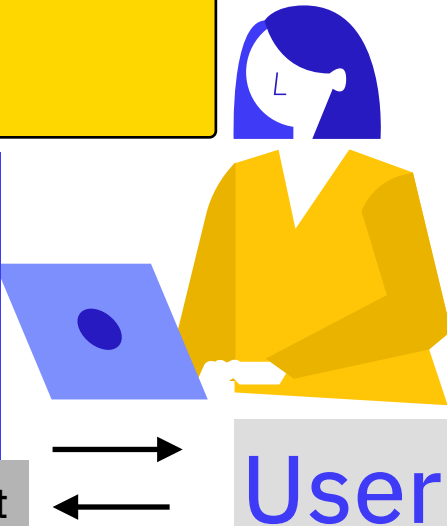
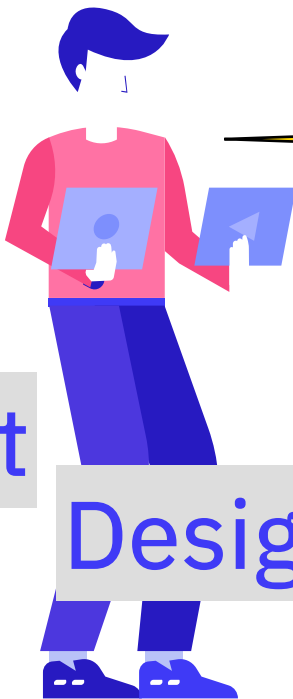
Data Scientist

