



Team C-rious

Milestone 6

Manu Benny
Rajesh Bhandari
Teja Sri Lakshmi Ganesh Balaji Bokka
Madeleine Breitzkreutz
Atif Harshad
Jannis Römermann

CONTENT

- INTRODUCTION
- VALIDATION EXPERIMENTS
- VALIDATION RESULT
- STATEMENT OF CONFIDENCE
- COMPARISONS
- CORRECTION MADE & LIMITATION
- PROJECT PROGRESS
- COST DIAGRAM
- LESSONS LEARNED

INTRODUCTION

➤ What is Validation?

Comparing the real system to the simulation model.

➤ Why Validate?

- Confidence in Results
- Model Verification
- Identify Model Limitations

VALIDATION EXPERIMENT

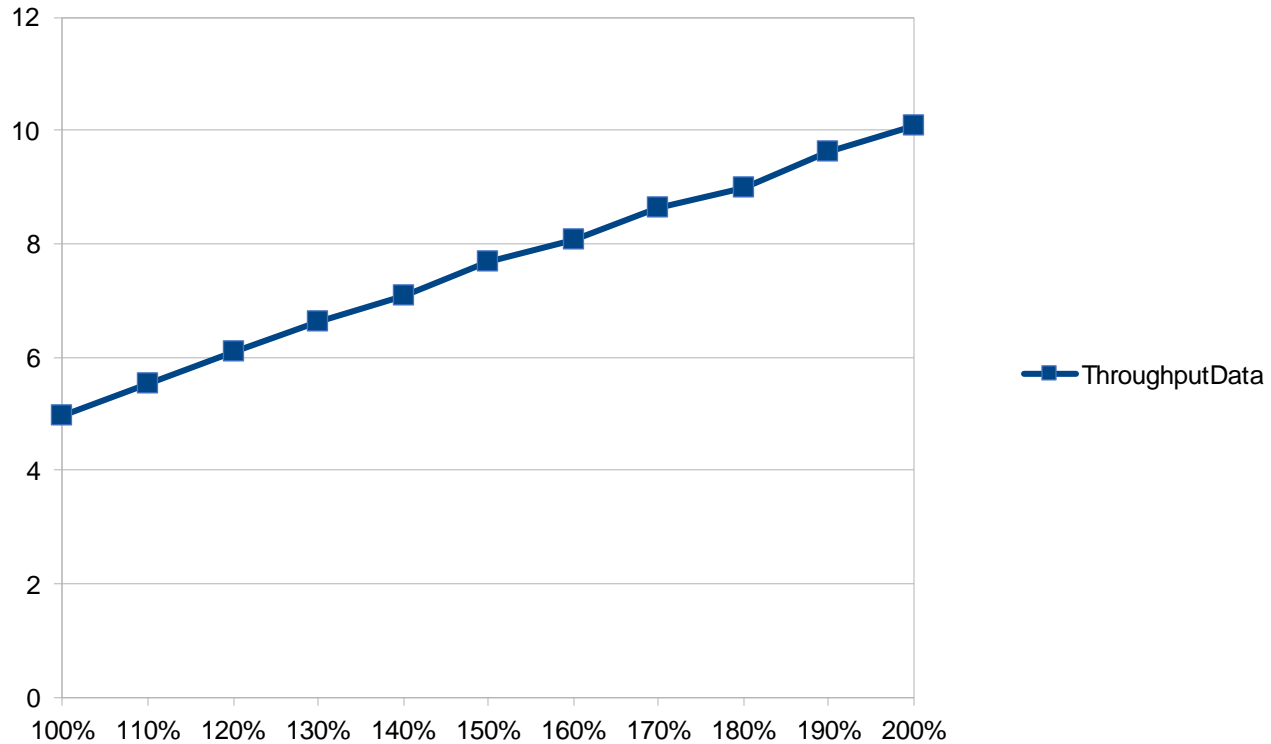
- Sensitivity Analysis - To assess model's sensitivity to input variations
 - a. Change in Throughput by varying traffic volume
 - b. Change in Waiting time by varying traffic volume
- Historical input data analysis - Comparing the means and confidence intervals.

