

**APPLYING NEURAL  
NETWORKS AND  
ANALOGOUS ESTIMATING  
TO DETERMINE THE  
PROJECT BUDGET**

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## Abstract

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This paper aims to discuss the use of the Artificial Neural Networks (ANN) to model aspects of the project budget where traditional algorithms and formulas are not available or not easy to apply. Neural networks use a process analogous to the human brain, where a training component takes place with existing data and subsequently, a trained neural network becomes an “expert” in the category of information it has been given to analyse. This “expert” can then be used to provide projections given new situations based on an adaptive learning (STERGIOU & CIGANOS, 1996).

The article also presents a fictitious example of the use of neural networks to determine the cost of project management activities based on the complexity, location, budget, duration and number of relevant stakeholders. The example is based on data from 500 projects and is used to predict the project management cost of a given project.

## Artificial Neural Networks (ANN)

Some categories of problems and challenges faced in the project environment may depend on many subtle factors that a computer algorithm cannot be created to calculate the results (KRIESEL, 2005). Artificial Neural Networks (ANN) are a family of statistical learning models inspired by the way biological nervous systems, such as the brain, process information. They process records one at a time, and “learn” by comparing their classification of the record with the known actual classification of the record.

The errors from the initial classification of the first record are fed back into the network, and used to modify the network's algorithm the second time around, and so on for a large number of iterations in a learning process in order to predict reliable results from complicated or imprecise data (STERGIOU & CIGANOS, 1996) (Exhibit 01).

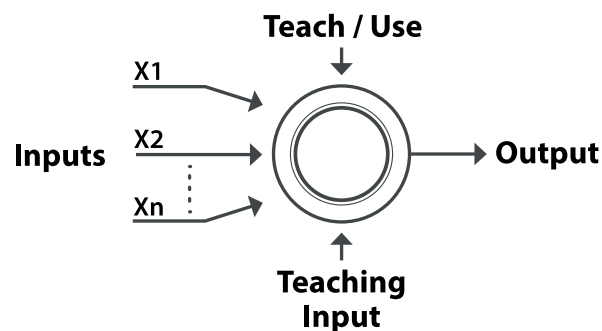


Exhibit 01 - Artificial Neural Networks Architecture (adapted from MCKIM, 1993 and STERGIOUS & CIGANOS, 1996)

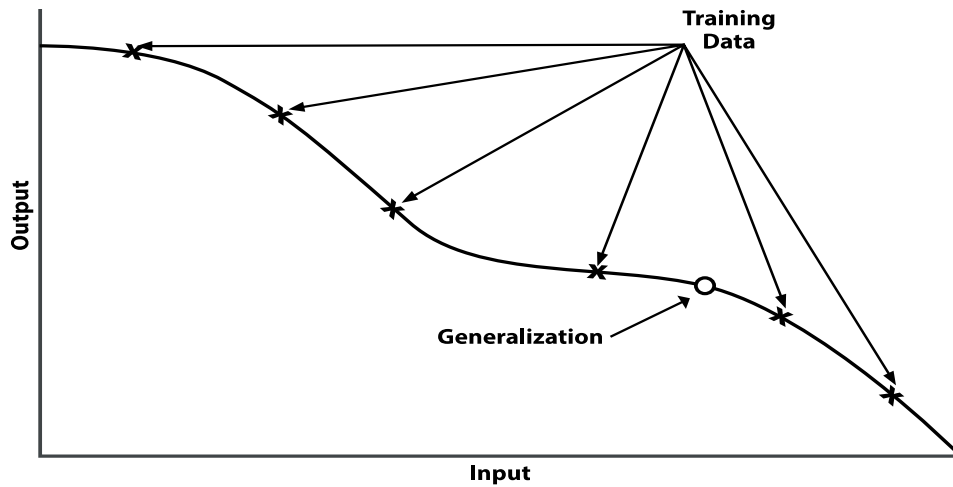
Some typical applications of ANN are

- *handwriting recognition,*
- *stock market prediction,*
- *image compression,*
- *risk management,*
- *sales forecasting*
- *industrial process control.*

The mathematical process behind the calculation uses different neural network configurations to give the best fit to predictions. The most common network types are briefly described below.

**Probabilistic Neural Networks (PNN)** – Statistical algorithm where the operations are organized in multi-layered feedforward network with four layers (input, pattern, summation and output). It is fast to be trained but it has a slow execution and requires large memory. It is also not as general as the feedforward networks (CHEUNG & CANNONS, 2002).

**Multi-Layer Feedforward Networks (MLF)** – MLF neural networks, trained with a back-propagation learning algorithm (Exhibit 02). They are the most popular neural networks (SVOZIL, KVASNIČKA & POSPÍCHAL, 1997).



**Exhibit 02** - Training data and generalization in a Multi-Layer Feedforward Network (SVOZIL, D., KVASNIČKA, V. & POSPÍCHAL, J., 1997)

**Generalized Regression Neural Networks (GRNN)** – Closely related to PNN networks, it is a memory-based network that provides estimates of continuous variables. It is a one-pass learning algorithm with a highly parallel structure. The algorithmic form can be used for any regression problem in which an assumption of linearity is not justified (SPECHT, 2002).

## Analogy Process and Data Set

One of the key factors of the Neural Networks is the data set used on the learning process. If the data set is not reliable, the results from the networks calculations will not be reliable. The use of Artificial Neural Networks can be considered one kind of analogy (BAILER-JONES & BAILER-JONES, 2002).

Analogy is a comparison between two or more elements, typically for the purpose of explanation or clarification (Exhibit 03). One of the most relevant uses of the analogy is to forecast future results based on similar results obtained in similar conditions (BARTHA, 2013). The challenge is to understand what a similar condition is. Projects in the past can be a reference for future projects if the underlying conditions where they were developed still exist in the project subject to the analysis.



**Exhibit 03** - Simple analogy example “sock are to feet as gloves are to hands”  
(Adapted from Spitzig, 2013)

One of the most relevant aspects of the analogy is related to the simple process of estimation based on similar events and facts. This process reduces the granularity of all calculations, where the final project costs can be determined by a set of fixed finite variables.

## Data Set, Dependent and Independent Categories and Numeric Variables

The first step to develop an Artificial Neural Network is to prepare the basic data set that will be used as a reference for the “training process” of the neural network. It is important to highlight that usually the right dataset is expensive and time consuming to build (INGRASSIA & MORLINI, 2005). A dataset is composed by a set of variables filled with information that will be used as a reference. These references are called cases (Exhibit 04).

		VARIABLES					
		INDEPENDENT VARIABLES					DEPENDENT VARIABLE (OUTPUT)
		V1	V2	V3	.....	Vn	V'1
CASES	Case 1						
	Case 2						
	Case 3						
	⋮						
	Case n						

**Exhibit 04** - Structure of a basic dataset

The most common variables types are

**Dependent Category** – dependent or output variable whose possible values are taken from a set of possible categories; for example Yes or No, or Red, Green or Blue.

**Dependent Numeric** – dependent or output variable whose possible values are numeric.

**Independent Category** – an independent variable whose possible values are taken from a set of possible categories; for example Yes or No, or Red, Green or Blue.

**Independent Numeric** – an independent variable whose possible values are numeric.

In the project environment, several variables can be used to calculate the project budget. Some common examples are

**Complexity** – Level of complexity of the project (Low, Medium, High). Usually it is an independent category.

**Location** – Location where the project works will happen. Associated to the complexity of the works and logistics. Most of the time it is an independent category.

**Budget** – Planned budget of the project. It is a numeric variable that can be independent or dependent (output).

**Actual Cost** – Actual Expenditure of the project. It is most of the time an independent numeric variable.

**Cost Variance** – The difference between the budget and the actual cost. It is a numeric variable that can be independent or dependent (output)

**Baseline Duration** – Duration of the project. Independent numeric variable.

**Actual Duration** – Actual duration of the project. Usually an independent numeric variable.

**Duration Variance** – The difference between the baseline duration and the actual duration.

**Type of Contract** – Independent category variable that defines the type of the contract used for the works in the project (ie: Fixed Firm Price, Cost Plus, Unit Price, etc).

**Number of Relevant Stakeholder Groups** – Independent numeric variable that reflect the number of relevant stakeholder groups in the project.

Some examples of input variables are presented at the Exhibit 05, 06 and 07.