Designer

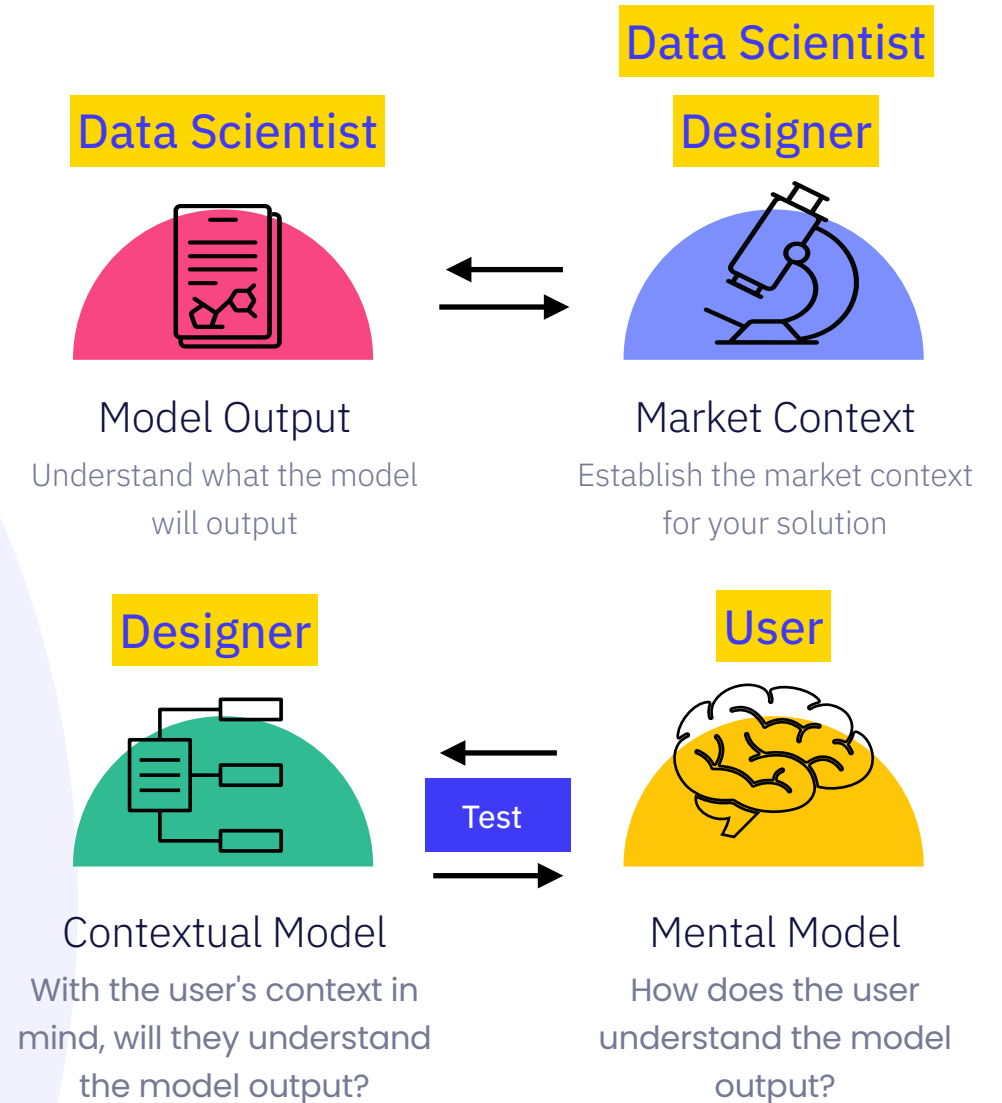
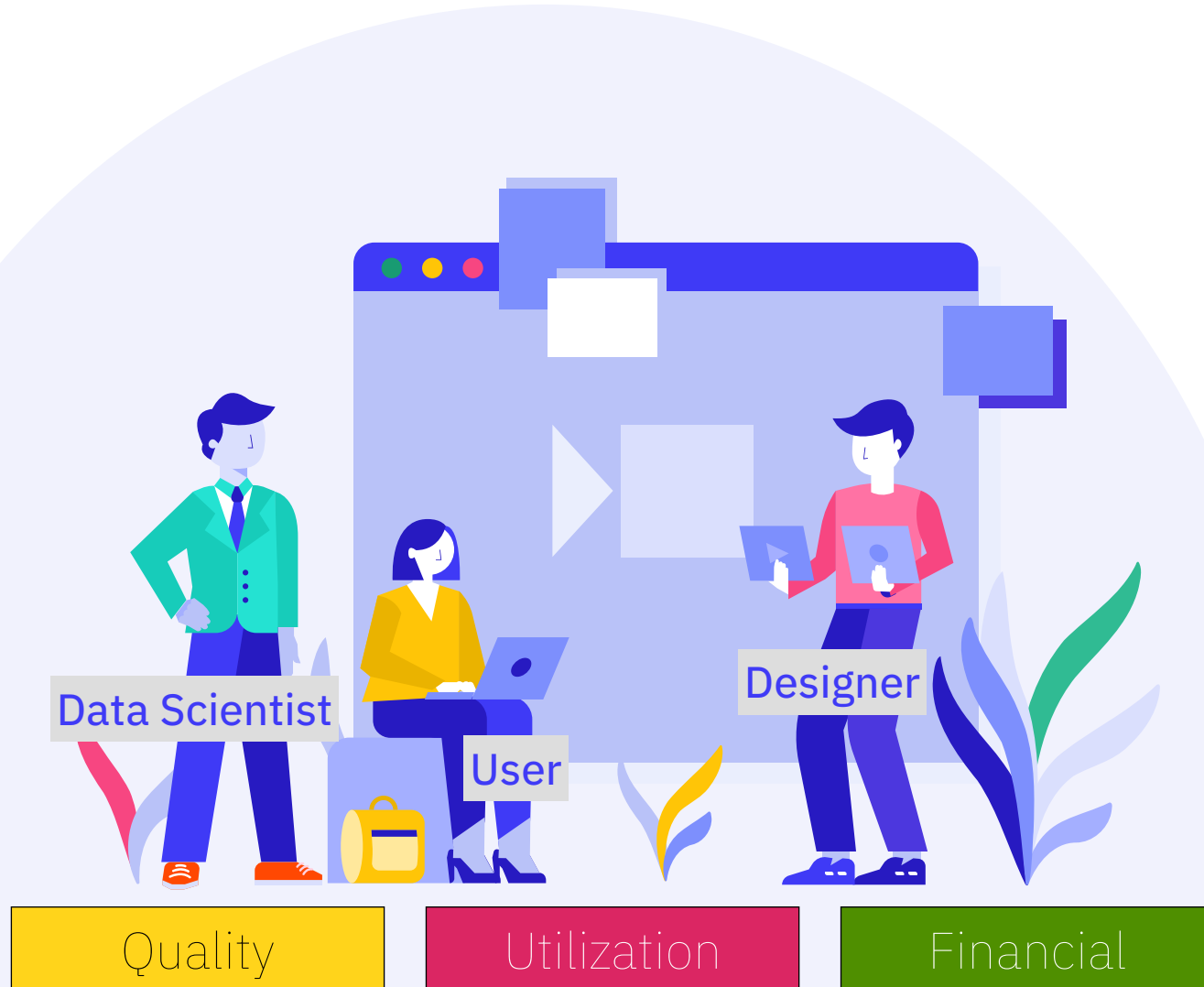
Design Hypothesis: For lower pay bands an RX of Out of Pocket <\$50 may reduce likelihood that User will have RX filled