VALIDATION RESULT

5/16

SENSITIVITY ANALYSIS

THROUGHPUT:

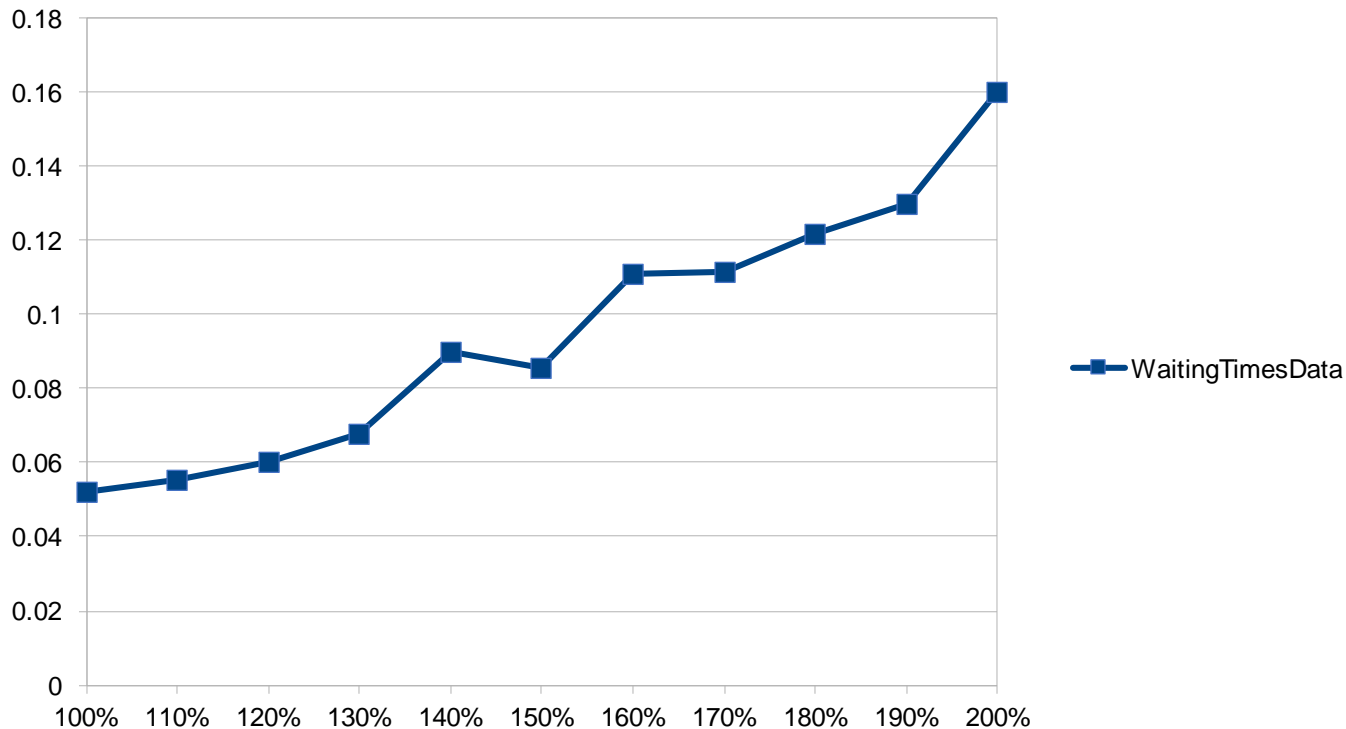


VALIDATION RESULT

6/16

SENSITIVITY ANALYSIS

WAITING TIME:

