

PROJECT NA NAGING STONE PA:

Improving Government Procurement Outcomes using Explainable Machine Learning

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Machine Learning 2 Public Presentation

We spend **trillions of pesos** to buy goods and services.

This is managed through budgeting and the public procurement process.



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1.073 trillion

total budget for
procurement in 2014



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This is managed through budgeting and the public procurement process.

1.073 trillion

total budget for
procurement in 2014

70 billion

total budget for vaccine
procurement in 2021

Only 3 out of 10 projects were awarded a contract after each bidding process in 2020.

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Government

Failed bids mean we fail to give the Filipino public what they need



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Government

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Companies

Failed bids cost bidders lost time and opportunities

How can we improve
procurement outcomes
using explainable
machine learning?



How can we improve procurement outcomes using explainable machine learning?

the government as
the **procuring entity**



How can we improve procurement outcomes using explainable machine learning?

the government as
the **procuring entity**

the companies as
the **service providers**

DATA SET



PS-PhilGEPS Date: 30-Nov-2021 9:33:37 AM

Modernized Government e-
Procurement System
PS-PhilGEPS

OPEN DATA

REGISTERED MERCHANTS

BLACKLISTED MERCHANTS

TRANSPARENCY
EFFICIENCY
ACCOUNTABILITY
INTegrity

PhilGEPS
PHILIPPINE
GOVERNMENT
ELECTRONIC
PROCUREMENT
SYSTEM

DATA SET



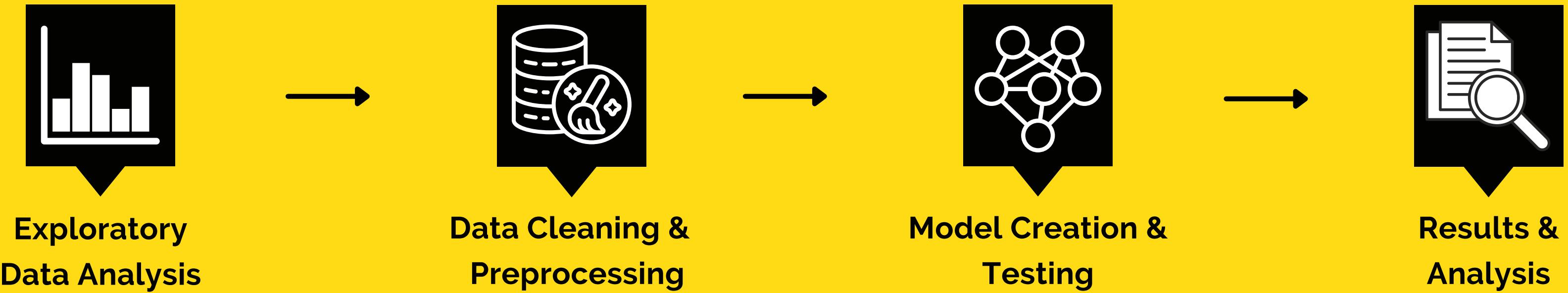
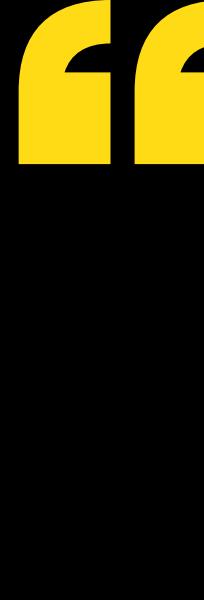
We reviewed
~**570,000 bids in 2020**
made available in
PhilGEPS