INPUT VARIABLES	DESCRIPTION	UNIT	RANGE
PWA	Predominant Work Activity	Category	New Construction Asphalt or Concrete
WD	Work Duration	month	14–30
PW	Pavement Width	m	7–14
SW	Shoulder Width	m	0–2
GRF	Ground Rise Fall	nillan	2–7
ACG	Average Site Clear/Grub	m <sup>2</sup> /kin	12605–30297
EWV	Earthwork Volume	m <sup>3</sup> /kin	13134–31941
SURFCLASS	Surface Class	Category	Asphalt or Concrete
BASEMATE	Base Material	Category	Crushed Stone or Cement Stab.
OUTPUT VARIABLE			
USDPERKM	Unit Cost of New Construction Project	US Dollars (2000)	572.501.64-4.006.103.95

**Exhibit 05** – Example of Variables in Road Construction (SODIKOV, 2005)

DESCRIPTION	RANGE
Ground floor	100–3668 m <sup>2</sup>
Area of the typical floor	0–2597 m <sup>2</sup>
No. of storeys	1–8
No. of columns	10–156
Type of foundation	1 – isolated
	2 – isolated and combined
	3 – raft or piles
No. of elevators	0–3
No. of rooms	2–38
Cost of structural skeleton	6,282469,680 USD

**Exhibit 06** – Example of key variables for buildings (ARAFA & ALQEDRA, 2011)

PROJECT CHARACTERISTICS	UNIT	TYPE OF INFORMATION	DESCRIPTORS
Gross Floor Area (GFA)	m <sup>2</sup>	Quantitative	n.a
Principal structural material	No unit	Categorical	1 – steel 2 – concrete
Procurement route	No unit	Categorical	1 – traditional 2 – design and construct
Type of work	No unit	Categorical	1 – residential 2 – commercial 3 – office
Location	No unit	Categorical	1 – central business district 2 – metropolitan 3 – regional
Sector	No unit	Categorical	1 – private sector 2 – public sector
Estimating method	No unit	Categorical	1 – superficial method 2 – approximate quantities
Number of storey	No unit	Categorical	1 – one to two storey(s) 2 – three to seven storeys 3 – eight storeys and above
Estimated Sum	Cost/m <sup>2</sup>	Quantitative	n.a

**Exhibit 07** – Example of variables for a building construction ( AIBINU, DASSANAYAKE & THIEN, 2011)

## Training Artificial Neural Networks

When the dataset is ready the network is ready to be trained. Two approaches can be used for the learning process: supervised or adaptive training.

In the supervised training, both inputs and outputs are provided and the network compares the results with the provided output. This allows the monitoring of how well an artificial neural network is converging on the ability to predict the right answer.

For the adaptive training, only the inputs are provided. Using self-organization mechanisms, the neural networks benefits from continuous learning in order to face new situations and environments. This kind of network is usually called self-organizing map (SOM) and was developed by Teuvo Kohonen (KOHONEN, 2014).

One of the biggest challenges of the training method is to decide on which network to use and the runtime process in the computer. Some networks can be trained in seconds but in some complex cases with several variables and cases, hours can be needed just for the training process.



The results of the training process are complex formulas that relate the input or independent variables with the outputs (dependable variables) like the graph presented in the Exhibit 2.

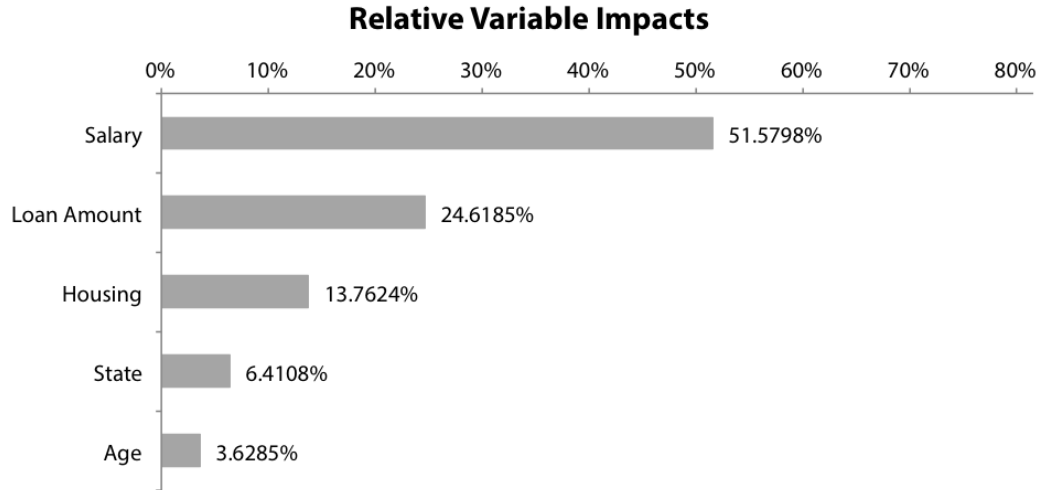
Most of the commercial software packages usually test the results of the training with some data points to evaluate the quality of the training. Around 10 to 20% of the sample is used for testing purposes (Exhibit 08).

Person	Gender	Age	Income	Alcohol	Exercise	Smoke	Blood pressure	Tag Used	Prediction	Good/Bad	Residual
1	Female	52	84800	75	7	49	53	train			
	Female	43	118570	75	70	49					
2	Female	28	172600	7	70	0	27	test	24,01	Good	2,99
3	Male	64	274500	31	19	24	78	test	81,80	Good	-3,80
4	Male	57	103600	50	0	78	94	train			
5	Female	37	107400	31	25	42	41	train			
6	Male	58	108500	57	0	62	72	train			
7	Male	54	156700	42	31	24	41	test	42,14	Good	-1,14
8	Male	26	71300	0	40	14	17	train			
9	Female	44	101300	54	24	56	49	train			
10	Male	31	100200	13	35	27	36	train			
11	Male	46	113100	39	5	75	67	train			
12	Male	65	122500	77	0	89	92	train			
13	Female	52	118900	62	21	67	60	test	63,75	Good	-3,75
14	Male	30	192600	78	83	65	71	test	82,75	Good	-11,75
15	Male	58	150600	52	1	61	65	train			
16	Male	42	66400	67	13	62	48	train			
17	Male	60	149600	63	13	69	70	test	72,05	Good	-2,05
18	Female	46	176100	39	60	46	54	train			

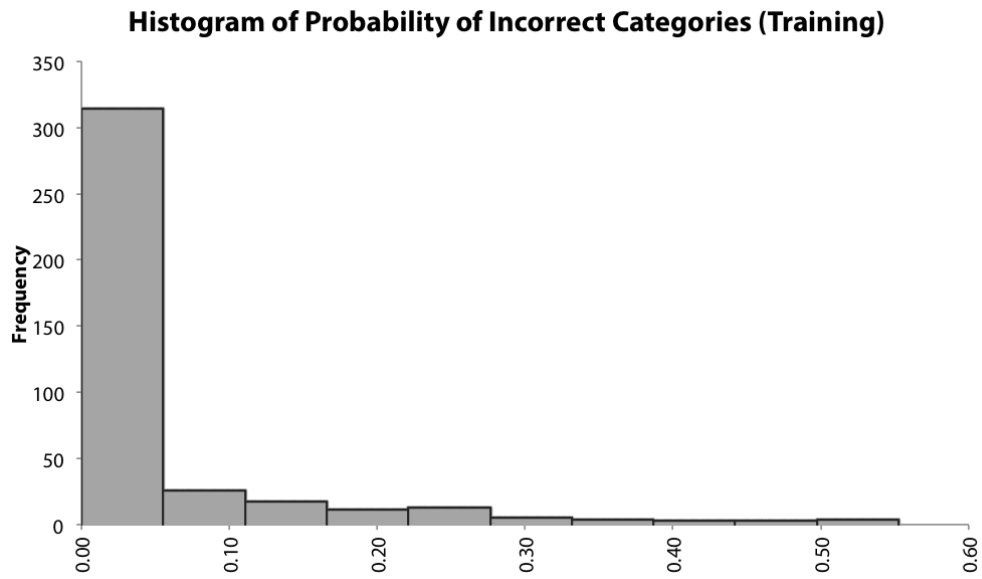
Exhibit 08 – Training results example to forecast the bloody pressure where some data is used for testing the network results (Palisade Neural Tools software example)

## Prediction Results

After the training, the model is ready to predict future results. The most relevant information that should be a focus of investigation is the contribution of each individual variable to the predicted results (Exhibit 09) and the reliability of the model (Exhibit 10).



**Exhibit 09** - Example of Relative Variable impacts, demonstrating that the Salary variable is responsible for more than 50% of the impact in the dependent variable (Palisade Neural Tools software example)



**Exhibit 10** – Example of histogram of Probability of Incorrect Categories showing a chance of 30% that 5% of the prediction can be wrong (Palisade Neural Tools software example)

It is important to highlight that one trained network that fails to get a reliable result in 30% of the cases is much more unreliable than another one that fails in only 1% of the cases.

## Example of Cost Modeling using Artificial Neural Networks

In order to exemplify the process, a fictitious example was developed to predict the project management costs on historical data provided by 500 cases<sup>1</sup>. The variables used are described in the Exhibit 11.