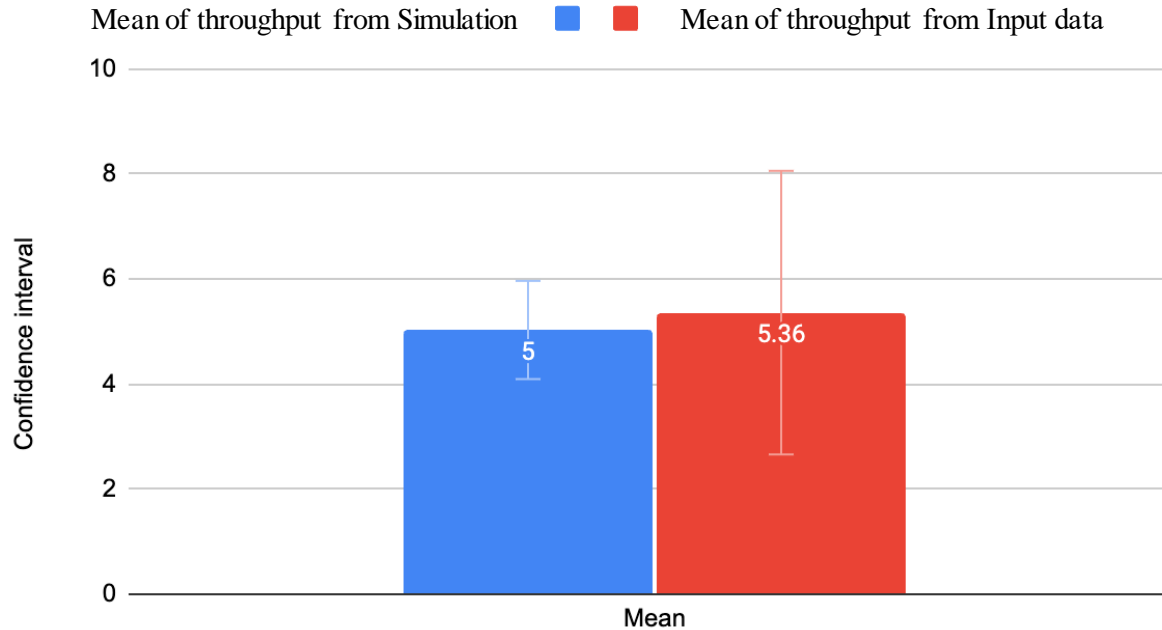


VALIDATION RESULT

7/16

HISTORICAL DATA ANALYSIS

THROUGHPUT:



Mean = 5

Confidence level Min = 4.09

Confidence level Max = 5.96

Mean = 5.36

Confidence level Min = 2.65

Confidence level Max = 8.06

VALIDATION RESULT

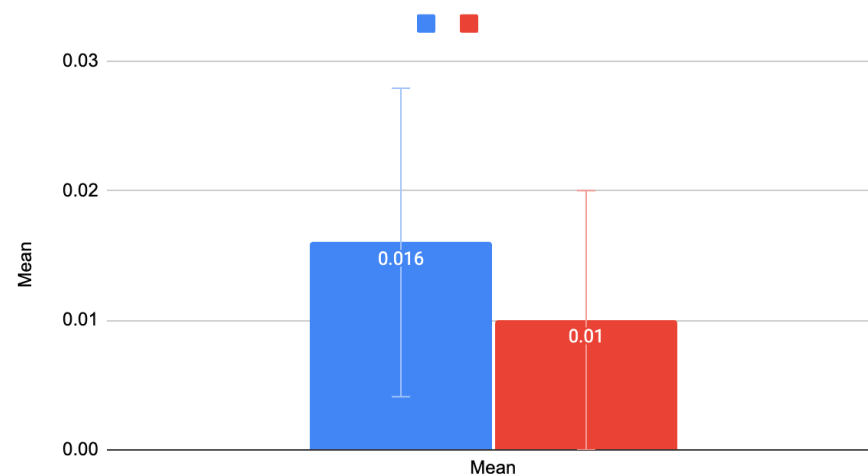
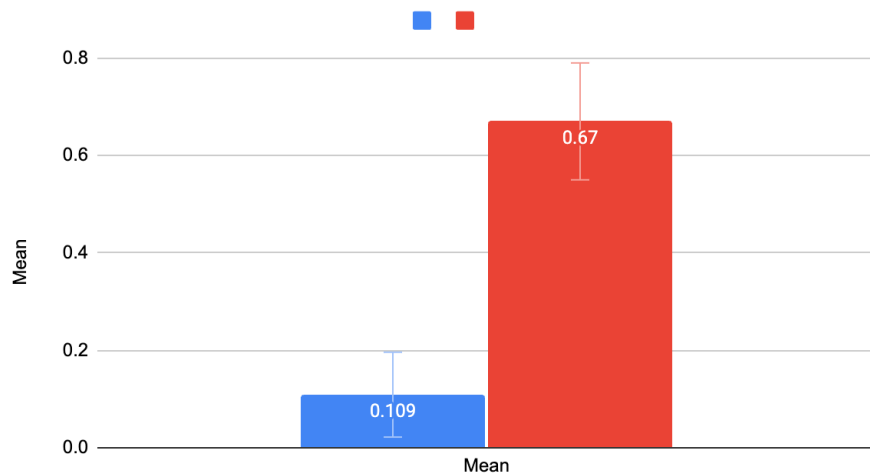
8/16