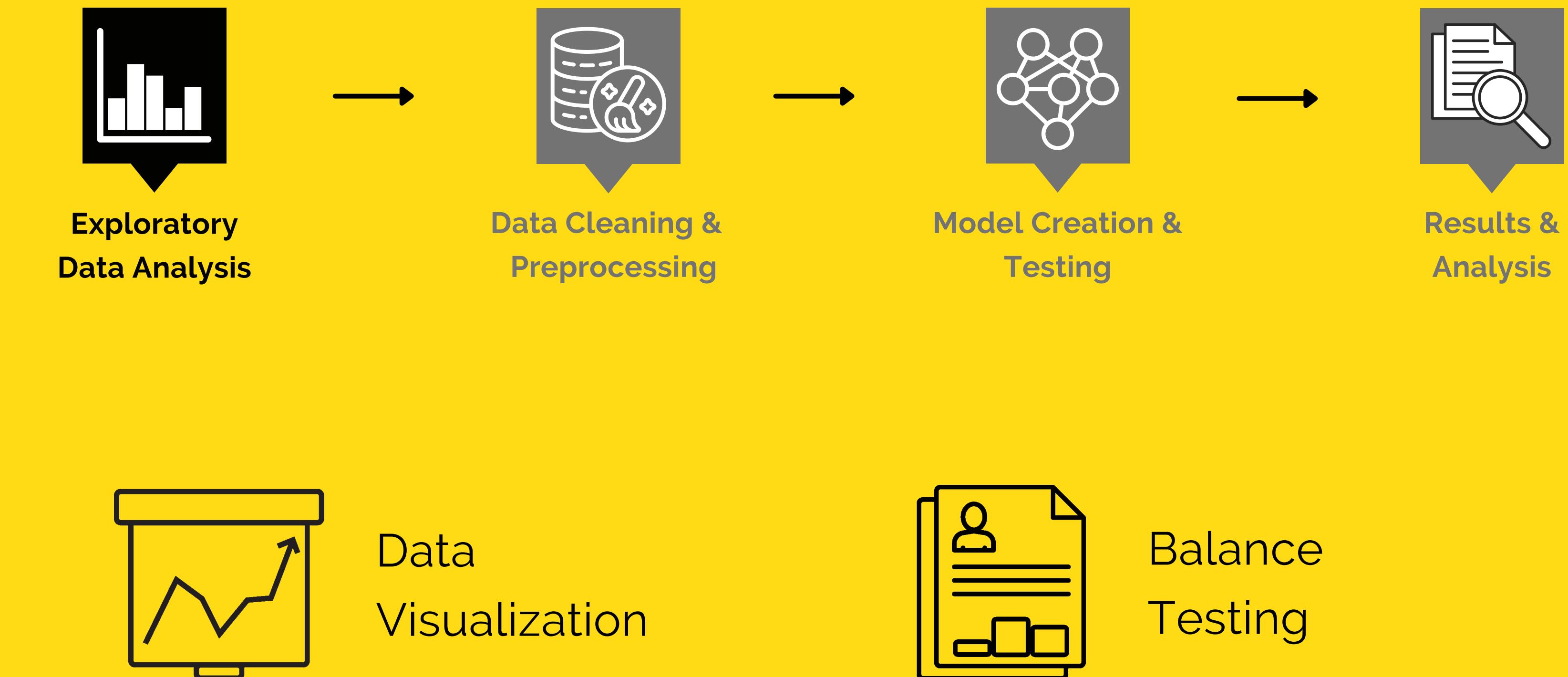


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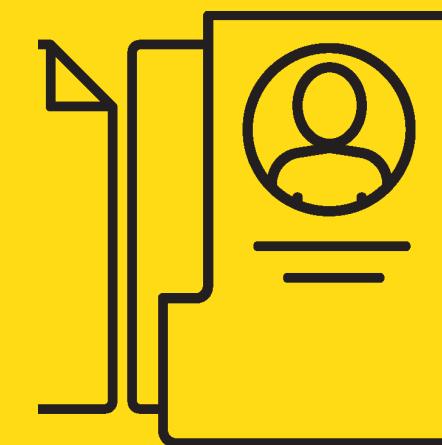
**Metro Manila and
Cotabato**