NAME	DESCRIPTION	VARIABLE TYPE
Project ID	ID Count of each project in the dataset	–
Location	Location where the project was developed (local or remote sites)	Independent Category
Complexity	Qualitative level of project complexity (Low, Medium and High)	Independent Category
Budget	Project Budget (between \$500,000 and \$2,000,000)	Independent Numeric
Duration	Project Duration (Between 12 and 36 months)	Independent Numeric
Relevant Stakeholder Groups	Number of relevant stakeholder groups for communication and monitoring (between 3 and 5)	Independent Category
PM Cost	Actual cost of the project management activities (planning, budgeting, controlling)	Dependent Numeric (Output)

Exhibit 11 – Variables used on the example dataset

The profiles of the cases used for the training are presented at the Exhibit 12, 13, 14, 15 and 16 and the full dataset is presented in the Appendix.

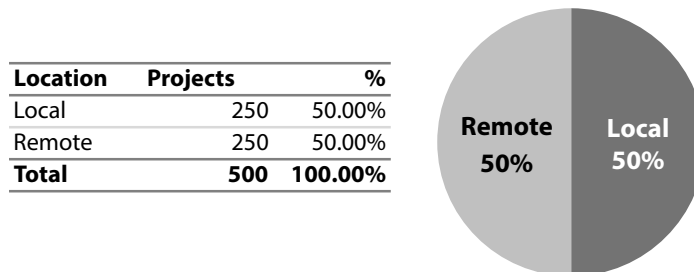


Exhibit 12 – Distribution of cases by Location

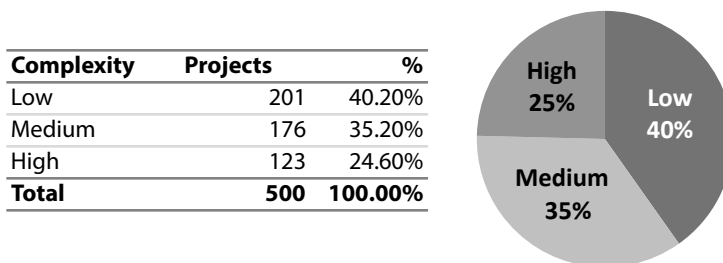


Exhibit 13 – Distribution of cases by Complexity

<sup>1</sup> The example was developed to demonstrate the use of the artificial networks and was not built from actual data. All data used is fictitious and should be considered only as an example.

Budget Range	Projects	%
500000-750000	158	31.60%
750000-1000000	111	22.20%
1000000-1250000	99	19.80%
1250000-1500000	74	14.80%
1500000-1750000	43	8.60%
1750000-2000000	15	3.00%
<b>Total</b>	<b>500</b>	<b>100.00%</b>

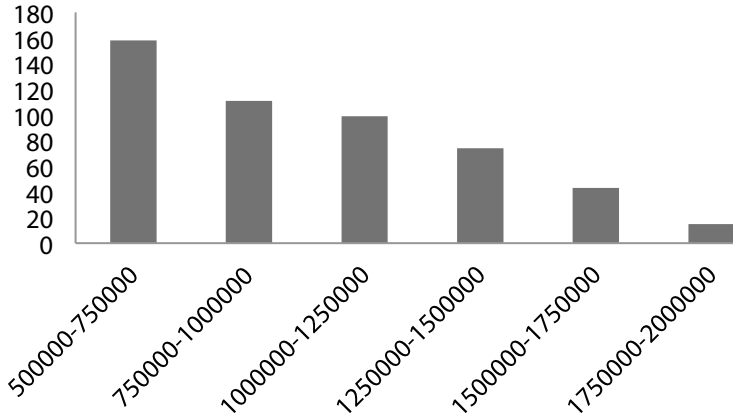


Exhibit 14 – Distribution of cases by Project Budget

Duration Range	Projects	%
12-17	145	29.00%
18-23	189	37.80%
24-29	96	19.20%
30-36	70	14.00%
<b>Total</b>	<b>500</b>	<b>100.00%</b>

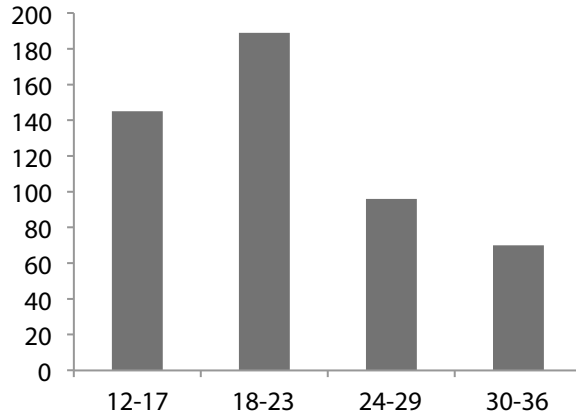


Exhibit 15 – Distribution of cases by Project Duration

Stakeholder Groups	Projects	%
3	238	47.60%
4	158	31.60%
5	104	20.80%
<b>Total</b>	<b>500</b>	<b>100.00%</b>

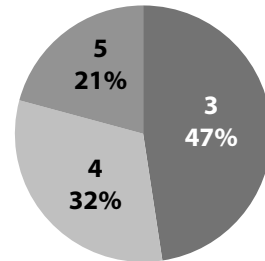


Exhibit 16 – Distribution of cases by Relevant Stakeholder Groups

The training and the tests were executed using the software Palisade Neural Tools. The test was executed in 20% of the sample and a GRNN Numeric Predictor. The summary of the training of the ANN is presented at the Exhibit 17.

NET INFORMATION		PREDICTION	
Name	Net Trained on Project Data	Number of Cases	1
Configuration	GRNN Numeric Predictor	Live Prediction Enabled	YES
Location	This Workbook	<b>TESTING</b>	
Independent Category Variables	3 (Location, Complexity, Relevant Stakeholder Groups)	Number of Cases	100
Independent Numeric Variables	2 (Budget, Duration)	% Bad Predictions (30% Tolerance)	0.0000%
Dependent Variable	Numeric Var. (PM Cost)	Root Mean Square Error	1,508.66
<b>TRAINING</b>		Mean Absolute Error	1,170.24
Number of Cases	400	Std. Deviation of Abs. Error	952.16
Training Time	00:00:38	<b>DATA SET</b>	
Number of Trials	75	Name	Project Data
Reason Stopped	Auto-Stopped	Number of Rows	501
% Bad Predictions (30% Tolerance)	0.0000%	Manual Case Tags	NO
Root Mean Square Error	944.70	<b>VARIABLE IMPACT ANALYSIS</b>	
Mean Absolute Error	706.47	Budget	54.3124%
Std. Deviation of Abs. Error	627.18	Duration	25.4821%
		Location	8.2800%
		Complexity	7.0677%
		Relevant Stakeholder Groups	4.8578%

Exhibit 17 – Palisade Neural Tools Summary Table

The relative impact of the five independent variables are described at the Exhibit 18, demonstrating that more than 50% of the impact in the Project Management cost is related to the project budget in this fictitious example.

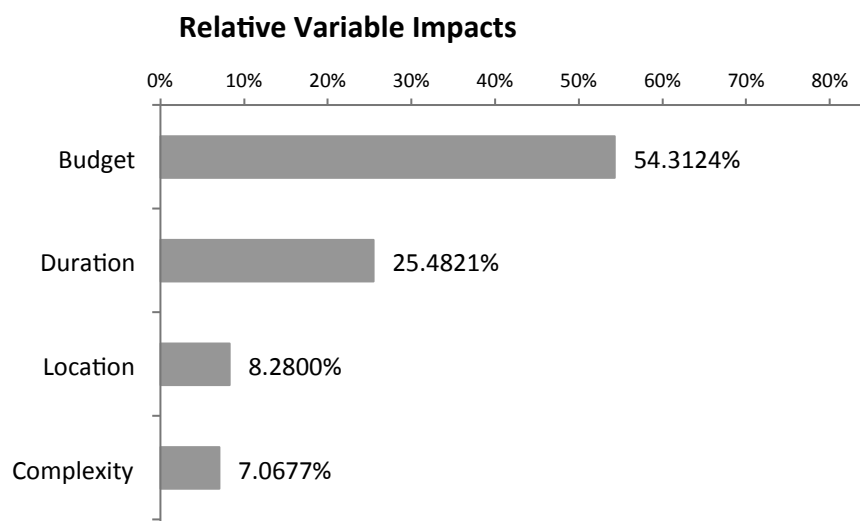


Exhibit 18 – Relative Variable Impacts

The training and tests were used to predict the Project Management Cost of a fictitious project with the following variables.

NAME	VARIABLE TYPE
Location	Local Project
Complexity	High Complexity
Budget	\$810,756
Duration	18 months
Relevant Stakeholder Groups	5 Stakeholder groups
Relevant Stakeholder Groups	Independent Category
PM Cost	Dependent Numeric (Output)

**Exhibit 19** – Basic information of a future project to be used to predict the Project Management costs

After running the simulation, the Project Management cost predictions based on the patterns in the known data is \$24,344.75, approximately 3% of the project budget.

## Conclusions

The use of Artificial Neural Networks can be a helpful tool to determine aspects of the project budget like the cost of project management, the estimated bid value of a supplier or the insurance cost of equipment. The Neural Networks allows some precise decision making process without an algorithm or a formula based process.