HISTORICAL DATA ANALYSIS

W

WAITING TIME:

B(W)



Mean = 0.1090

Mean= 0.67

Confidence level Min = 0.022

Confidence level Min = 0.55

Confidence level Max = 0.196

Confidence level Max = 0.79

Mean = 0.016

Mean= 0.01

Confidence level Min = 0.004

Confidence level Min = 0

Confidence level Max = 0.027

Confidence level Max = 0.02

VALIDATION RESULT

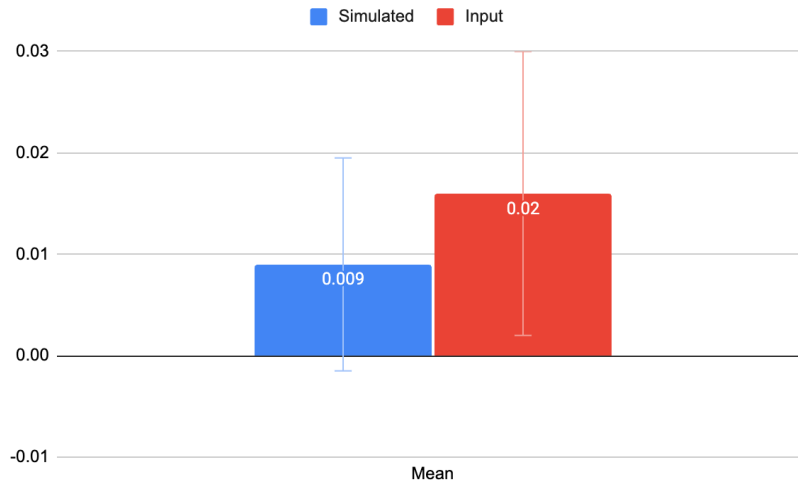
9/16

HISTORICAL DATA ANALYSIS

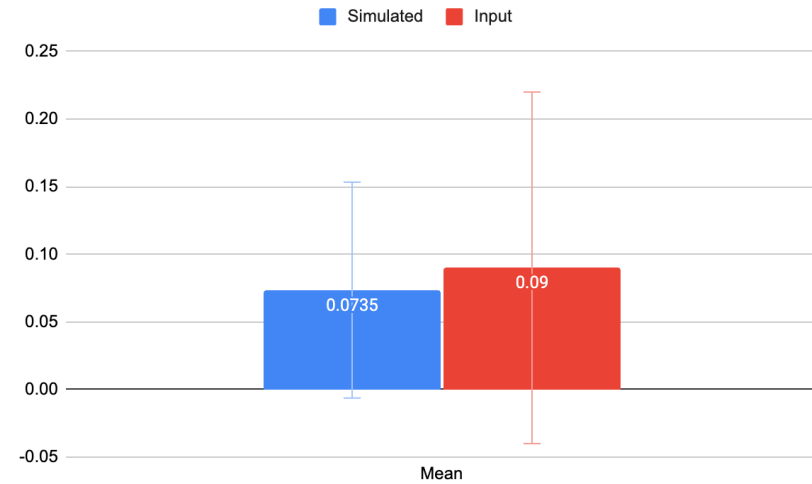
B(E)

WAITING TIME:

S



Mean = 0.009	Mean = 0.02
Confidence level Min = -0.0015	Confidence level Min = 0.01
Confidence level Max = 0.0195	Confidence level Max = 0.03