METHODOLOGY

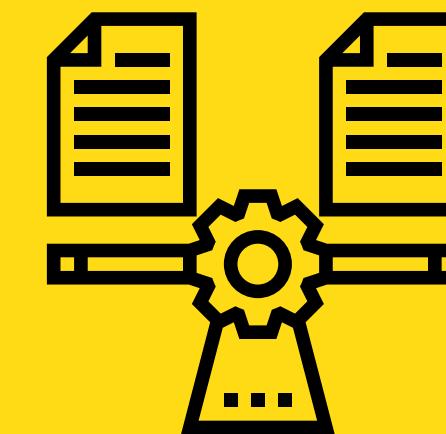




METHODOLOGY

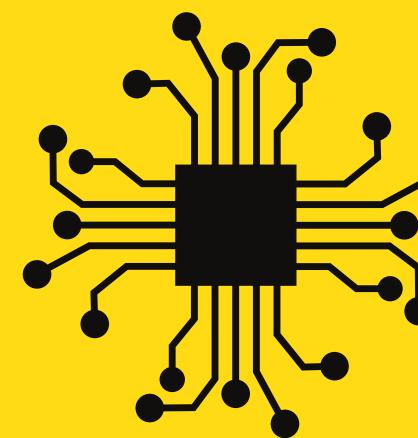


Removing
Nulls



Addressing
Imbalance

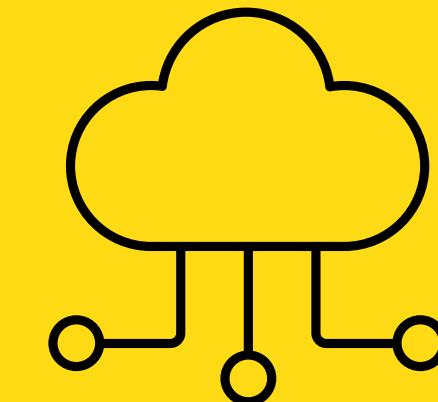
METHODOLOGY



scikit
learn
Auto ML



Cross
Validation



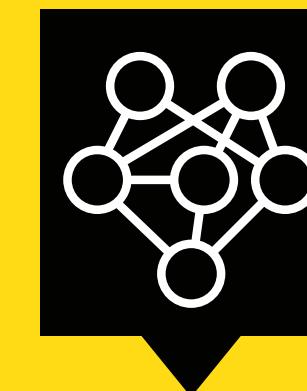
Hyperparameter
Tuning



Exploratory
Data Analysis



Data Cleaning &
Preprocessing



Model Creation &
Testing



Results &
Analysis

METHODOLOGY



Model Interpretation



Shap
DiCE

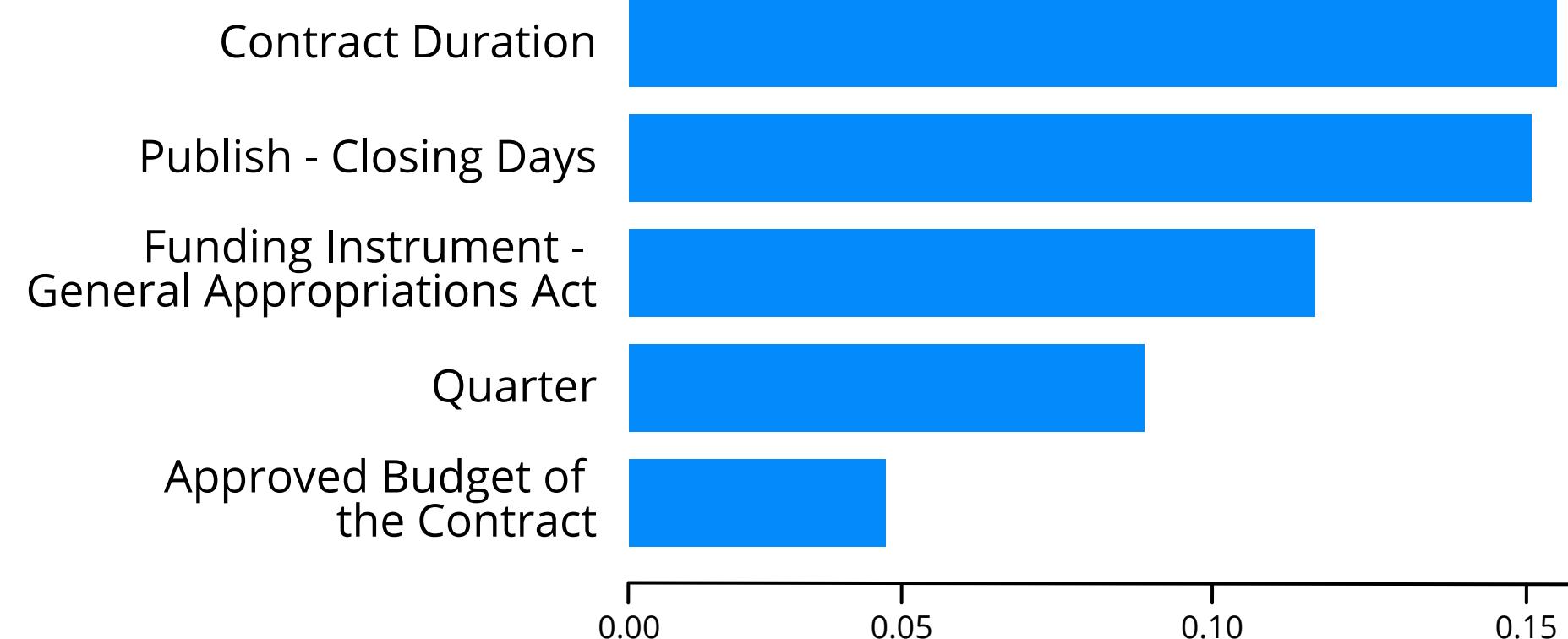
RESULTS

Model	Metro Manila		Cotabato	
	Recall %	Runtime	Recall %	Runtime

RESULTS

Model	Metro Manila		Cotabato	
	Recall %	Runtime	Recall %	Runtime
Logistic Regressor	20	0.30 sec	75	0.42 sec
GaussianNB	20	0.17 sec	31	0.22 sec
Decision Tree	81	0.17 sec	76	0.22 sec
Random Forest	36	2.35 sec	76	0.30 sec
Gradient Boosting	29	5.31 sec	77	1.03 sec

