

Examining Telecommunications firm's ability to provision circuits

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- Goal: To examine affects on telecommunications firm's ability to provision circuits, affects based on:
 - Customer (Sales Channel)
 - Bandwidth
 - Expedites
 - Service Type
 - Off Network (work with another carrier)
 - Changes made to an order once submitted

- Data Source: Telecommunications firms provisioning process data
- Summary Info:
 - 1,007 observations (orders) over three months
 - Response Variable: *Meet Interval?*
 - Binary variable based on Cycle Time (Order Opened → Order Completed)
 - 1 if Cycle Time below 21 days, 0 otherwise
- Data Groupings/Transformation
 - Version Number: 0, 1, 2, 3...13 → Version Number Group: 0, 1, 2
 - Service Type: 4 (PL, ATM, FR, DAV) → 3 (PL, ATM/FR, DAV)
 - Bandwidth: 7 (DS0, DS1, DS3, OC3, OC12, OC48, PVC) → 5 (DS0, DS1/DS3, OC3/OC12, OC48, PVC)
 - Sales Channel (ESG, WS, LD)
 - Offnet
 - Expedites

Dataset- Example

Cycle Time	MeetInterval	Version NumGroup	VNGroup 1	VNGroup 2	EXPE D_1	Sales Channel	SC_ESG	SC_LD	Svc Type	ST_A TM/F R	ST_DAV	BW	BW_D DS0	BW_O S1/DS 3	C3/OC1 2	BW_OC48	OffNet	OffNet_1
7	1	0	0	0	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
42	0	2	0	1	1	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
34	1	0	0	0	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
63	0	2	0	1	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
54	0	2	0	1	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
51	0	2	0	1	1	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
63	0	2	0	1	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
37	0	0	0	0	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
37	0	0	0	0	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
46	0	2	0	1	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
67	0	1	1	0	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
56	0	2	0	1	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0
30	1	0	0	0	0	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	1	1
44	0	2	0	1	1	ESG	1	0	PL	0	0	DS1/DS3	0	1	0	0	0	0

Approaches

- *Data Exploration*
- *Classification Tree*
- *Logistic Regression*
- *Discriminate Analysis*

Data Exploration

- 7 Pivot Tables / Chi-Sqr tests
- Predictors with low p-value:
 - VersionNum
 - VersionNumGroup
 - SvcType
 - Bandwidth

1. MeetInt vs. VersionNum

Count MeetInt?	VersionNum	0	1	2	3	4	5	6	7	8	9	10	13	Total
0	1	172	112	69	39	20	12	6	2	2	3		1	438
1	0	409	103	38	7	9	2	1				1		570
Total		581	215	107	46	29	14	7	2	2	3	1	1	1008

Count MeetInt?	VersionNum	0	1	2	3	4	5	6	7	8	9	10	13	Total
0	1	39%	26%	16%	8.9%	4.6%	2.7%	1.4%	0.5%	0.5%	0.7%	0.0%	0.2%	100%
1	0	72%	18%	6.7%	1.2%	1.6%	0.4%	0.2%	0.0%	0.0%	0.0%	0.2%	0.0%	100%
Total		58%	21%	11%	4.6%	2.9%	1.4%	0.7%	0.2%	0.2%	0.3%	0.1%	0.1%	100%

Count MeetInt?	VersionNum	0	1	2	3	4	5	6	7	8	9	10	13	Total
0	1	252	93.4	46.5	20	12.6	6.08	3.04	0.87	0.87	1.3	0.43	0.43	438
1	0	329	122	60.5	26	16.4	7.92	3.96	1.13	1.13	1.7	0.57	0.57	570
Total		581	215	107	46	29	14	7	2	2	3	1	1	1008

p-value 0.000

- 7 Pivot Tables / Chi-Sqr tests
- Predictions with low p-value:
 - VerisonNum
 - VerisonNumGroup
 - SvcType
 - Bandwidth

5. MeetInt vs. SvcType

Count MeetInt?	SvcType				Total
MeetInt?	DAV	PL	ATM/FR		
0	57	217	164		438
1	85	160	325		570
Total	142	377	489		1008