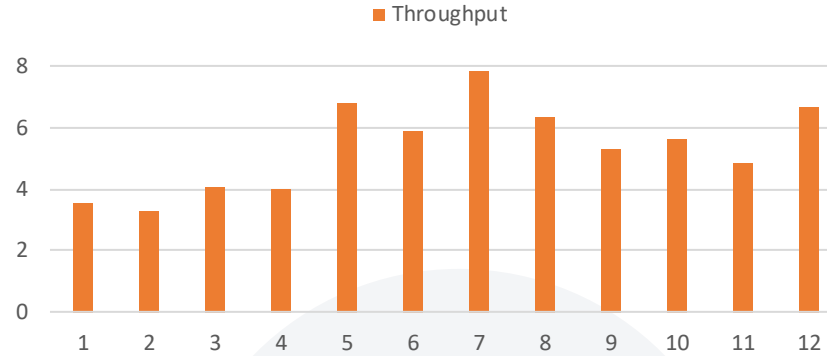
Mean = 0.0735	Mean = 0.09
Confidence level Min = -0.006	Confidence level Min = -0.04
Confidence level Max = 0.153	Confidence level Max = 0.22

STATEMENT OF CONFIDENCE

- Comparing the confidence interval calculated from the input data with the confidence interval obtained from the simulation output, it is evident that the two intervals have a significant overlap.
- With a significance level of 0.05, this overlapping region provides strong evidence that the simulation output is consistent with the observed data.
- Therefore, we can state with 95% confidence that the simulation accurately reflects the underlying distribution of the data and can be considered a valid representation

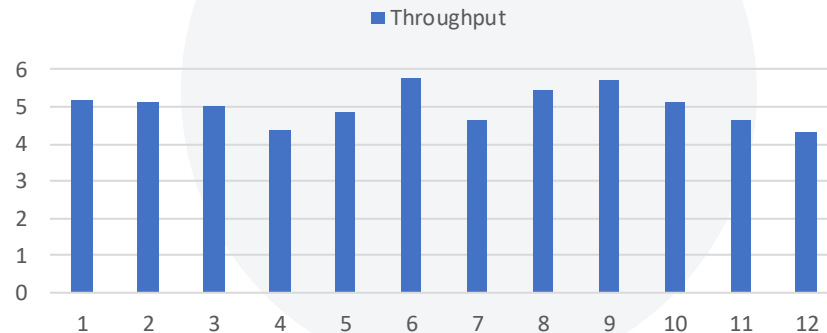
COMPARISON

Throughput from real world



MEAN: $5.36 \approx 5$

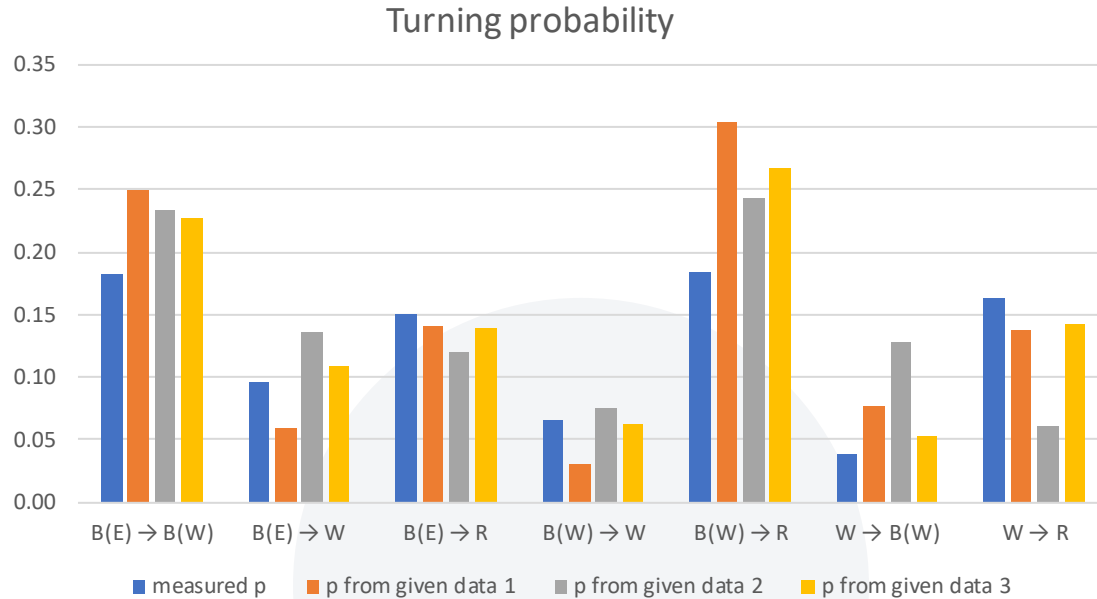
Throughput from simulation



MEAN: $5.03 \approx 5$

COMPARISON

12/16



Our turning probabilities are fairly similar to the given data from the city!