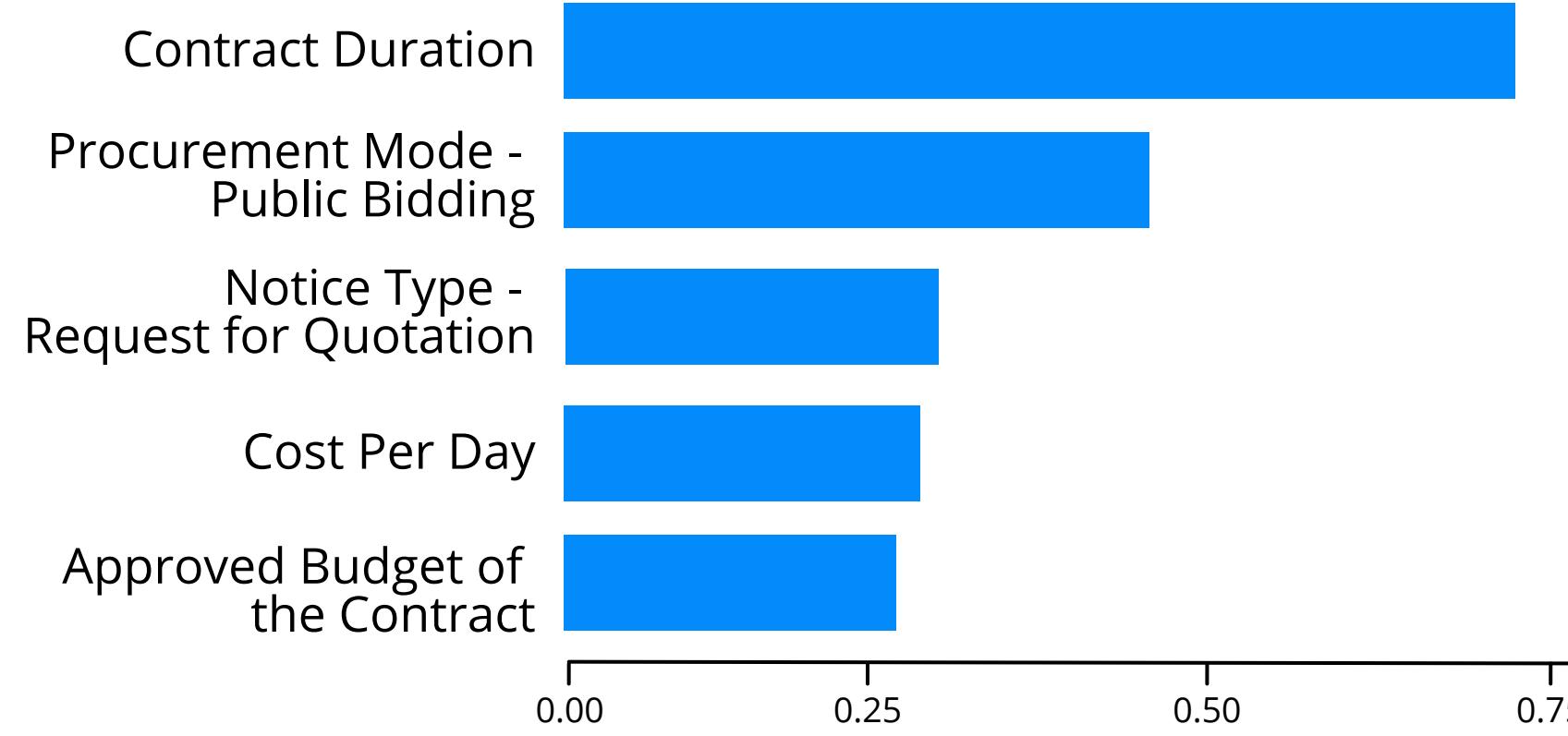
METRO MANILA



Contract Duration

Shorter duration more likely to be approved

