# Mastering the Optimization Pipeline: A Consultant's Perspective

Justine Broihan

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# Introduction

# About Me

## Justine Broihan

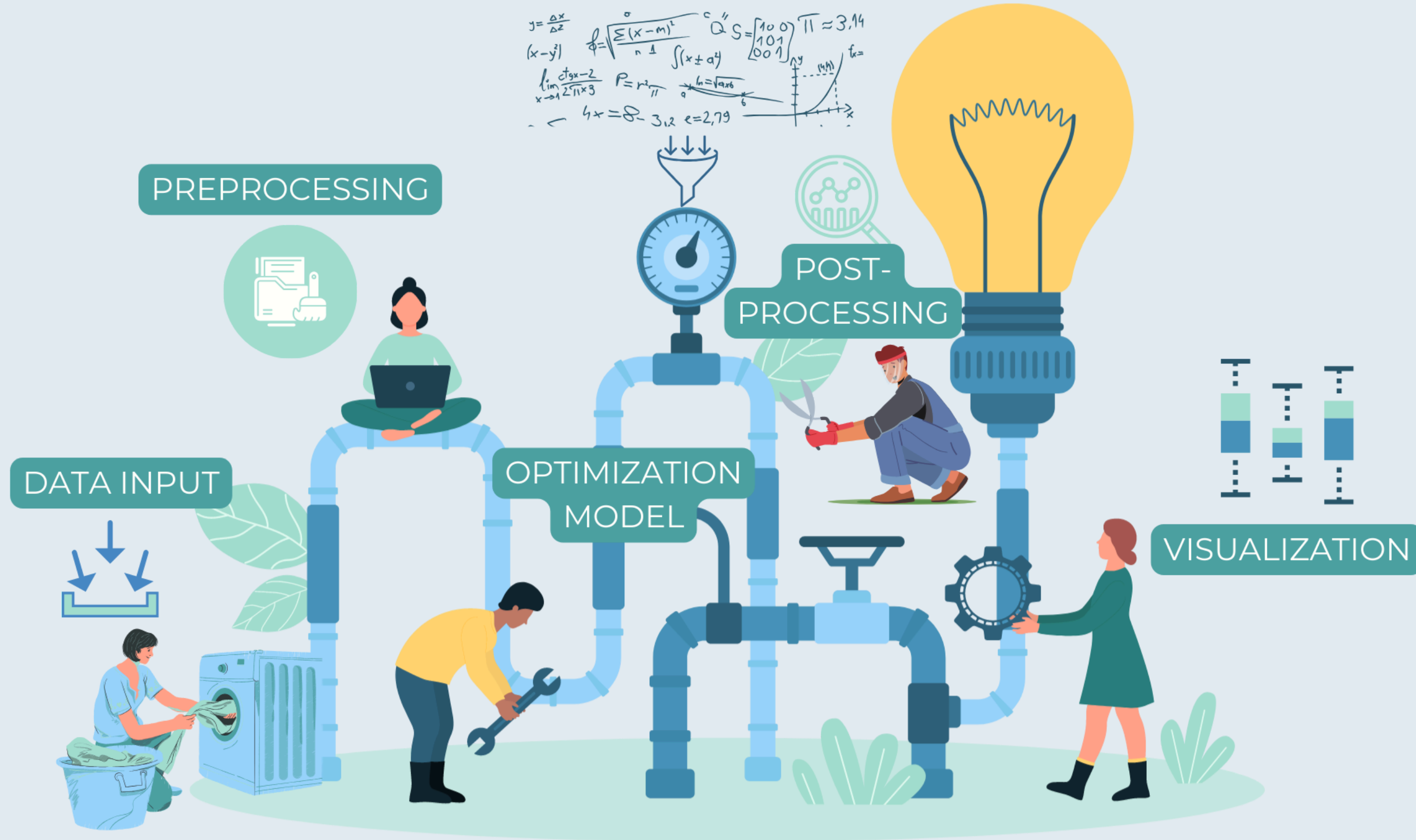### PROJECT AND CONSULTING SPECIALIST

PHD IN OPERATIONS RESEARCH

WORKED 6 YEARS AS RESEARCH AND TEACHING ASSISTANT AT LEIBNIZ UNIVERSITY HANNOVER

# About GAMS



SOFTWARE TOOL PROVIDER
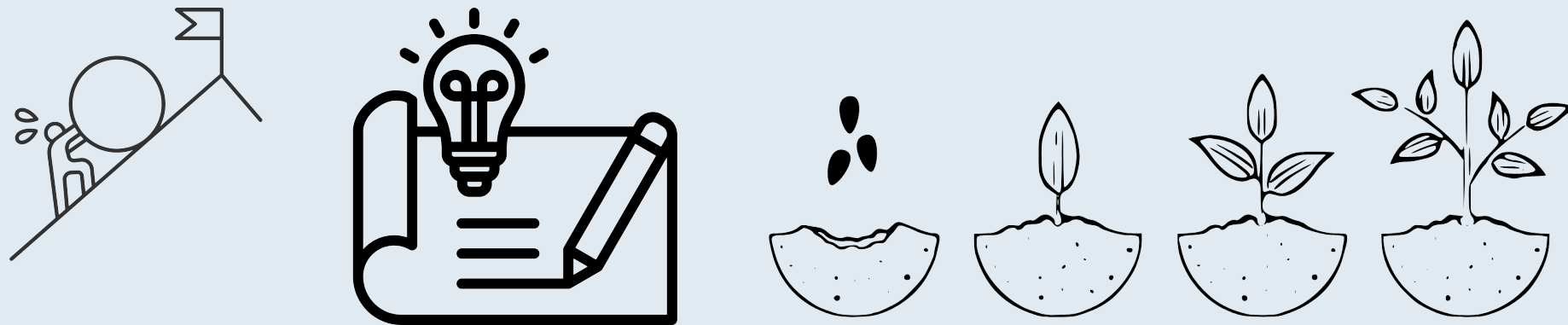
CONSULTANTS

BUSINESS