CORRECTIONS MADE

13/16

Got it right on the first try:

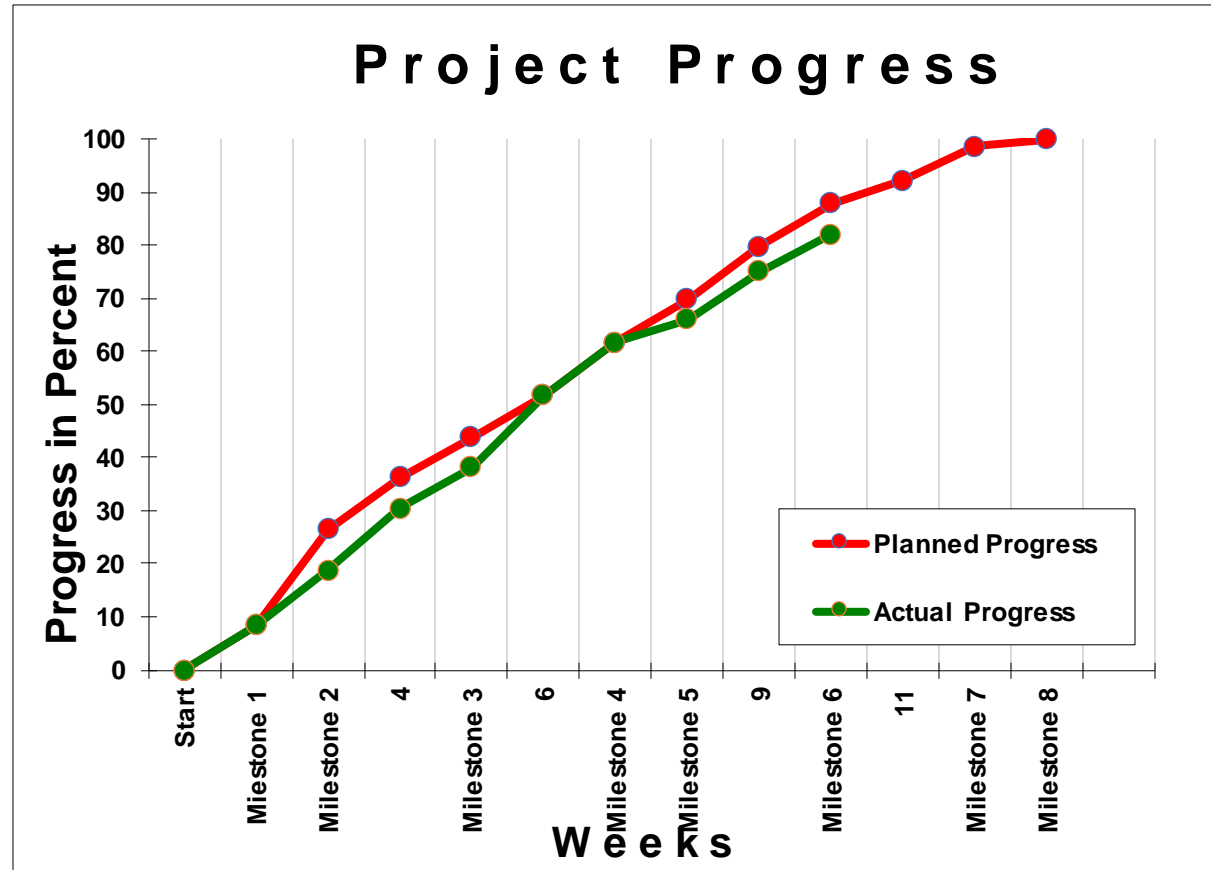
Our team's careful work and thoroughness resulted in a flawless outcome without any need for corrections or changes.

LIMITATION

- The simulation is only valid for one goal but not for another.
- Our data is measured at a peak traffic time for the node so we can only really tell the validity for a maximum traffic model.
- We had a limited amount of waiting time data available for conducting comparisons.