Heath Ecosystem policies, regulations & context

User



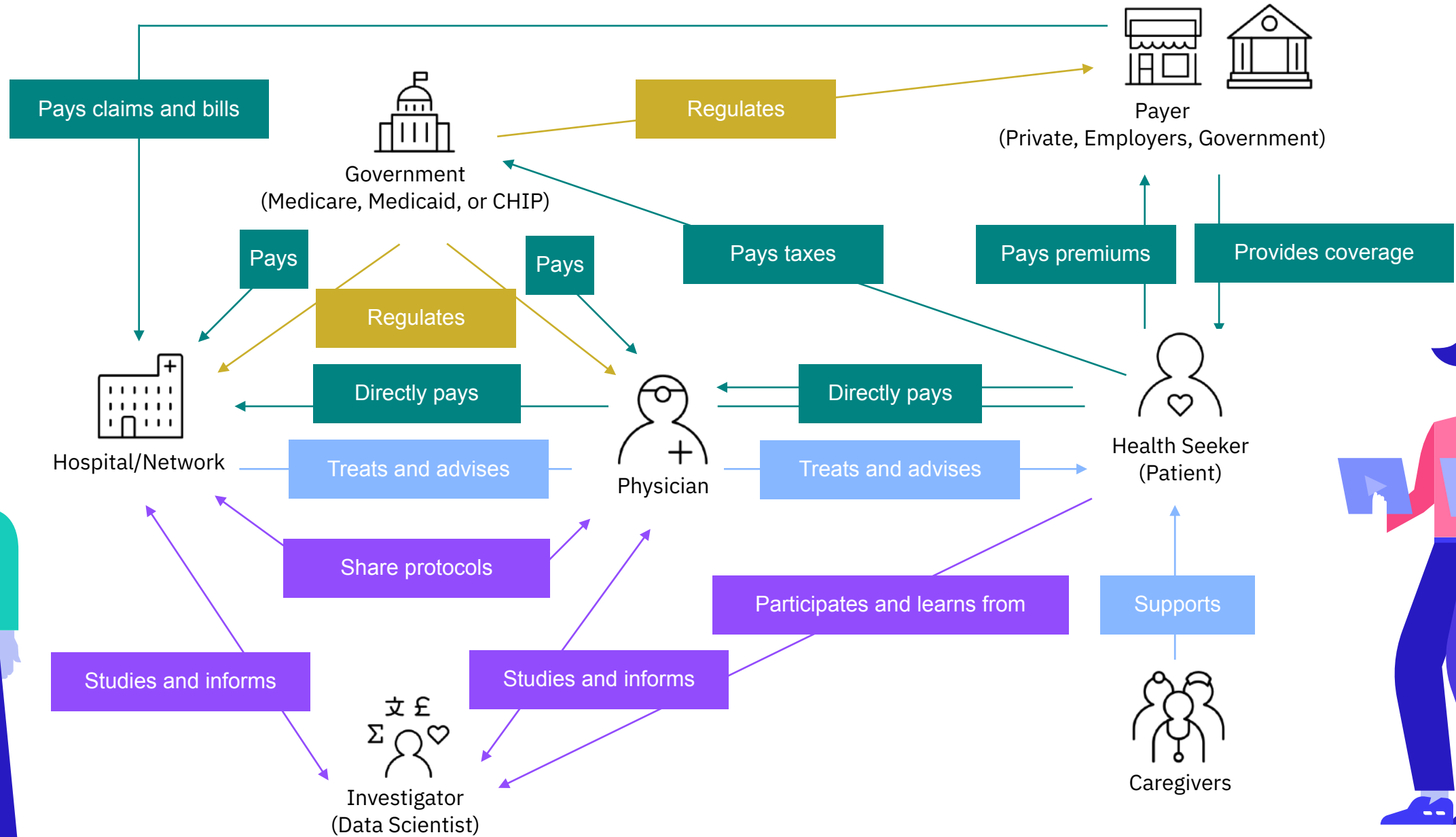
UX for healthcare analytics using a mental model



Please complete your session evaluations.



Healthcare Logic Context



Other mental model resources:

- Understanding mental and conceptual models in product design
- Universal Mental Models