RESEARCH

# The Optimization Pipeline

# Outline

- Common challenges in application development.

- Role of rapid prototyping.

- Transitioning from prototype to mature applications.

# Common Challenges

# The Problem with Communication



How the customer explained it

How the team designed it

What the customer really needed

# Scene: Initial Meeting

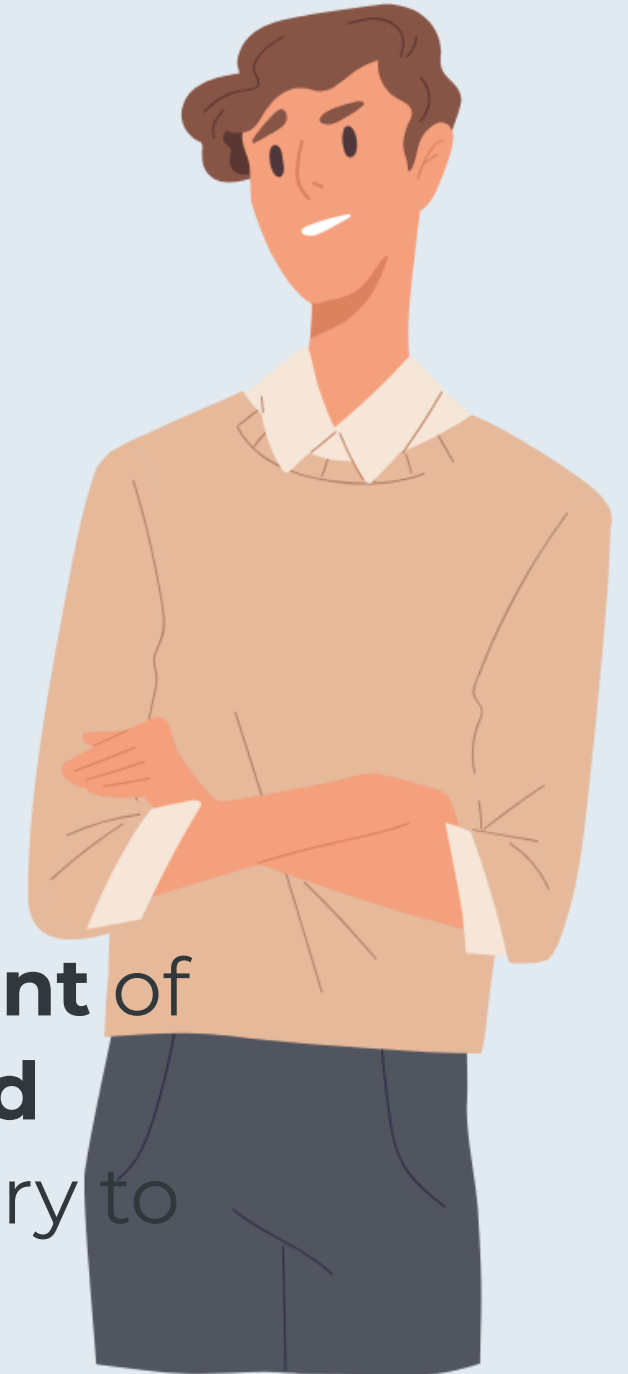OR Specialist (**Sarah**): Specializes in mathematical optimization.