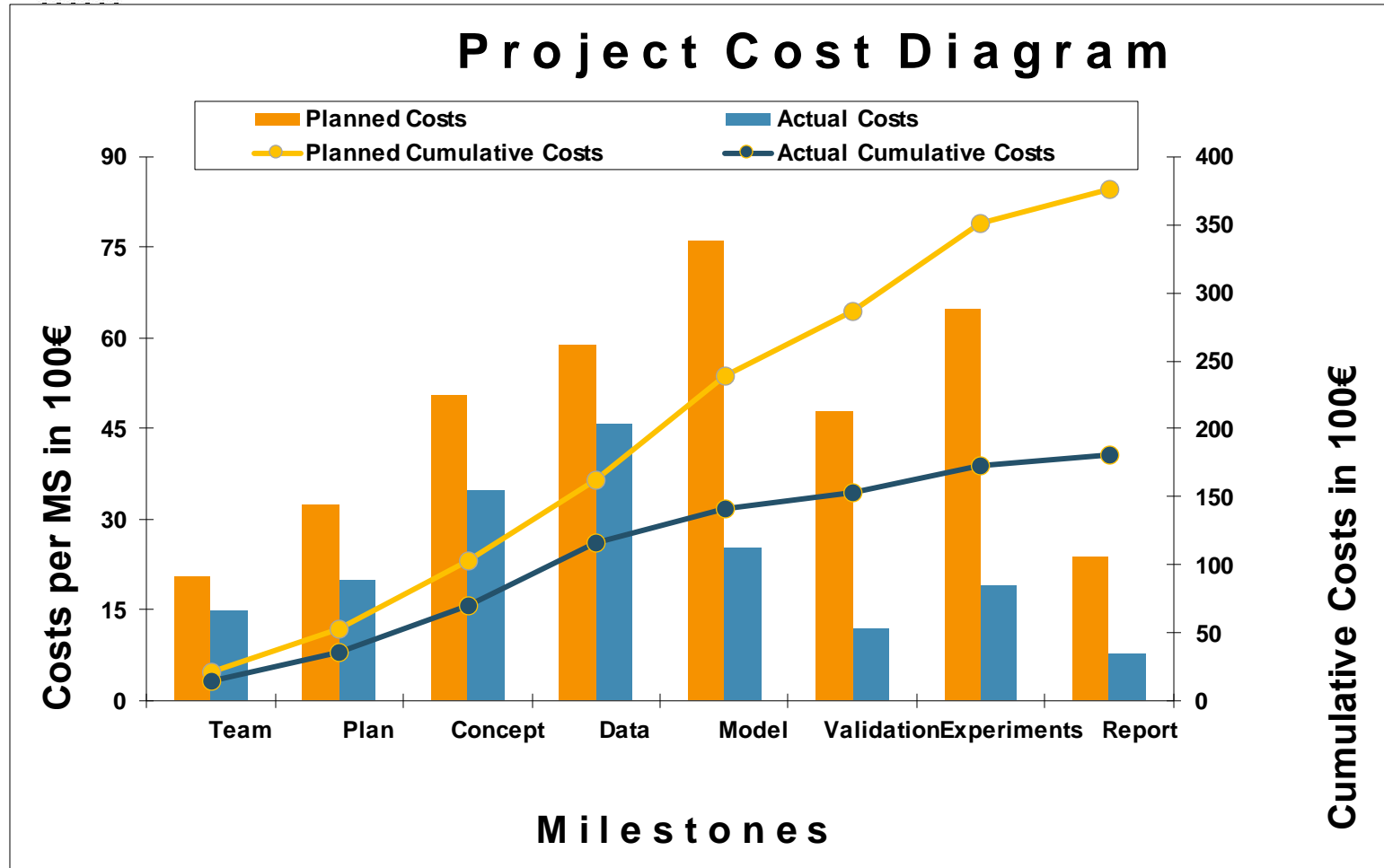
PROJECT PROGRESS

14/16



COST DIAGRAM

15/16



LESSONS LEARNED

- Learned how to validate.
- Understood the importance of validation.
- Importance of good input data.
- My team has my back.



THANK YOU!