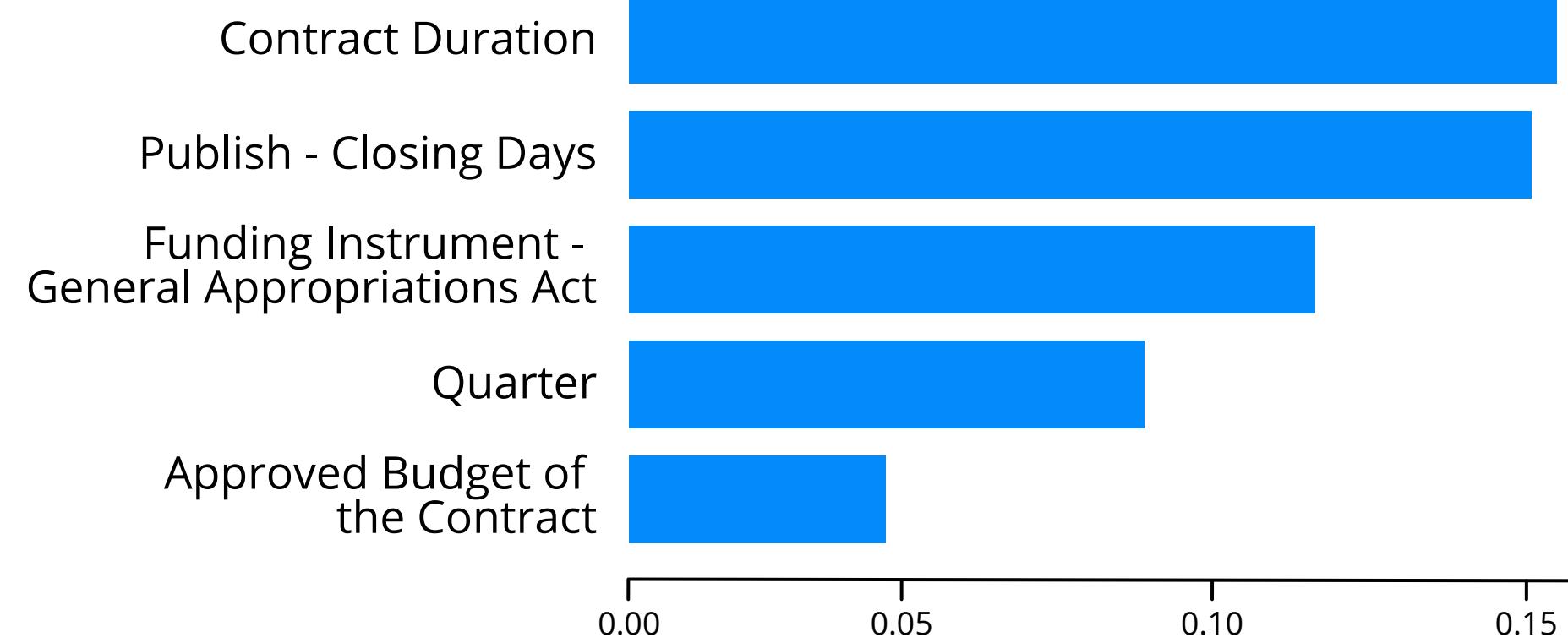
COTABATO



SHAP: WHAT ARE THE MOST IMPORTANT FEATURES?