Client (**John**): A supply chain manager at a retail company unfamiliar with mathematical optimization.

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# What is the Objective?

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To get started, I'd like to ask a few questions to understand your needs better. First, can you tell me what your main **objective** is?

Sure, the objective is to have the **right amount** of inventory—just enough to **meet our demand** without overstocking. I just want the inventory to be balanced, not too much or too little.

# What are your Constraints?

What kind of **constraints** do we need to keep in mind when managing your inventory?

Well, one big constraint is that our **suppliers are often late with deliveries**. Sometimes they say they'll deliver in a week, but it ends up taking two or even three weeks. This really messes up our inventory plans.

# What are the Decisions?

What are the **key decisions** you need to make in your inventory management process?

Decisions? Well, we have to decide things like whether to go with **one supplier or another**, or if we should **have a promotion** to clear out inventory.
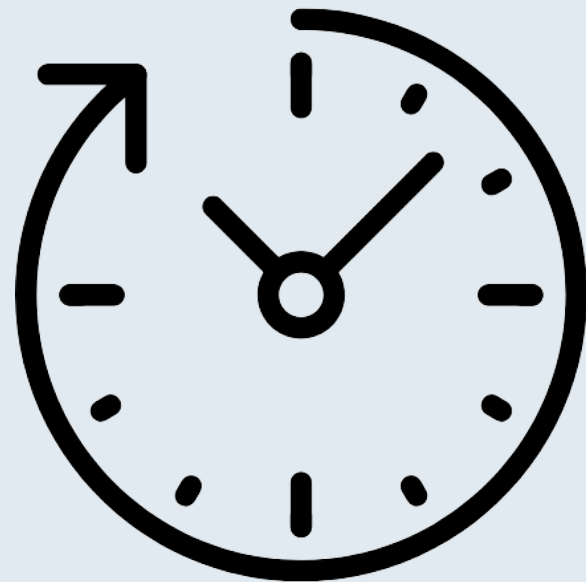
# Common Challenges

- Sarah and John speak different **languages**.

- John doesn't know what **optimization is capable of**.

- John doesn't know what is **relevant** for Sarah.

- John owns his *problem* and certain constraints seem second nature to him. He **forgets to mention** them.

# The Problem with the Quote

- 80 % of the work is done if you understand the clients *problem*.

- Understanding allows you to estimate the required time.
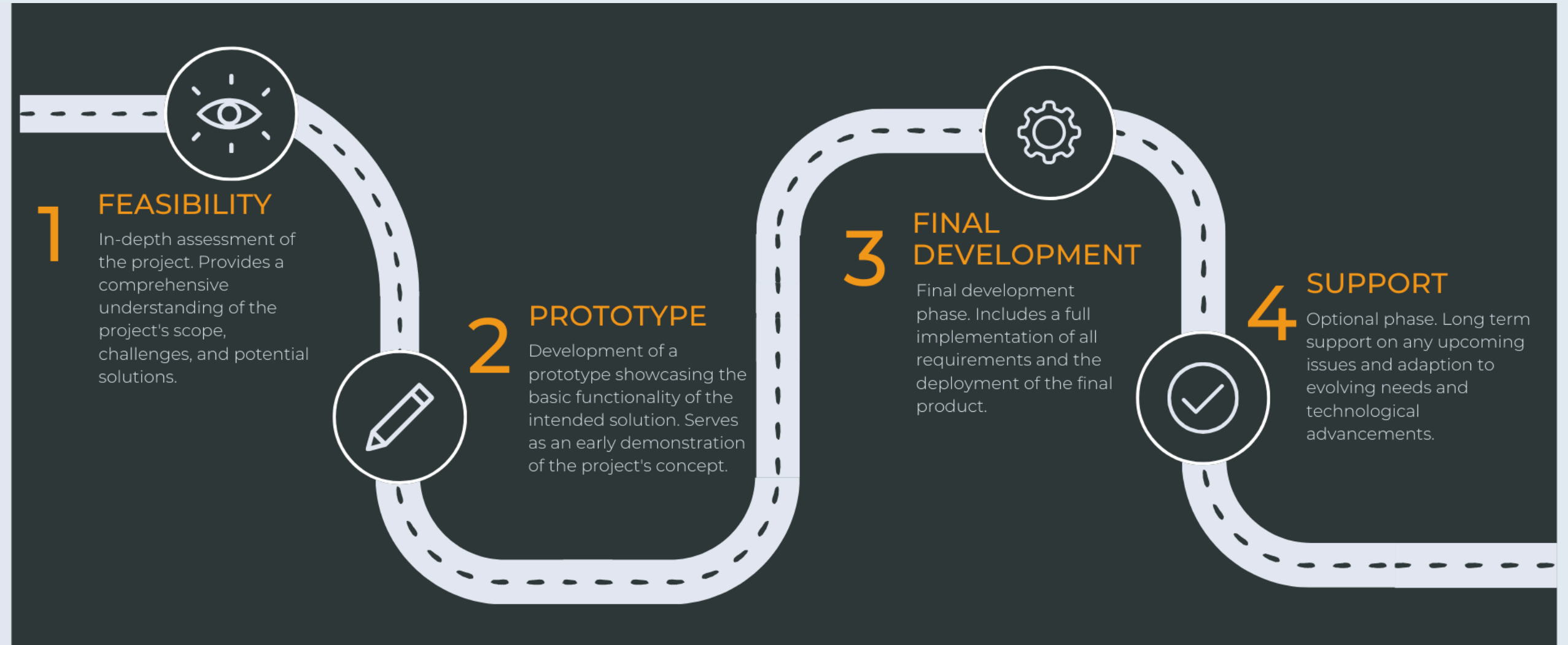
- Based on the required time you can quote a budget.