With the recent development of software tools, the calculation process becomes very simple and straightforward. However, the biggest challenge to produce reliable results lies in the quality of the known information. The whole process is based on actual results, and most of the time the most expensive and laborious part of the process is related to getting enough reliable data to train and test the process.

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## Appendix – Example Dataset

LOCATION	COMPLEXITY	BUDGET	DURATION	RELEVANT STAKEHOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	Medium	703,998.33	17	3	21,547.87	3.06%	train				
Remote	High	902,327.29	17	5	33,934.58	3.76%	test	33,275.83	Good	658.75	1.94%
Local	Low	904,824.77	27	3	14,789.98	1.63%	train				
Local	Low	640,833.02	17	3	15,128.69	2.36%	train				
Local	Low	683,992.89	16	3	16,985.82	2.48%	test	17,240.60	Good	-254.78	-1.50%
Remote	High	1,467,802.93	20	5	49,416.03	3.37%	train				
Remote	High	569,532.07	26	4	16,983.74	2.98%	train				
Remote	Low	1,235,140.98	12	4	47,896.02	3.88%	train				
Remote	Low	1,254,182.69	13	4	45,954.54	3.66%	test	43,510.55	Good	2,443.99	5.32%
Local	Low	634,127.64	16	3	15,747.50	2.48%	test	16,691.89	Good	-944.38	-6.00%
Remote	High	1,310,397.18	25	3	34,507.13	2.63%	train				
Local	High	1,045,689.31	15	3	31,603.05	3.02%	test	29,729.94	Good	1,873.11	5.93%
Local	Medium	1,070,909.21	20	5	27,486.67	2.57%	train				
Remote	High	1,069,089.15	25	4	31,359.95	2.93%	train				
Remote	Low	600,174.43	14	4	21,491.96	3.58%	train				
Remote	Low	1,274,790.04	17	4	39,018.57	3.06%	test	37,604.96	Good	1,413.61	3.62%
Remote	Low	1,333,972.58	13	5	50,212.10	3.76%	train				
Remote	High	1,600,399.26	16	4	58,948.04	3.68%	train				
Remote	High	1,208,443.26	32	3	28,297.71	2.34%	train				
Local	Low	1,618,395.90	12	3	49,810.63	3.08%	test	43,252.94	Good	6,557.69	13.17%
Remote	Low	580,524.22	15	3	18,125.26	3.12%	test	18,178.96	Good	-53.70	-0.30%
Remote	Low	1,277,669.74	26	4	30,434.75	2.38%	train				
Local	High	1,465,538.27	27	5	35,679.52	2.43%	test	36,732.46	Good	-1,052.93	-2.95%
Local	High	534,389.92	19	5	16,322.33	3.05%	test	16,106.84	Good	215.49	1.32%
Local	Low	1,110,809.34	19	4	26,152.74	2.35%	test	24,588.71	Good	1,564.03	5.98%
Remote	Low	938,755.52	14	4	33,616.39	3.58%	train				
Remote	Medium	573,363.07	22	5	17,287.77	3.02%	train				
Remote	High	1,030,776.33	24	3	27,716.43	2.69%	train				
Remote	High	961,099.65	13	5	41,943.37	4.36%	train				
Local	Medium	765,884.98	16	3	20,551.25	2.68%	train				
Remote	High	1,074,273.06	15	3	37,838.28	3.52%	train				
Local	Low	762,219.86	16	3	18,928.46	2.48%	train				
Local	Low	964,410.00	20	3	19,931.14	2.07%	train				
Remote	Low	911,404.26	24	4	23,595.24	2.59%	test	22,578.66	Good	1,016.59	4.31%
Remote	High	1,930,468.28	20	3	57,270.56	2.97%	train				
Remote	High	981,611.00	23	5	31,895.24	3.25%	train				
Local	Low	1,126,200.40	21	3	21,254.80	1.89%	test	22,151.95	Good	-897.15	-4.22%
Local	High	708,383.15	21	3	17,619.63	2.49%	train				
Local	Low	852,403.45	17	4	22,680.62	2.66%	train				
Remote	Low	816,178.39	16	3	24,349.32	2.98%	train				



LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	Low	1,151,686.39	22	5	31,270.03	2.72%	train				
Remote	High	624,255.72	13	3	24,746.14	3.96%	train				
Remote	High	531,076.00	25	3	14,516.08	2.73%	train				
Local	Low	1,219,803.85	21	5	27,900.59	2.29%	train				
Remote	Low	1,359,202.77	17	4	41,602.27	3.06%	train				
Local	Low	693,228.75	15	3	18,178.00	2.62%	train				
Local	High	801,510.16	28	3	16,755.38	2.09%	train				
Local	High	511,096.39	26	5	13,196.77	2.58%	train				
Local	Low	590,242.71	15	5	17,838.45	3.02%	train				
Remote	Low	1,116,386.68	17	4	34,170.19	3.06%	train				
Remote	Medium	1,123,846.83	23	4	30,897.64	2.75%	test	31,578.29	Good	-680.64	-2.20%
Remote	High	547,802.19	23	5	17,799.60	3.25%	train				
Remote	High	966,086.13	15	4	37,892.04	3.92%	train				
Local	Medium	1,273,716.73	22	3	25,667.32	2.02%	train				
Local	High	778,993.21	20	4	22,331.14	2.87%	test	22,044.71	Good	286.43	1.28%
Local	Low	894,732.93	19	3	19,276.00	2.15%	train				
Remote	Low	1,171,008.92	19	4	33,425.11	2.85%	train				
Remote	Low	551,582.86	21	4	15,374.28	2.79%	train				
Remote	High	546,599.66	29	4	15,574.95	2.85%	train				
Remote	High	1,789,071.54	28	4	49,923.62	2.79%	train				
Local	Low	1,323,310.37	28	3	19,723.63	1.49%	train				
Remote	Low	845,707.18	20	3	21,706.48	2.57%	train				
Local	Medium	782,095.09	21	5	20,235.16	2.59%	train				
Local	Medium	512,318.31	18	4	14,098.24	2.75%	train				
Remote	High	1,056,680.60	23	4	32,221.10	3.05%	train				
Local	Low	1,399,151.60	12	4	47,260.23	3.38%	train				
Remote	Low	1,629,835.05	19	4	46,521.78	2.85%	train				
Local	Low	1,747,728.47	19	5	42,896.00	2.45%	train				
Local	High	584,824.62	24	4	15,140.46	2.59%	train				
Remote	High	1,522,611.48	36	4	38,460.04	2.53%	train				
Remote	Low	1,234,685.15	19	4	35,242.68	2.85%	train				
Local	Low	982,920.06	21	3	19,533.59	1.99%	train				
Local	Medium	1,788,200.40	12	4	63,977.84	3.58%	train				
Local	High	1,082,133.01	21	4	29,080.18	2.69%	test	28,236.53	Good	843.65	2.90%
Remote	High	1,035,386.38	25	4	30,371.33	2.93%	test	31,220.71	Good	-849.38	-2.80%
Remote	Medium	1,264,034.73	14	3	42,736.41	3.38%	train				
Remote	High	1,367,409.84	19	4	45,868.20	3.35%	train				
Remote	Low	1,002,553.31	13	5	37,737.13	3.76%	train				
Local	Low	1,420,828.51	19	3	29,189.30	2.05%	train				
Local	Low	1,709,337.52	15	4	48,241.30	2.82%	train				
Local	High	609,335.11	28	4	14,566.01	2.39%	test	14,651.91	Good	-85.90	-0.59%
Remote	High	833,883.05	30	4	23,441.38	2.81%	train				

