

MGMT 524
CAPSTONE PROBLEM SET

CP-3 This problem demonstrates knowledge from PMBOK 8.3 Perform Quality Control. Variations to the final project can be devastating, This problem uses statistical data to find the root cause.

A manufacturer of aircraft components is concerned about production variations and asked that his operations researcher determine the factors contributing to varying production rates.

Various supervisory personnel were queried about the causes. Chief among their thoughts as to the cause were:

- the number of employees actually on the job
- the in-plant temperature
- the in-plant light level
- and the percentage of time actually on the production floor by supervisory personnel.

In an effort to determine the probable cause(s) of the fluctuations in productivity and to attempt to produce a predictive means the following data were collected:

ATTENDANCE IS IN PERCENT FULL MANNING.

TEMPERATURE IS IN DEGREES F.

LIGHT LEVEL IS IN UNITS OF PERCENT OF MAXIMUM

SUPERVISORY PRESENCE IS IN PERCENT OF MAXIMUM.

DAY	PRODUCTION	EMPLOYEE ATTENDANCE	PLANT TEMP	PLAN T LL	SUPERVISORY PRESENCE
1	110	105	72	100	100
2	95	100	82	100	100
3	100	95	74	95	95
4	98	99	76	98	98
5	92	95	84	96	94
6	91	96	86	95	93
7	89	98	86	94	93
8	91	99	87	95	95
9	88	98	87	95	94
10	88	98	88	99	100
11	90	101	86	97	99
12	92	100	85	96	95
13	94	100	80	100	97
14	105	102	78	99	98
15	106	101	77	100	98

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a.) Which independent variable best predicts the dependent variable, production?
Why do you so state?

Answer: Plant Temperature. It has the lowest P-value of 0.00005343. Inspection of the data supports this hypothesis.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.946811
R Square	0.896451
Adjusted R S	0.855031
Standard Error	2.670926
Observations	15

ANOVA					
	df	SS	MS	F	Significance F
Regression	4	617.5949	154.3987	21.6431178	6.53E-05
Residual	10	71.33848	7.133848		
Total	14	688.9333			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	106.2263	44.8475	2.368612	0.0393704	6.299874	206.1528	6.299874	206.1528
Employee Att	0.786751	0.371792	2.116104	0.0604185	-0.04165	1.615155	-0.04165	1.615155
Plant Temp	-1.05009	0.156658	-6.7031	0.0000534	-1.39915	-0.70104	-1.39915	-0.70104
Plant LL	0.462487	0.685512	0.674659	0.5151864	-1.06493	1.989903	-1.06493	1.989903
Supervisor Pr	-0.49658	0.578216	-0.85882	0.4105556	-1.78493	0.791764	-1.78493	0.791764

b.) Using attendance as the only independent variable, predict production if attendance is 75, 93, and 112.

Answer: If attendance = 75 ,Production = 58.615 75 If attendance = 93, Production = 85.952 93. If attendance = 112, Production = 114.807 112

	1st Test (Y)	Final Av (X)	(X - $\bar{X}$) ²	(X - $\bar{X}$)(Y - $\bar{Y}$)	(Y - $\bar{Y}$) ²	?	(Y - ?) ²	(? - $\bar{Y}$) ²
1	110	105	34.42	86.44	217.07	104.18	33.91	79.38
2	95	100	0.75	-0.23	0.07	96.58	2.51	1.73
3	100	95	17.08	-19.56	22.40	88.99	121.24	39.41
4	98	99	0.02	-0.36	7.47	95.06	8.62	0.04
5	92	95	17.08	13.50	10.67	88.99	9.06	39.41
6	91	96	9.82	13.37	18.20	90.51	0.24	22.64
7	89	98	1.28	7.10	39.27	93.55	20.66	2.96
8	91	99	0.02	0.57	18.20	95.06	16.52	0.04
9	88	98	1.28	8.24	52.80	93.55	30.75	2.96
10	88	98	1.28	8.24	52.80	93.55	30.75	2.96
11	90	101	3.48	-9.83	27.74	98.10	65.64	8.04
12	92	100	0.75	-2.83	10.67	96.58	21.00	1.73
13	94	100	0.75	-1.10	1.60	96.58	6.67	1.73
14	105	102	8.22	27.90	94.74	99.62	28.94	18.95
15	106	101	3.48	20.04	115.20	98.10	62.38	8.04
	1429	1487	99.733	151.467	688.933		458.898	230.035
	95.267	99.133	$\Sigma(X - \bar{X})^2$		$\Sigma(X - \bar{X})(Y - \bar{Y})$			
	95.2666667							
	n= 15							

	Production	Attendance X
b. If attendance = X, Production =	58.615	75
b. If attendance = X, Production =	85.952	93
b. If attendance = X, Production =	114.807	112

c.) Progressively build a prediction model using as many of the independent variables as you see fit. How good is the model? (How much of the variation in production does the

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model "account for"?) What is the range of predictability or usability for each of the independent variables used?

Answer: Using Regression Statistics:

R² is almost 90% which equates to a relative accurate depiction of the data.

Multiple R 0.946810869

R Square 0.896450822

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