# Client Expectations vs. Project Budget
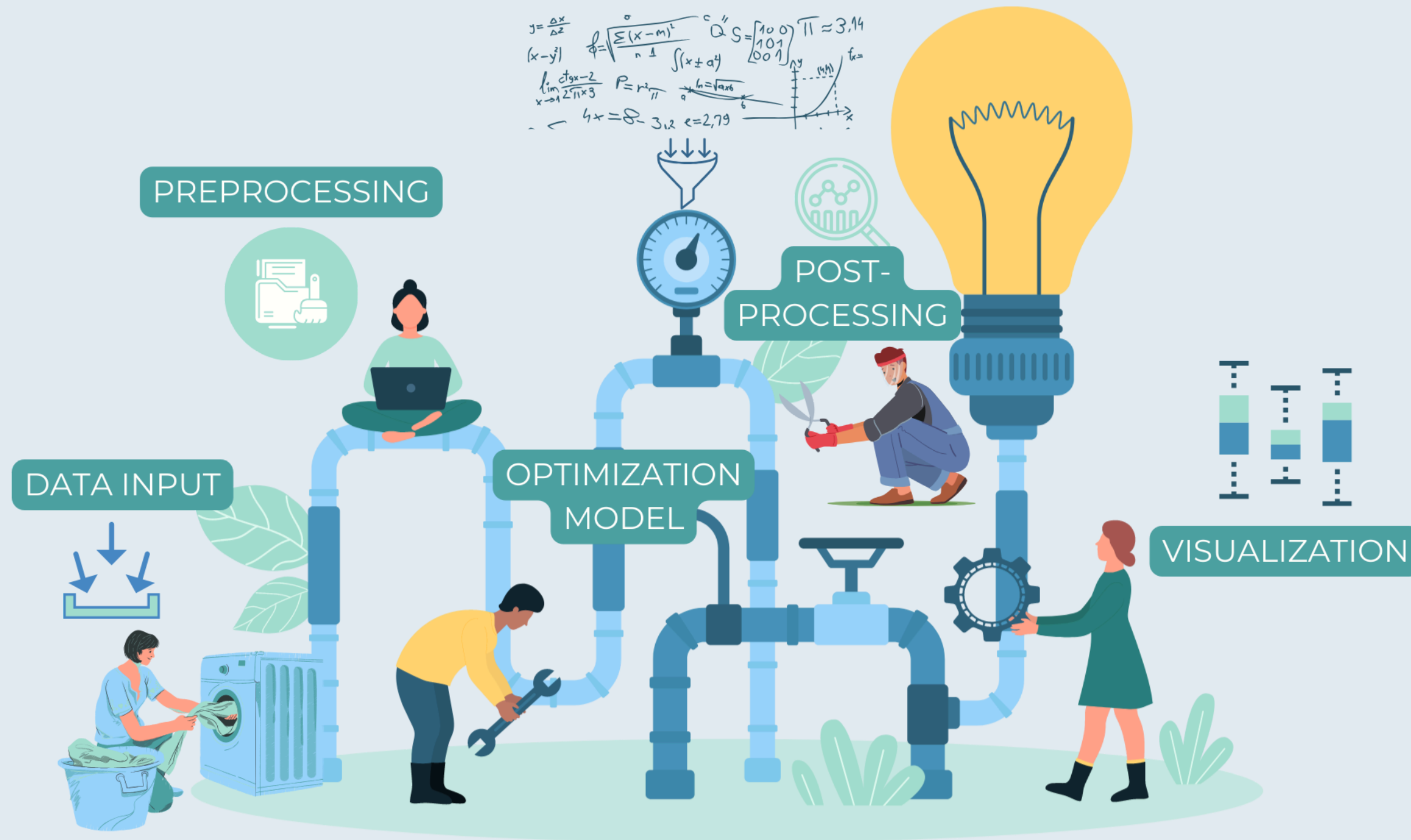
# The Relevance of Prototyping

# Project Phases



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PROJECT PHASES

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**1 FEASIBILITY**
In-depth assessment of the project. Provides a comprehensive understanding of the project's scope, challenges, and potential solutions.

**2 PROTOTYPE**
Development of a prototype showcasing the basic functionality of the intended solution. Serves as an early demonstration of the project's concept.

**3 FINAL DEVELOPMENT**
Final development phase. Includes a full implementation of all requirements and the deployment of the final product.

**4 SUPPORT**
Optional phase. Long term support on any upcoming issues and adaption to evolving needs and technological advancements.

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# The Power of Rapid Prototyping in OR

- **Rapid Prototyping**: Quick development of *solutions* to test concepts.