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	Low	1,297,801.29	23	3	29,191.12	2.25%	train				
Remote	Low	1,119,369.76	14	3	35,606.62	3.18%	train				
Local	Low	925,628.02	19	4	22,718.48	2.45%	train				
Local	High	667,414.59	24	3	15,276.38	2.29%	train				
Remote	High	1,722,870.56	19	5	59,514.60	3.45%	train				
Local	Low	951,195.05	23	5	21,395.00	2.25%	test	20,650.89	Good	744.11	3.48%
Local	Low	1,363,830.91	18	5	34,802.94	2.55%	train				
Remote	Medium	1,151,990.74	24	4	30,975.75	2.69%	train				
Local	High	1,125,818.31	30	5	26,018.91	2.31%	train				
Remote	High	1,279,302.89	28	3	31,860.73	2.49%	train				
Local	Medium	555,745.83	16	3	14,912.51	2.68%	test	17,164.08	Good	-2,251.57	-15.10%
Local	High	1,437,619.16	15	5	49,198.52	3.42%	train				
Remote	Low	512,839.97	15	3	16,012.00	3.12%	train				
Remote	Low	1,108,388.88	18	3	29,392.83	2.65%	train				
Local	Low	1,491,757.71	14	4	44,468.59	2.98%	train				
Local	High	573,367.88	25	4	14,525.32	2.53%	train				
Local	High	577,732.27	28	5	14,388.28	2.49%	test	13,498.17	Good	890.11	6.19%
Remote	Low	1,340,923.44	30	3	25,626.54	1.91%	train				
Local	Medium	1,218,034.19	30	3	19,623.88	1.61%	train				
Remote	Medium	982,929.62	15	4	35,603.90	3.62%	train				
Remote	Low	918,511.12	15	3	28,677.96	3.12%	train				
Remote	High	799,134.56	34	3	19,022.54	2.38%	train				
Local	Medium	1,699,228.84	14	4	54,051.66	3.18%	train				
Local	Medium	557,737.83	20	4	14,315.27	2.57%	train				
Local	Medium	1,308,696.78	25	4	27,918.86	2.13%	train				
Local	Low	823,502.63	21	3	16,365.48	1.99%	train				
Local	Low	1,277,239.09	22	5	28,292.78	2.22%	train				
Remote	High	951,405.82	17	3	31,974.70	3.36%	train				
Remote	Low	615,510.45	19	5	18,800.06	3.05%	train				
Local	Low	852,551.98	24	3	15,251.21	1.79%	test	16,513.71	Good	-1,262.50	-8.28%
Local	Low	514,229.05	22	5	11,905.18	2.32%	train				
Local	Medium	831,541.04	19	4	22,072.31	2.65%	train				
Local	Medium	1,035,118.41	21	4	24,711.40	2.39%	train				
Remote	High	813,527.00	16	4	30,778.44	3.78%	test	31,776.14	Good	-997.71	-3.24%
Local	Low	534,936.99	27	5	10,883.66	2.03%	test	11,947.44	Good	-1,063.79	-9.77%
Remote	High	839,992.75	27	3	22,130.18	2.63%	test	21,463.60	Good	666.58	3.01%
Local	High	968,941.49	20	4	27,776.32	2.87%	train				
Local	High	1,455,430.69	23	3	32,736.64	2.25%	train				
Remote	Low	553,402.62	20	4	15,864.21	2.87%	train				
Remote	Low	1,550,217.54	15	3	46,851.02	3.02%	train				
Remote	Medium	1,571,769.84	20	3	41,913.86	2.67%	train				
Local	Low	958,266.50	21	4	21,918.44	2.29%	train				

LOCATION	COMPLEXITY	BUDGET	DURATION	RELEVANT STAKEHOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	High	1,203,129.39	12	5	53,873.46	4.48%	train				
Local	Medium	512,774.70	19	4	13,611.02	2.65%	train				
Remote	Low	1,572,775.22	24	3	34,426.30	2.19%	train				
Local	High	928,720.44	21	3	23,100.08	2.49%	test	22,313.20	Good	786.88	3.41%
Local	Low	1,286,047.40	13	5	41,977.91	3.26%	test	43,382.91	Good	-1,405.01	-3.35%
Local	Medium	897,200.07	21	3	19,624.47	2.19%	train				
Local	Medium	506,773.64	28	3	9,073.66	1.79%	test	10,009.00	Good	-935.33	-10.31%
Remote	Medium	1,561,191.51	16	5	54,381.50	3.48%	test	53,120.34	Good	1,261.17	2.32%
Local	High	903,316.02	20	4	25,895.06	2.87%	train				
Remote	Medium	580,211.77	20	3	16,052.53	2.77%	test	17,675.50	Good	-1,622.97	-10.11%
Remote	Low	595,520.47	15	5	20,975.55	3.52%	train				
Local	Low	1,001,793.43	19	4	23,586.08	2.35%	test	21,799.23	Good	1,786.85	7.58%
Local	Low	655,421.89	16	5	18,898.00	2.88%	train				
Local	High	897,256.60	20	4	25,721.36	2.87%	train				
Remote	Low	604,357.31	19	3	16,041.98	2.65%	train				
Remote	High	868,980.86	18	4	30,864.91	3.55%	train				
Local	Medium	1,054,258.00	16	3	27,235.00	2.58%	train				
Local	Low	504,023.79	19	3	10,858.62	2.15%	train				
Remote	Medium	984,726.14	26	3	23,456.68	2.38%	train				
Remote	Low	914,671.35	20	3	23,476.56	2.57%	test	23,342.33	Good	134.24	0.57%
Local	Low	816,984.05	33	3	11,520.30	1.41%	train				
Local	Medium	1,102,518.04	15	5	34,423.06	3.12%	test	32,270.39	Good	2,152.67	6.25%
Local	Medium	1,568,418.96	18	3	36,886.89	2.35%	train				
Local	Low	866,386.50	27	4	16,760.84	1.93%	train				
Remote	Low	945,814.91	19	3	25,105.58	2.65%	train				
Remote	Medium	1,352,496.54	25	4	35,615.74	2.63%	train				
Remote	Low	1,007,543.31	21	3	24,053.10	2.39%	train				
Local	Medium	1,585,230.00	17	4	43,764.78	2.76%	train				
Remote	High	599,627.37	28	3	15,533.20	2.59%	test	15,007.94	Good	525.27	3.38%
Local	Medium	1,063,937.52	33	3	16,066.53	1.51%	test	19,098.46	Good	-3,031.93	-18.87%
Remote	Low	1,316,509.72	17	3	36,345.99	2.76%	train				
Local	Low	819,992.37	36	5	14,152.46	1.73%	train				
Remote	Medium	1,059,271.62	15	3	34,132.09	3.22%	test	34,598.62	Good	-466.54	-1.37%
Remote	High	661,598.27	36	3	15,388.29	2.33%	train				
Local	Low	556,860.84	22	3	10,664.73	1.92%	train				
Remote	High	1,629,259.58	20	4	53,222.48	3.27%	train				
Local	Medium	560,885.36	27	5	12,533.36	2.23%	train				
Remote	Low	1,128,949.92	36	3	19,484.84	1.73%	train				
Remote	Low	1,140,022.19	16	3	32,870.64	2.88%	train				
Local	Medium	1,277,998.06	23	5	30,023.69	2.35%	test	29,794.51	Good	229.18	0.76%
Local	Low	1,370,381.07	13	4	43,360.26	3.16%	train				
Remote	Medium	622,821.80	20	3	17,231.40	2.77%	train				

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Local	Low	606,852.57	26	5	12,634.98	2.08%	train				
Remote	Low	951,616.00	12	5	38,804.79	4.08%	train				
Remote	Medium	617,490.46	35	3	12,673.26	2.05%	train				
Local	Low	704,413.02	34	3	9,723.66	1.38%	test	9,729.60	Good	-5.94	-0.06%
Remote	Low	580,202.08	32	3	11,265.59	1.94%	train				
Local	Low	1,283,482.92	30	5	23,245.30	1.81%	train				
Remote	Low	1,615,066.28	23	4	41,172.49	2.55%	test	38,529.89	Good	2,642.60	6.42%
Remote	Medium	1,221,684.39	25	3	28,505.97	2.33%	train				
Local	Low	1,554,072.32	21	4	33,992.25	2.19%	test	32,400.12	Good	1,592.13	4.68%
Local	Medium	1,147,660.40	21	3	23,955.13	2.09%	test	25,670.99	Good	-1,715.86	-7.16%
Remote	Low	1,226,103.02	27	3	24,945.90	2.03%	train				
Remote	Low	514,184.61	22	3	12,418.34	2.42%	train				
Remote	Medium	1,559,320.98	22	3	39,219.29	2.52%	train				
Remote	Medium	904,655.73	18	3	26,704.10	2.95%	train				
Remote	Low	1,304,661.29	22	4	34,118.87	2.62%	test	32,420.45	Good	1,698.42	4.98%
Remote	Medium	573,409.51	16	4	19,973.76	3.48%	train				
Remote	High	545,633.58	21	3	16,299.72	2.99%	train				
Remote	High	503,090.27	33	4	13,634.25	2.71%	train				
Local	Medium	525,195.05	30	5	11,087.45	2.11%	train				
Local	Low	894,012.12	17	5	24,681.75	2.76%	train				
Local	Medium	833,563.20	22	3	17,631.12	2.12%	train				
Local	Low	535,711.70	22	4	11,866.83	2.22%	train				
Local	Medium	1,325,009.13	24	4	29,002.98	2.19%	train				
Remote	Medium	590,318.95	22	5	17,799.01	3.02%	train				
Local	High	1,770,395.16	22	3	40,987.33	2.32%	train				
Local	High	1,405,512.56	16	3	40,525.61	2.88%	train				
Local	Medium	1,286,163.78	17	3	31,649.72	2.46%	train				
Local	Low	1,103,463.05	15	3	27,831.79	2.52%	train				
Remote	Medium	885,202.32	20	4	27,146.20	3.07%	test	25,689.17	Good	1,457.04	5.37%
Local	Low	1,220,977.54	27	4	22,399.66	1.83%	train				
Remote	High	679,641.98	31	3	16,822.97	2.48%	train				
Local	Medium	1,158,479.42	20	5	29,734.31	2.57%	train				
Remote	High	1,297,008.10	16	3	43,882.11	3.38%	train				
Local	Medium	595,980.69	31	3	9,984.28	1.68%	train				
Remote	Low	812,827.47	19	3	21,575.58	2.65%	train				
Remote	Low	800,720.74	20	4	22,953.99	2.87%	train				
Local	Low	1,360,528.32	31	4	22,792.51	1.68%	test	22,768.65	Good	23.86	0.10%
Remote	Medium	622,078.94	25	3	15,137.25	2.43%	train				
Local	Medium	1,048,802.19	22	4	24,281.36	2.32%	test	25,044.15	Good	-762.79	-3.14%
Local	High	964,150.49	20	4	27,638.98	2.87%	train				
Remote	Low	1,270,776.17	21	4	34,149.59	2.69%	train				
Local	Medium	1,236,912.47	26	5	26,990.06	2.18%	test	27,084.03	Good	-93.96	-0.35%