Count MeetInt?	SvcType				Total
MeetInt?	DAV	PL	ATM/FR		
0	13.0%	49.5%	37.4%		100%
1	14.9%	28.1%	57.0%		100%
Total	14.1%	37.4%	48.5%		100%

Count MeetInt?	SvcType				Total
MeetInt?	DAV	PL	ATM/FR		
0	16.5119	61.70238	195.9702		438
1	21.4881	80.29762	255.0298		570
Total	38	142	451		1008

p-value 0.000

6. MeetInt vs. BW

Count MeetInt?	BW						Total
MeetInt?	DS0	DS1/DS3	OC3/OC12	OC48	PVC		
0	12	285	7	11	123		438
1	2	288	1		279		570
Total	14	573	8	11	402		1008

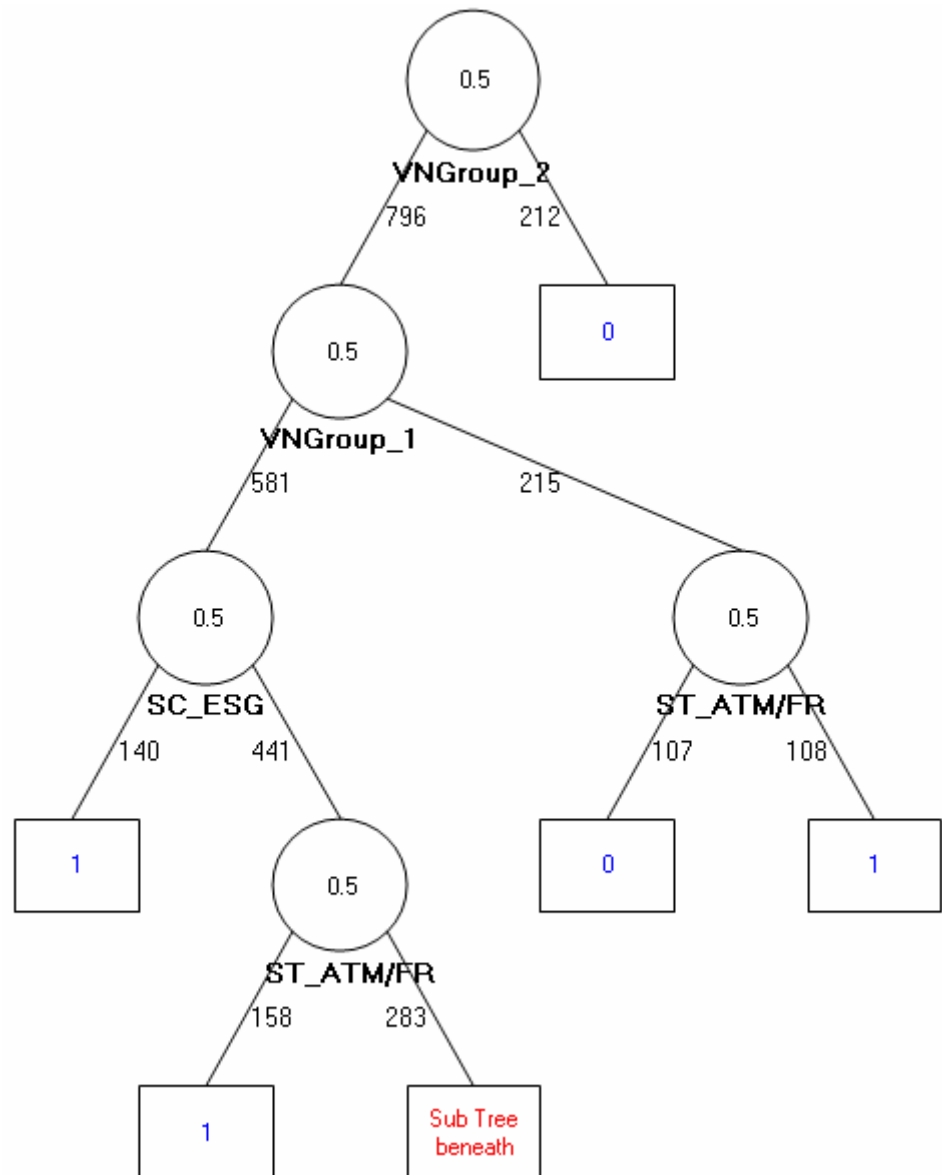
Count MeetInt?	BW						Total
MeetInt?	DS0	DS1/DS3	OC3/OC12	OC48	PVC		
0	2.7%	65.1%	1.6%	2.5%	28.1%		100%
1	0.4%	50.5%	0.2%	0.0%	48.9%		100%
Total	1.4%	56.8%	0.8%	1.1%	39.9%		100%