# The Power of Rapid Prototyping in OR

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# Typical Model Development

https://www.youtube.com/watch?v=pwglOID7e0M

# Examples of Rapid Prototyping
## Scheduling Physicians in a Hospital

# Examples of Rapid Prototyping

## Scheduling Physicians in a Hospital

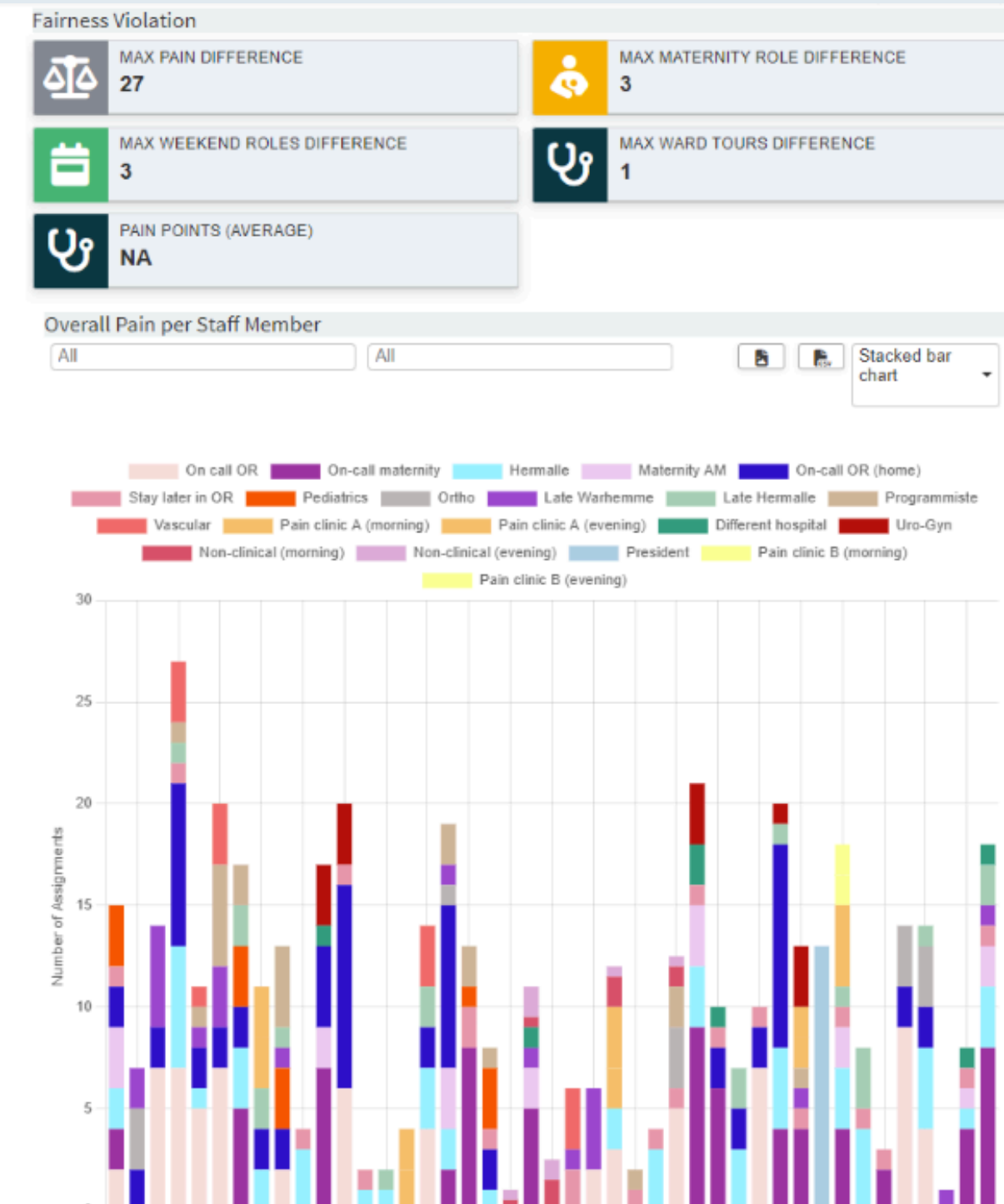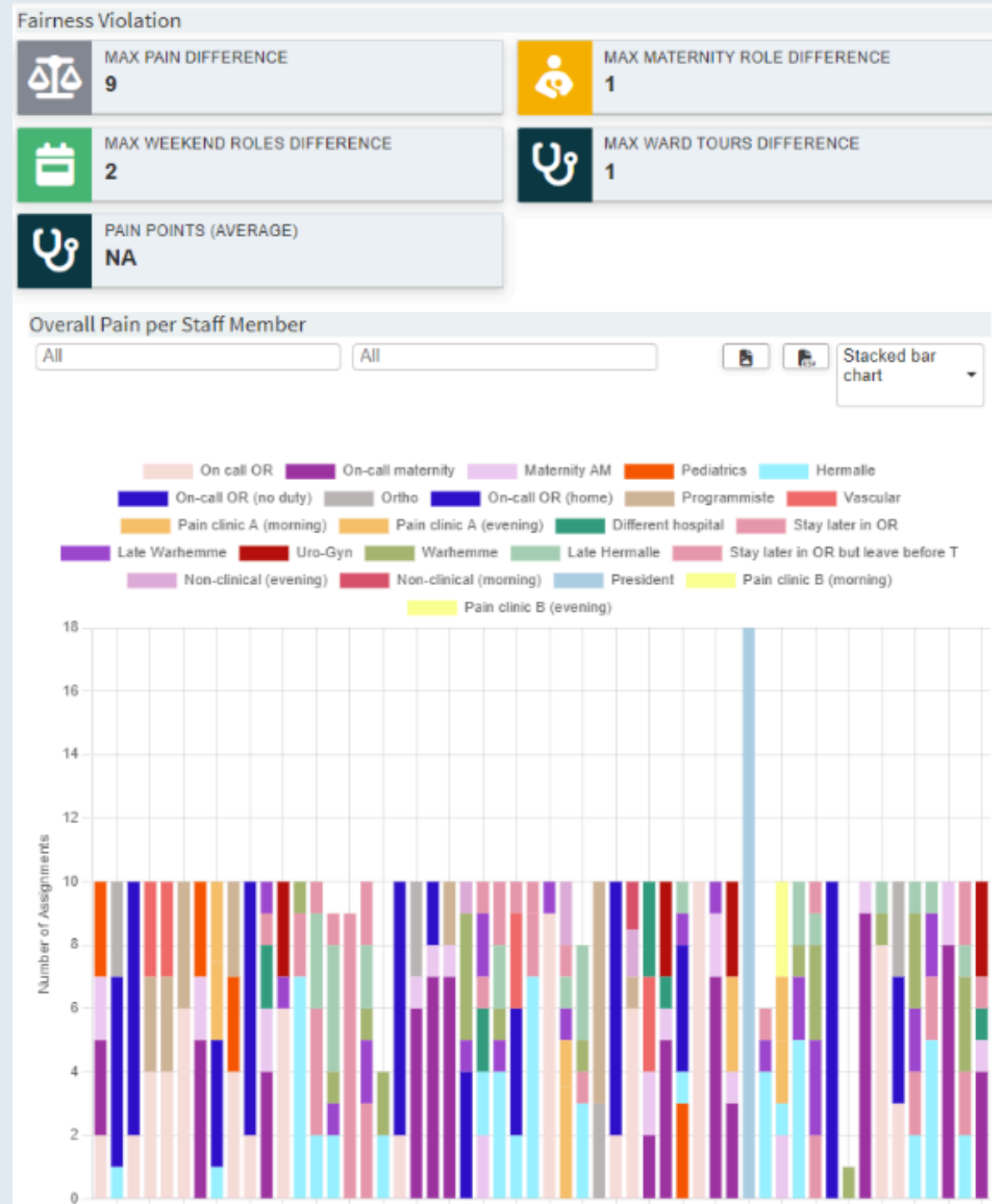5 TASK A
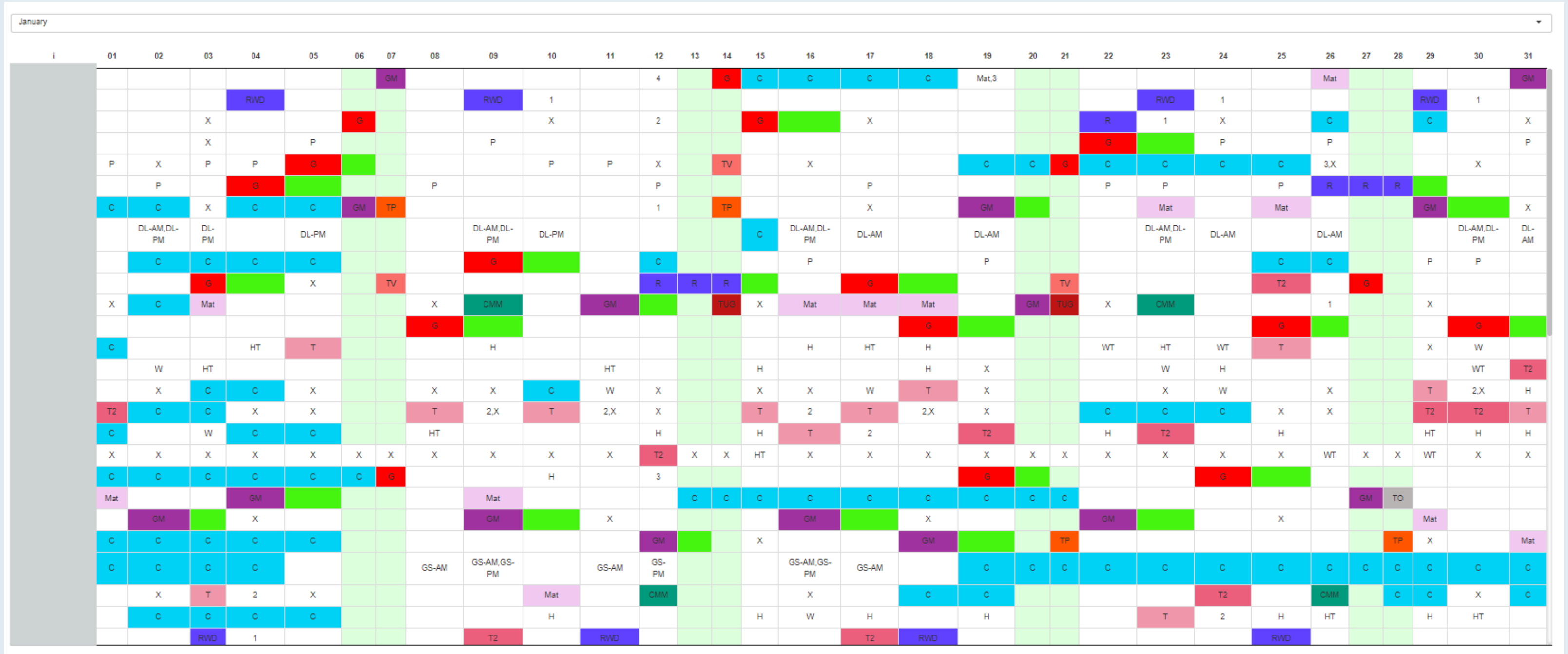
2 TASK B