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Local	Medium	828,706.86	16	4	24,723.09	2.98%	train				
Remote	High	946,925.63	15	3	34,299.75	3.62%	train				
Local	Medium	826,666.64	20	5	22,044.44	2.67%	train				
Local	Medium	744,008.05	22	4	17,968.92	2.42%	train				
Local	Medium	1,335,476.56	18	3	31,408.43	2.35%	train				
Remote	Low	540,059.74	12	3	19,862.20	3.68%	train				
Remote	Medium	1,937,816.91	19	3	53,374.96	2.75%	train				
Remote	Medium	769,785.60	17	3	23,561.48	3.06%	train				
Local	Medium	1,094,632.16	20	4	27,000.93	2.47%	train				
Remote	High	1,280,061.70	22	3	36,035.68	2.82%	train				
Remote	High	896,347.09	36	4	23,537.41	2.63%	train				
Local	Low	704,793.42	16	3	17,502.37	2.48%	train				
Remote	High	849,940.50	21	4	27,940.11	3.29%	train				
Local	Low	1,325,031.76	28	4	23,724.38	1.79%	train				
Remote	Medium	1,493,825.11	21	5	44,625.06	2.99%	train				
Remote	Low	640,849.31	33	3	12,240.87	1.91%	test	11,703.26	Good	537.61	4.39%
Remote	Medium	536,908.21	19	3	15,325.43	2.85%	train				
Remote	Low	1,167,617.40	16	4	37,169.15	3.18%	train				
Local	High	1,192,348.18	26	3	24,825.30	2.08%	train				
Remote	Low	531,703.85	15	3	16,600.98	3.12%	test	17,783.95	Good	-1,182.98	-7.13%
Remote	Medium	1,510,277.92	19	3	41,598.88	2.75%	train				
Local	Medium	1,438,409.49	35	3	20,891.19	1.45%	test	19,508.51	Good	1,382.68	6.62%
Remote	Medium	866,217.66	17	5	29,977.92	3.46%	train				
Local	High	1,830,390.71	28	4	37,189.23	2.03%	train				
Remote	Medium	993,322.40	12	4	41,498.80	4.18%	train				
Local	Low	948,143.98	15	3	24,862.44	2.62%	train				
Local	Medium	1,379,684.09	21	4	32,937.22	2.39%	train				
Remote	Low	1,120,685.21	14	5	40,131.20	3.58%	test	38,958.02	Good	1,173.18	2.92%
Local	Medium	1,163,330.12	19	4	29,715.94	2.55%	train				
Local	Medium	1,028,805.86	21	3	21,474.28	2.09%	train				
Local	Medium	698,116.99	19	3	16,436.37	2.35%	train				
Local	Medium	520,721.77	21	3	11,389.76	2.19%	train				
Remote	Medium	1,761,126.50	20	5	54,007.88	3.07%	train				
Remote	High	1,657,808.50	31	4	44,350.83	2.68%	test	46,338.40	Good	-1,987.57	-4.48%
Local	Medium	1,458,640.17	25	4	31,117.66	2.13%	train				
Remote	High	1,143,918.74	19	3	34,939.69	3.05%	train				
Remote	Low	539,042.04	24	5	14,494.24	2.69%	test	16,519.13	Good	-2,024.88	-13.97%
Local	Medium	809,443.86	15	5	26,082.08	3.22%	train				
Local	High	1,767,884.50	25	3	37,714.87	2.13%	train				
Local	High	771,280.77	21	3	19,184.08	2.49%	train				
Remote	Low	625,360.95	26	5	16,147.14	2.58%	train				
Remote	Low	599,119.11	15	5	21,102.31	3.52%	train				

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Local	High	854,967.79	22	3	20,648.77	2.42%	train				
Local	Low	614,910.44	18	4	15,691.60	2.55%	train				
Local	High	1,010,812.89	16	3	29,145.11	2.88%	train				
Local	Low	1,605,359.49	15	3	40,490.73	2.52%	train				
Local	Low	909,185.58	25	5	19,395.96	2.13%	train				
Remote	Medium	559,258.89	15	3	18,579.82	3.32%	train				
Remote	High	575,367.10	20	4	19,370.69	3.37%	test	18,927.68	Good	443.01	2.29%
Remote	Medium	565,256.88	30	5	14,759.49	2.61%	train				
Local	Medium	868,794.53	20	3	19,692.68	2.27%	test	19,750.18	Good	-57.50	-0.29%
Local	Medium	513,426.44	24	3	10,211.48	1.99%	train				
Local	Medium	565,225.63	33	3	9,100.70	1.61%	train				
Remote	Low	1,750,698.16	16	5	57,481.26	3.28%	train				
Remote	Low	777,901.92	18	3	21,406.71	2.75%	train				
Local	Low	1,485,078.05	32	4	24,380.03	1.64%	test	25,014.55	Good	-634.52	-2.60%
Local	High	785,613.65	34	3	14,772.62	1.88%	train				
Local	Low	706,311.75	19	3	15,216.68	2.15%	train				
Remote	Low	739,540.41	21	5	21,352.76	2.89%	train				
Remote	High	1,342,549.88	20	3	39,828.98	2.97%	train				
Local	High	1,201,962.84	21	3	28,694.48	2.39%	train				
Remote	High	735,242.88	17	3	24,709.93	3.36%	test	24,688.38	Good	21.55	0.09%
Remote	High	1,712,608.43	16	3	57,943.25	3.38%	train				
Local	High	1,050,306.81	16	4	33,434.77	3.18%	train				
Remote	Medium	538,418.45	28	4	13,947.60	2.59%	train				
Local	Medium	606,669.12	32	5	12,386.16	2.04%	train				
Local	Low	888,601.69	20	3	18,364.43	2.07%	train				
Local	High	602,631.37	25	3	13,458.77	2.23%	train				
Local	Medium	528,769.94	28	5	11,582.58	2.19%	train				
Remote	Medium	733,381.20	24	5	21,186.57	2.89%	test	19,471.21	Good	1,715.35	8.10%
Remote	Low	615,606.68	31	5	14,622.31	2.38%	train				
Local	Low	1,038,350.37	30	3	14,652.28	1.41%	train				
Remote	Low	1,008,605.83	15	3	30,482.31	3.02%	train				
Remote	Medium	1,537,920.89	23	4	42,281.68	2.75%	train				
Remote	Medium	1,246,255.59	14	4	45,874.07	3.68%	train				
Remote	Medium	563,905.89	21	4	16,845.57	2.99%	train				
Local	High	1,033,174.25	18	4	30,497.77	2.95%	test	28,677.64	Good	1,820.13	5.97%
Remote	Low	658,752.67	20	3	16,907.99	2.57%	train				
Remote	Medium	829,602.26	20	3	22,952.33	2.77%	train				
Local	Medium	1,771,365.49	16	5	52,845.74	2.98%	train				
Remote	Medium	511,380.29	22	4	14,907.51	2.92%	test	17,273.01	Good	-2,365.50	-15.87%
Local	Medium	1,543,534.66	20	3	33,443.25	2.17%	train				
Remote	Medium	629,687.82	27	3	14,700.49	2.33%	train				
Remote	Medium	895,421.00	25	4	24,474.84	2.73%	train				