Count MeetInt?	BW						Total
MeetInt?	DS0	DS1/DS3	OC3/OC12	OC48	PVC		
0	6.083	248.9821	3.47619	4.77976	174.7		438
1	7.917	324.0179	4.52381	6.22024	227.3		570
Total	14	573	8	11	402		1008

p-value 0.000

Classification Tree

- Significant variables
 - VNGroup_1
 - VNGroup_2
 - SC_ESG
 - ST_ATM/FR



Logistic Regression

- 9 iterations of LR to get significant predictors
 - Variables with statistics significance
 - BW_DS0 and SvcType
 - Multiple R-square, Error rate

The Regression Model

Input variables	Coefficient	Std. Error	p-value	Odds
Constant term	-0.19407111	0.10897337	0.07492811	*
VNGroup_1	-0.4804143	0.15988036	0.00265724	0.61852705
ST_ATM/FR	1.02886558	0.14350402	0	2.79789019
ST_DAV	0.7085709	0.20184708	0.00044738	2.03108644
BW_DS0	-2.14766765	0.77582985	0.00563634	0.11675617

Residual df	1003
Residual Dev.	1307.879272
% Success in training data	56.54761905
# Iterations used	7
Multiple R-squared	0.05229524

Training Data scoring - Summary Report

Cut off Prob.Val. for Success (Updatable) **0.5**

Classification Confusion Matrix		
	Predicted Class	
Actual Class	1	0
1	408	162
0	214	224

Error Report			
Class	# Cases	# Errors	% Error
1	570	162	28.42
0	438	214	48.86
Overall	1008	376	37.30

Discriminate Analysis

- 6 significant predictors
 - VNGroup_1
 - VNGroup_2
 - BW_DS0
 - BW_OC3/OC12
 - BW_OC48
 - Expedite, Sales Channel and Service Type are insignificant

Classification Function

Variables	Classification Function		
		1	0
Constant	-21.0904369	-22.3286762	1.23823928
VNGroup_1	0.58928084	1.59270751	-1.00342667
VNGroup_2	1.80701351	3.81881809	-2.01180458
EXPED_1	-0.5543164	-0.9772445	0.4229281
SC_ESG	25.51146317	25.72283363	-0.21137046
SC_LD	23.41515923	23.88856506	-0.47340583
ST_ATMFR	14.55923653	14.6274004	-0.06816387
ST_DAV	1.84855342	1.54711378	0.30143964
BW_DS0	7.80373335	10.0202713	-2.21653795
BW_DS1/DS3	15.80019951	16.5318203	-0.73162079
BW_OC3/OC12	28.62760544	31.21977234	-2.5921669
BW_OC48	18.14013481	21.4595089	-3.31937409
OffNet_1	-0.34150863	-0.51942718	0.17791855

Training Data scoring - Summary Report

Cut off Prob.Val. for Success (Updatable) **0.5**

Classification Confusion Matrix		
	Predicted Class	
Actual Class	1	0
1	427	143
0	183	255

Error Report			
Class	# Cases	# Errors	% Error
1	570	143	25.09
0	438	183	41.78
Overall	1008	326	32.34

Comparison Across Models

Classification Tree	Logistic Regression	Discriminate Analysis
VNGroup_1 VNGroup_2 SC_ESG ST_ATM/FR	VNGroup_1 ST_DAV BW_DS0 ST_ATM/FR	VNGroup_1 VNGroup_2 BW_DS0 BW_OC3/OC12 BW_OC48

- Changes made to an order once submitted are detrimental to the firm's ability to provision circuits within standard interval
- Dealing with an outside carrier to provision circuit is not significantly different than provisioning circuit in house (Off Net vs On Net)
- DS0 bandwidth orders need to be investigated further to determine cause on inconsistencies (Supposedly they are the most simple)
- Expedites do not significantly influence the ability to meet standard interval