3 TASK C

1 TASK D

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# Examples of Rapid Prototyping
## Scheduling Physicians in a Hospital

# Examples of Rapid Prototyping
## Scheduling Physicians in a Hospital

# Transitioning from Prototype to Mature OR Applications

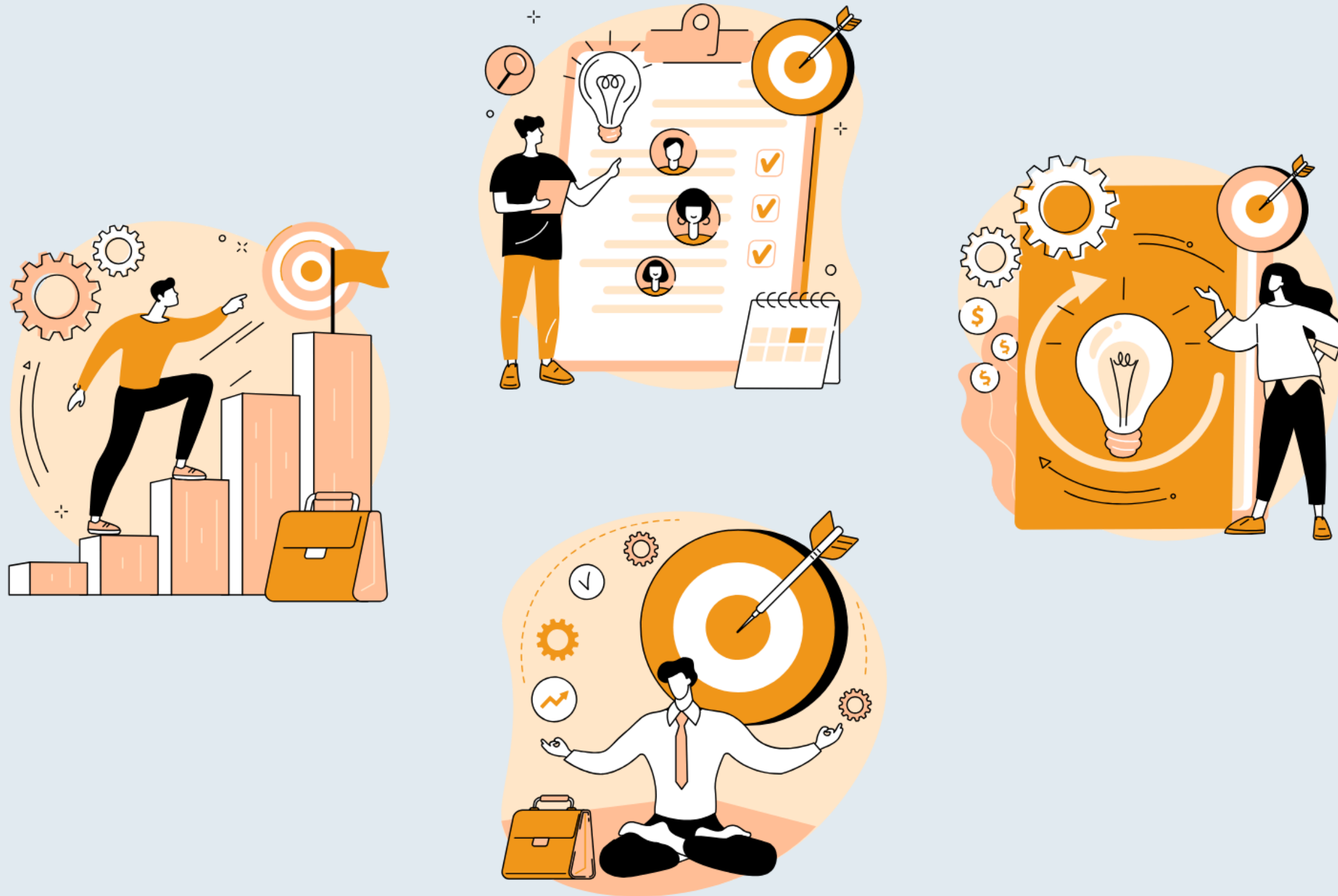# Transitioning from Prototype to Mature OR Applications

## Key Steps in the Transition

- **User Interface Enhancement**: Developing intuitive GUIs.

- **Streamlining the Workflow**: Smooth and integrated handling.

- **Deployment Strategies**: On-premise, cloud, hybrid — choosing the right one.

- **Computational Performance**: Optimizing for scalability and efficiency.

## Common Challenges

- Integration with existing systems.

- Managing data consistency and quality.

- Preventing user errors.

# Insights and GAMS Product Development

# Conclusion

# Conclusion and Strategic Takeaways

- Communicating OR solutions $!=$ selling a car.

- **Rapid** and early prototyping is key.

- Tight feedbacks loops are crucial.

# Contact Us

## Meet Me for Cake

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