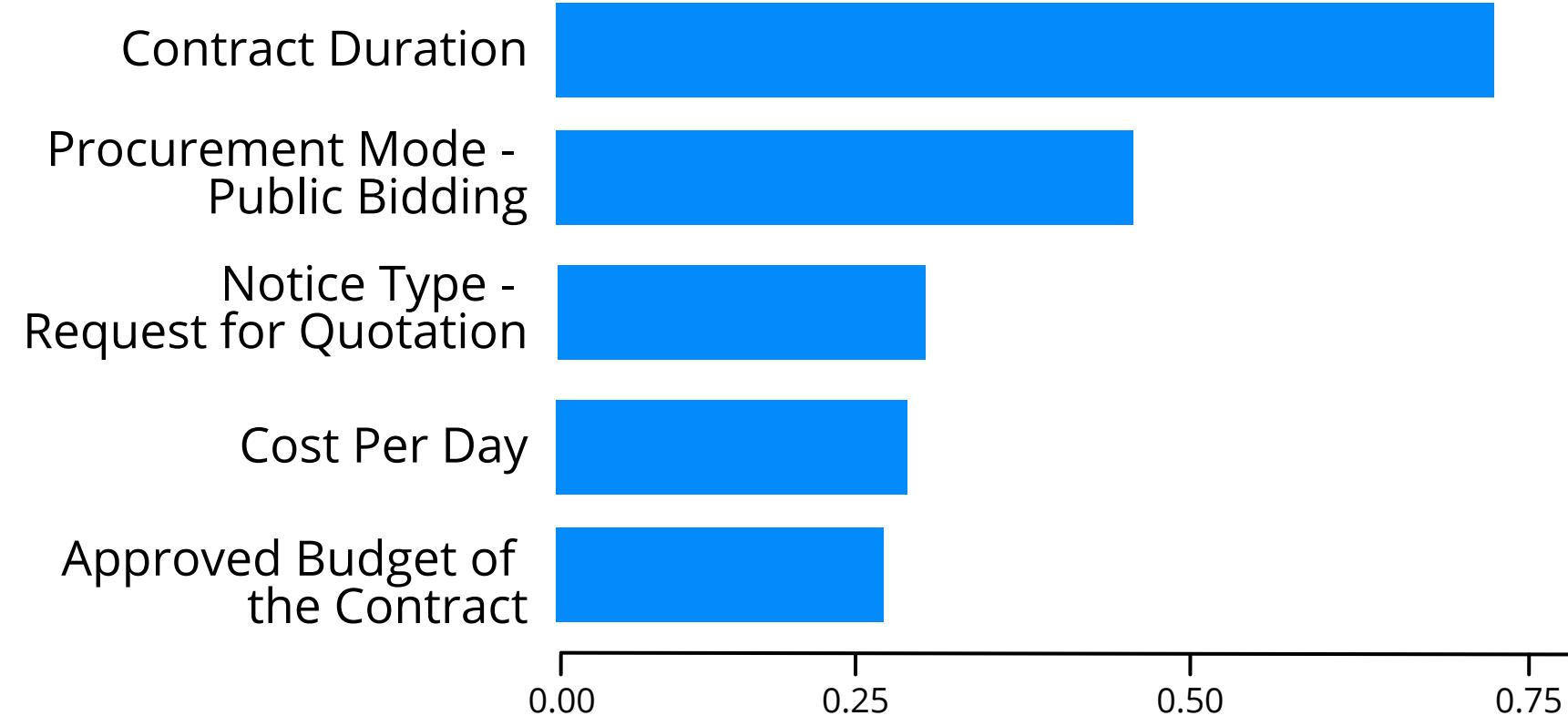
METRO MANILA



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COTABATO

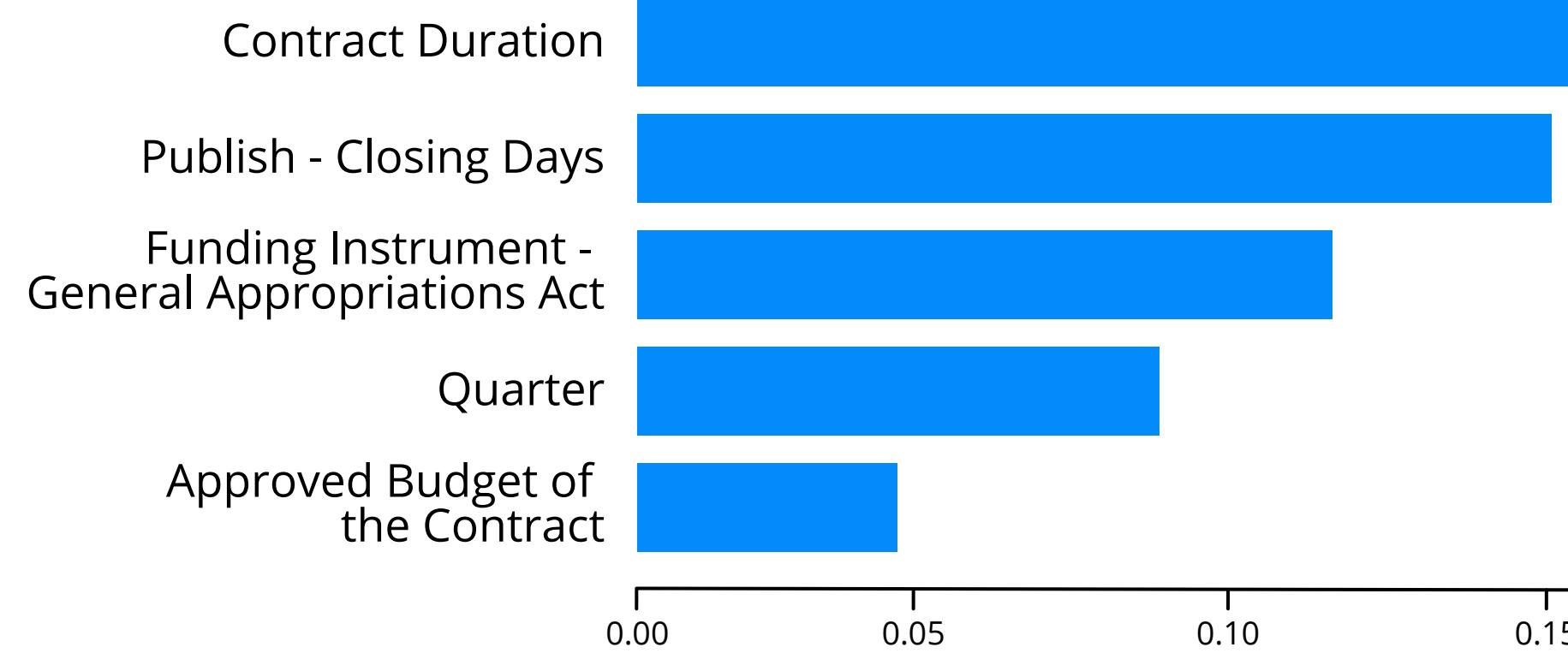


Notice Type

Competitive bidding more likely to be approved



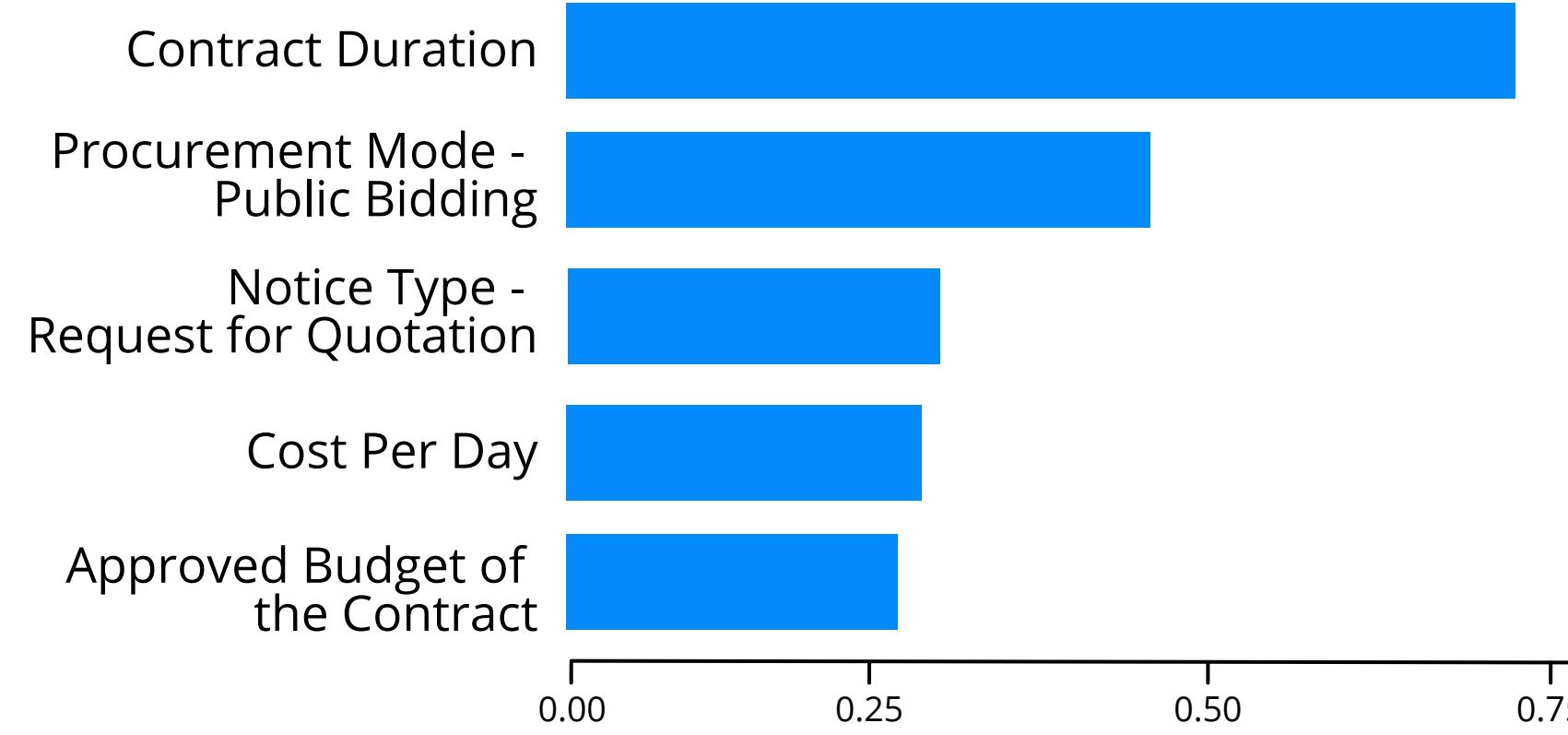
METRO MANILA



Contract Duration

Shorter duration more likely to be approved

COTABATO



Notice Type

Competitive bidding more likely to be approved

Approved Budget of the Contract

Higher budget more likely to be approved



Approved budget of the contract	Contract Duration (Days)	Publish-Closing (Days)	Quarter
---------------------------------	--------------------------	------------------------	---------

Unsuccessful bid: this is what happened

100,026.00

5.0

4.0

1



Approved budget of the contract	Contract Duration (Days)	Publish-Closing (Days)	Quarter
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Unsuccessful bid: this is what happened

100,026.00	5.0	4.0	1
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Counterfactuals: what can gov't change?

100,027.00	5.9	4.1	3
100,026.9	20.0	--	2
--	--	--	--
--	--	--	2
--	--	4.9	--
--	--	4.9	--
--	--	4.1	--

Increase duration of the contract

From 5 days to 5.9 days to 20 days



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Process bidding at an earlier date

If the bid failed during the 1st quarter, repost it immediately at the 2nd or 3rd; OR post the bid at the 2nd or 3rd quarter of the year



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Consider lengthening bidding dates

Lengthen time for pre-bidding phase to solicit more interested bidders





Government

Understand reasons
for low awarding rate
and how to promote
competition



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Bidders

Can see underserved
industries and areas
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Filipino public

We can provide value to the country when it is most needed

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ANNA
Ramos



MIKE
Tanjangco