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	Low	556,260.00	14	4	19,919.41	3.58%	test	20,022.91	Good	-103.50	-0.52%
Local	Medium	1,817,837.94	27	3	31,531.63	1.73%	train				
Local	Medium	1,622,698.23	20	4	40,026.56	2.47%	test	38,438.01	Good	1,588.54	3.97%
Remote	Medium	846,257.51	27	3	19,756.46	2.33%	train				
Local	Medium	1,611,292.85	16	3	41,625.07	2.58%	train				
Remote	Low	1,262,421.26	18	5	38,527.23	3.05%	test	37,941.67	Good	585.56	1.52%
Remote	Medium	612,061.28	36	3	12,399.91	2.03%	train				
Remote	High	1,129,246.13	12	3	46,048.15	4.08%	train				
Local	Low	537,807.95	25	4	10,935.43	2.03%	train				
Local	Low	955,684.84	26	3	16,075.11	1.68%	train				
Remote	High	1,134,051.12	25	4	33,265.50	2.93%	train				
Remote	Medium	600,240.51	19	4	18,933.90	3.15%	train				
Remote	Low	995,130.04	27	3	21,241.73	2.13%	train				
Remote	Low	1,141,834.26	19	3	29,166.85	2.55%	train				
Remote	Medium	950,139.68	16	3	30,246.11	3.18%	train				
Remote	High	1,236,433.40	12	3	50,419.01	4.08%	train				
Local	Low	1,149,263.50	28	5	21,726.55	1.89%	test	22,898.96	Good	-1,172.40	-5.40%
Local	High	697,640.20	21	3	17,352.42	2.49%	train				
Remote	Medium	584,742.74	26	3	13,928.87	2.38%	train				
Local	High	1,439,365.41	15	3	43,500.82	3.02%	train				
Local	High	644,115.39	35	5	14,507.93	2.25%	train				
Remote	Low	875,107.31	19	3	23,228.73	2.65%	train				
Local	Low	1,471,608.90	30	5	26,652.47	1.81%	train				
Local	Medium	630,681.97	21	5	16,317.64	2.59%	train				
Local	Low	1,134,830.22	15	3	28,622.94	2.52%	test	27,401.45	Good	1,221.49	4.27%
Local	Low	1,515,009.77	24	3	25,586.83	1.69%	train				
Local	Medium	503,379.10	24	4	11,521.79	2.29%	train				
Local	Medium	1,289,329.63	13	5	44,663.70	3.46%	train				
Remote	Low	540,092.44	20	3	13,862.37	2.57%	train				
Remote	Medium	1,506,018.23	27	3	33,653.00	2.23%	test	36,646.12	Good	-2,993.12	-8.89%
Local	Low	1,223,357.49	20	3	24,059.36	1.97%	train				
Remote	Low	1,177,260.33	22	3	27,255.36	2.32%	train				
Remote	Low	567,631.63	20	3	14,569.21	2.57%	train				
Remote	Low	1,059,977.22	30	3	20,257.34	1.91%	train				
Remote	High	1,426,212.38	33	3	32,946.95	2.31%	train				
Remote	Low	1,078,018.55	34	5	23,505.03	2.18%	test	20,705.97	Good	2,799.07	11.91%
Local	Medium	1,642,148.81	23	4	36,936.45	2.25%	train				
Remote	Medium	568,875.01	27	3	13,280.77	2.33%	train				
Local	Medium	1,323,716.42	12	5	48,683.35	3.68%	test	45,392.41	Good	3,290.94	6.76%
Remote	Low	1,242,074.92	22	3	28,755.92	2.32%	train				
Remote	Low	533,466.84	19	5	16,294.14	3.05%	train				
Remote	High	1,341,511.76	20	5	45,164.23	3.37%	train				

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	Medium	1,190,106.86	17	3	35,236.50	2.96%	train				
Remote	Medium	1,639,194.71	12	4	66,842.72	4.08%	train				
Local	High	557,365.65	17	4	17,617.13	3.16%	train				
Remote	Low	840,319.07	15	4	28,757.59	3.42%	test	29,966.92	Good	-1,209.33	-4.21%
Local	Low	575,092.91	30	3	8,690.29	1.51%	train				
Local	Medium	865,197.22	19	3	20,370.08	2.35%	train				
Local	Low	1,283,649.31	21	4	28,077.28	2.19%	train				
Local	High	1,127,308.76	21	4	30,294.19	2.69%	train				
Remote	Low	863,172.40	15	5	30,402.85	3.52%	train				
Local	Medium	822,039.76	24	4	18,815.58	2.29%	train				
Remote	Low	562,812.48	15	4	19,260.69	3.42%	train				
Local	Low	502,502.19	24	4	10,496.71	2.09%	test	11,330.66	Good	-833.95	-7.94%
Remote	Low	518,239.43	34	5	11,817.89	2.28%	train				
Local	High	1,282,007.44	15	4	42,591.14	3.32%	train				
Remote	Medium	774,354.55	35	3	15,892.71	2.05%	train				
Remote	Low	589,499.15	21	4	16,431.12	2.79%	test	16,242.83	Good	188.28	1.15%
Remote	Medium	1,682,541.00	24	3	40,194.04	2.39%	train				
Local	Medium	838,064.15	24	3	16,668.16	1.99%	test	18,249.56	Good	-1,581.39	-9.49%
Remote	Medium	1,197,097.75	15	3	38,573.15	3.22%	train				
Local	Low	673,022.37	15	3	17,648.14	2.62%	train				
Local	Medium	989,563.79	14	4	32,467.12	3.28%	train				
Local	Low	1,314,990.27	26	3	20,803.82	1.58%	test	21,387.48	Good	-583.66	-2.81%
Local	High	1,768,637.41	33	5	39,088.67	2.21%	train				
Remote	Medium	902,133.76	34	3	18,767.92	2.08%	train				
Remote	Medium	768,791.62	21	4	22,966.12	2.99%	train				
Local	Medium	834,143.17	21	3	18,245.23	2.19%	train				
Local	Low	1,721,279.85	20	3	33,851.84	1.97%	train				
Remote	Medium	649,359.38	28	4	16,821.50	2.59%	test	14,796.02	Good	2,025.48	12.04%
Remote	Medium	1,292,141.59	30	5	32,447.11	2.51%	train				
Local	Medium	1,162,828.90	31	3	18,317.68	1.58%	test	19,475.00	Good	-1,157.31	-6.32%
Remote	Low	522,425.32	24	3	11,957.74	2.29%	test	13,711.25	Good	-1,753.51	-14.66%
Remote	Low	1,259,321.65	18	5	38,432.63	3.05%	train				
Local	High	753,129.64	34	3	14,161.79	1.88%	test	14,469.25	Good	-307.46	-2.17%
Local	High	1,591,469.31	13	4	58,313.07	3.66%	train				
Local	High	1,815,026.04	15	5	62,114.22	3.42%	train				
Remote	Medium	539,535.55	16	4	18,793.82	3.48%	test	19,527.43	Good	-733.61	-3.90%
Remote	Medium	1,012,917.15	17	3	29,990.29	2.96%	train				
Local	Low	1,191,074.21	24	3	20,115.92	1.69%	train				
Remote	Medium	1,242,927.66	25	3	29,001.65	2.33%	train				
Local	Low	866,382.17	26	3	14,572.99	1.68%	train				
Remote	High	1,809,778.83	14	3	66,617.10	3.68%	train				
Local	Low	1,200,895.52	19	4	28,273.72	2.35%	train				



LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	High	664,897.90	21	3	19,862.51	2.99%	train				
Remote	Low	838,060.77	19	3	22,245.37	2.65%	test	22,111.30	Good	134.06	0.60%
Local	High	708,604.12	15	3	22,124.20	3.12%	train				
Remote	High	721,495.49	21	5	24,439.23	3.39%	test	22,337.15	Good	2,102.08	8.60%
Local	Medium	1,455,977.09	15	3	39,634.93	2.72%	train				
Local	Low	1,111,810.02	27	3	17,061.48	1.53%	test	17,956.39	Good	-894.91	-5.25%
Remote	Low	1,587,492.55	16	5	52,122.67	3.28%	train				
Local	Low	879,426.14	20	3	18,174.81	2.07%	train				
Remote	Low	814,569.24	24	3	18,644.58	2.29%	train				
Remote	Low	550,677.71	29	3	11,285.73	2.05%	train				
Remote	Low	654,244.47	28	3	13,676.82	2.09%	train				
Local	Medium	1,142,844.15	19	5	30,335.49	2.65%	train				
Local	Medium	873,476.34	21	3	19,105.56	2.19%	train				
Remote	Medium	554,435.96	13	3	20,315.10	3.66%	train				
Local	Medium	825,566.09	15	4	25,776.01	3.12%	train				
Remote	Low	633,649.59	26	3	13,826.56	2.18%	train				
Remote	High	587,307.33	20	4	19,772.68	3.37%	train				
Remote	Low	641,383.96	35	3	11,880.87	1.85%	train				
Remote	Medium	1,481,728.02	17	3	43,870.77	2.96%	test	42,949.19	Good	921.58	2.10%
Local	Medium	1,007,413.35	34	5	18,943.32	1.88%	train				
Local	Medium	643,538.40	26	5	14,685.88	2.28%	train				
Remote	Low	1,827,161.32	16	3	52,683.15	2.88%	train				
Remote	Low	964,830.02	15	4	33,018.63	3.42%	train				
Local	Low	632,906.70	22	3	12,121.12	1.92%	train				
Local	Low	526,027.21	34	3	7,261.24	1.38%	train				
Remote	Medium	731,439.19	20	3	20,236.48	2.77%	train				
Local	Low	886,535.29	20	3	18,321.73	2.07%	train				
Remote	Medium	1,055,346.94	20	4	31,308.63	2.97%	test	31,889.28	Good	-580.66	-1.85%
Local	Low	1,248,941.20	33	3	16,362.39	1.31%	train				
Local	High	618,518.54	21	3	15,384.42	2.49%	train				
Local	Low	530,522.61	15	3	13,911.48	2.62%	train				
Local	Low	1,009,146.22	22	4	21,344.97	2.12%	train				
Local	High	1,021,674.63	27	3	20,786.66	2.03%	train				
Remote	Low	1,121,376.46	22	5	30,447.07	2.72%	train				
Local	Low	638,464.57	31	4	11,334.46	1.78%	train				
Remote	Medium	1,256,833.06	34	3	24,890.22	1.98%	train				
Remote	High	546,298.17	30	4	15,357.05	2.81%	train				
Local	Medium	987,396.42	15	3	27,866.52	2.82%	test	26,778.88	Good	1,087.64	3.90%
Remote	Medium	1,046,307.06	21	5	31,256.35	2.99%	train				
Local	High	694,023.76	29	4	16,305.57	2.35%	train				
Local	Medium	1,234,868.04	27	5	26,359.10	2.13%	train				
Local	Medium	632,587.31	24	3	12,581.46	1.99%	train				

LOCA-TION	COMPLE-XITY	BUDGET	DURA-TION	RELE-VANT STAKE-HOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Remote	High	1,366,884.27	21	4	43,566.72	3.19%	train				
Remote	Medium	869,516.65	12	3	33,717.92	3.88%	test	34,888.20	Good	-1,170.28	-3.47%
Remote	High	924,774.23	20	4	31,134.07	3.37%	train				
Remote	High	1,729,408.45	21	3	49,933.24	2.89%	train				
Local	Low	1,633,982.66	35	4	25,365.64	1.55%	train				
Local	Medium	814,029.10	15	4	25,415.80	3.12%	train				
Local	High	994,502.93	21	3	24,736.29	2.49%	test	24,108.59	Good	627.70	2.54%
Remote	Low	573,443.71	23	3	13,471.77	2.35%	train				
Local	Medium	586,644.29	30	5	12,384.71	2.11%	test	12,332.61	Good	52.10	0.42%
Local	Low	1,194,191.56	20	3	23,485.77	1.97%	train				
Local	Low	640,851.46	29	4	11,852.07	1.85%	train				
Local	High	653,026.72	15	3	20,388.95	3.12%	train				
Remote	Low	1,123,457.64	30	3	21,470.52	1.91%	train				
Remote	Medium	807,182.36	23	3	20,577.30	2.55%	train				
Remote	Low	1,367,692.12	17	4	41,862.11	3.06%	train				
Local	Low	573,685.93	27	4	11,098.34	1.93%	train				
Local	Medium	567,217.09	20	3	12,856.92	2.27%	train				
Remote	Medium	1,188,181.44	21	4	34,306.38	2.89%	train				
Local	Medium	552,218.25	12	3	18,652.71	3.38%	train				
Local	Medium	575,508.83	19	5	15,851.73	2.75%	train				
Local	Low	1,022,032.17	16	3	24,358.43	2.38%	test	24,273.38	Good	85.06	0.35%
Remote	High	1,245,112.01	17	3	40,600.42	3.26%	train				
Local	Medium	764,762.97	35	3	11,872.03	1.55%	test	12,294.49	Good	-422.46	-3.56%
Remote	High	534,546.78	16	4	20,223.69	3.78%	train				
Local	Medium	934,959.92	19	5	25,752.40	2.75%	train				
Local	High	1,680,626.26	17	5	53,120.97	3.16%	train				
Local	Medium	1,072,671.58	24	4	23,479.59	2.19%	train				
Remote	High	1,556,942.09	17	3	50,768.52	3.26%	test	52,653.72	Good	-1,885.20	-3.71%
Local	Low	1,368,257.92	16	4	36,714.92	2.68%	train				
Remote	Low	551,086.24	20	3	14,144.55	2.57%	train				
Local	Medium	860,268.78	25	5	20,072.94	2.33%	train				
Local	High	584,003.61	16	4	19,174.79	3.28%	train				
Remote	Low	625,248.12	18	3	17,205.90	2.75%	train				
Local	Low	1,689,416.73	30	4	28,907.80	1.71%	test	26,945.85	Good	1,961.94	6.79%
Remote	Medium	1,069,349.15	15	5	38,734.20	3.62%	train				
Remote	Low	627,751.93	15	4	21,483.07	3.42%	test	20,197.79	Good	1,285.28	5.98%
Local	High	1,268,675.38	20	4	35,100.02	2.77%	train				
Local	High	1,547,340.00	27	5	37,671.04	2.43%	train				
Local	Medium	1,294,799.07	20	4	31,938.38	2.47%	train				
Remote	High	1,185,245.00	32	4	31,310.22	2.64%	test	28,602.72	Good	2,707.50	8.65%
Local	Low	524,430.06	33	3	7,394.99	1.41%	train				
Local	Medium	663,249.69	28	5	14,528.33	2.19%	train				

LOCATION	COMPLEXITY	BUDGET	DURATION	RELEVANT STAKEHOLDER GROUPS	PM COST	% PM COST	TAG USED	TEST	GOOD OR BAD	RESIDUAL	%
Local	Medium	1,653,133.09	15	4	49,961.36	3.02%	train				
Local	Medium	528,820.61	20	4	13,573.06	2.57%	train				
Local	Medium	519,719.13	30	3	8,892.97	1.71%	train				
Remote	Medium	743,037.32	33	5	18,650.99	2.51%	train				
Remote	Medium	856,258.79	24	3	21,311.33	2.49%	test	21,521.34	Good	-210.01	-0.99%
Local	High	620,702.06	31	4	14,122.64	2.28%	train				
Remote	Medium	1,284,054.66	24	4	34,526.80	2.69%	test	33,189.13	Good	1,337.68	3.87%
Remote	Low	1,221,724.86	15	5	41,810.14	3.42%	train				
Local	Low	1,713,664.43	16	4	45,983.33	2.68%	train				
Remote	Medium	1,277,241.72	36	3	24,598.73	1.93%	test	25,616.68	Good	-1,017.95	-4.14%
Remote	Medium	1,376,535.12	15	3	44,355.02	3.22%	train				
Local	Medium	1,201,960.23	30	3	19,364.91	1.61%	train				
Local	Medium	1,048,096.64	16	4	30,220.12	2.88%	train				
Local	Medium	781,372.88	16	3	20,966.84	2.68%	train				
Local	Low	889,253.80	16	4	24,750.90	2.78%	test	22,245.27	Good	2,505.62	10.12%
Remote	Low	635,992.33	32	5	14,892.82	2.34%	test	13,943.56	Good	949.26	6.37%
Local	Low	510,489.36	31	4	9,062.56	1.78%	train				
Local	Medium	880,766.98	15	3	24,857.20	2.82%	train				
Remote	Medium	843,268.82	20	3	23,330.44	2.77%	test	23,204.29	Good	126.15	0.54%
Local	High	1,296,821.96	23	5	34,356.38	2.65%	train				
Local	Medium	1,484,991.68	14	5	48,721.87	3.28%	train				
Local	Medium	1,273,825.30	24	3	24,061.14	1.89%	train				
Local	Low	1,066,325.50	20	3	20,971.07	1.97%	train				
Remote	Low	941,441.39	16	5	31,852.10	3.38%	train				
Local	Low	546,951.49	23	3	10,114.64	1.85%	train				
Remote	Low	661,069.81	20	4	18,950.67	2.87%	train				
Local	Medium	568,661.89	20	4	14,595.66	2.57%	train				
Remote	Low	1,240,392.01	16	3	35,764.64	2.88%	train				
Remote	Medium	1,474,071.34	34	4	33,614.61	2.28%	train				
Remote	High	504,448.03	31	3	12,486.44	2.48%	train				
Remote	Low	869,608.71	23	4	23,038.33	2.65%	train				
Remote	Medium	1,484,723.62	20	4	44,046.80	2.97%	train				
Remote	Low	568,098.78	22	3	13,720.45	2.42%	train				
Remote	High	809,584.87	21	5	27,423.08	3.39%	test	28,005.36	Good	-582.28	-2.12%
Remote	Medium	1,283,825.59	19	5	40,496.81	3.15%	train				
Remote	Low	568,442.98	34	3	10,688.96	1.88%	test	11,691.38	Good	-1,002.42	-9.38%
Local	Medium	543,071.16	17	5	16,079.17	2.96%	train				
Remote	Medium	1,206,922.14	20	3	32,184.59	2.67%	train				
Local	Low	1,565,873.75	23	5	33,654.94	2.15%	train				
Remote	Low	686,957.91	19	3	18,234.51	2.65%	train				