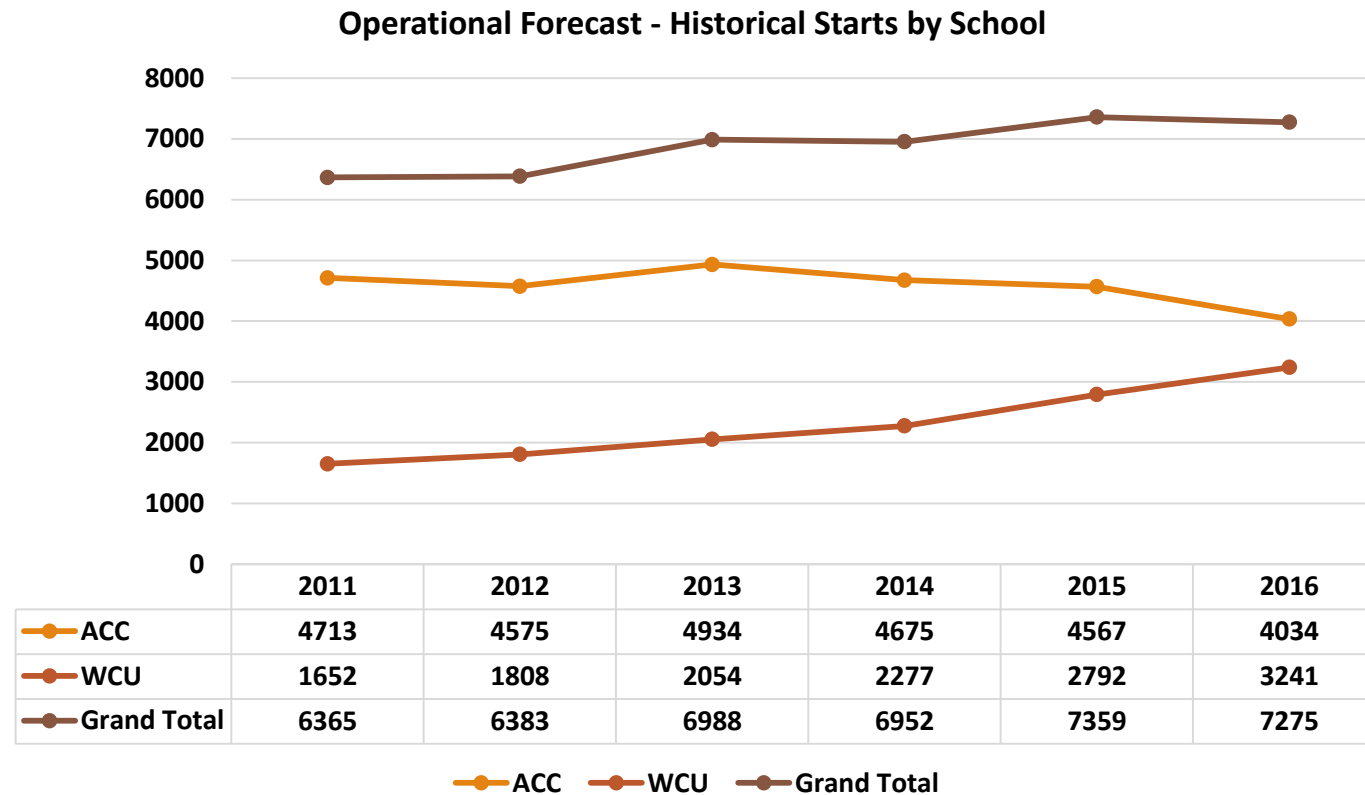


Predictive Analytics World for Business Las Vegas 2018

STUDENT ACQUISITION: FROM OPERATIONAL FORECASTING TO A
THEORY OF PROSPECT BEHAVIOR

PETER KARPIUK, PH.D. PMP.

Project Motivation – Historical Trends: Starts by College in Portfolio

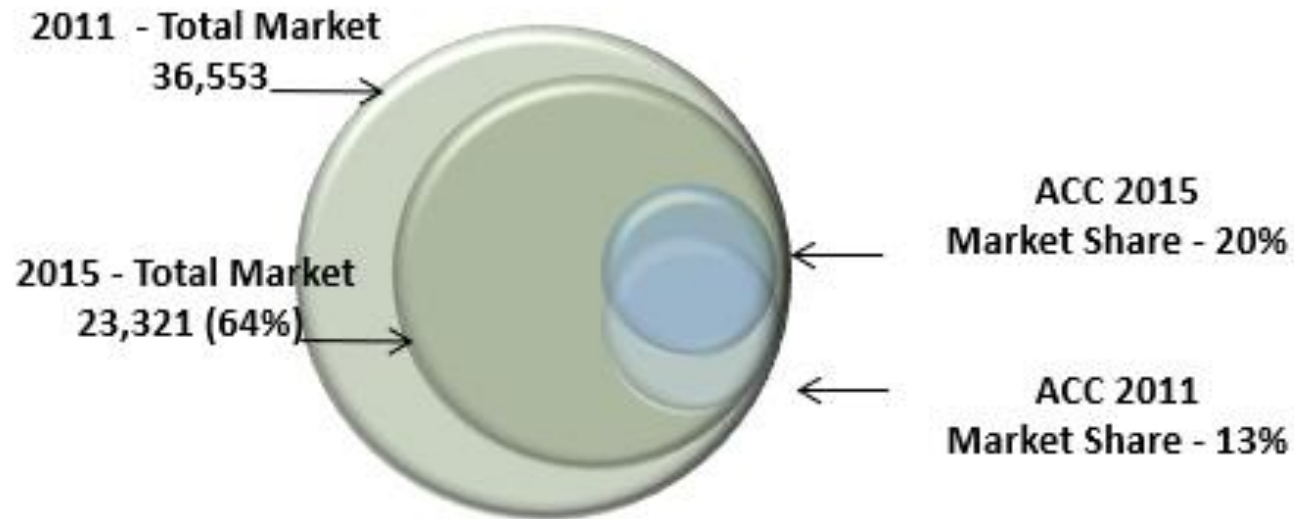


The data show overall starts have increased due to:

- A steady increase in WCU starts that is offsetting
- A more recent decline in ACC starts.

Note that, in terms of order of magnitude, the number of starts at ACC, across all campuses and programs has remained above 4,000 and has been as high as 4934 per year.

College Market – Total Market and ACC Market Share



- Enrollment has marginally declined
- Market share has actually increased
- What is driving the market and market share?

Student Starts – Business Objective and Analytic Statement

Business is thinking:

- How many students can I expect in next fiscal year?
- What are the Enrollment/Start Revenue Drivers for Programs and Campuses?

Modeler is constructing an Analytic Statement

- Student Characteristics Driving Enrollment and Non-Enrollment
- Student Enrollment (Y/N) = F (Student Demographics, Educational Background), Contact Type & Timeline, Lead Data, Program Variables (Type, Length), Gray Associate Variables, Funding/Scholarship Variables

Modeling Strategy – ACC Leadmaster 1.3 Columns

Lead Data Variables	
Student Number	graydataprog
Name	Cvprogcode
Admissions Advisor	CVstartdate
Admission Status	preved
Campus	HESI
Date Applied	Entrance Exam
Date Canceled	TEAS V
Date Enrolled	ACT Composite
Ethnicity	SAT Test
Expected Start Date	Campus Visit
Gender	Info Session
Lead Source	Financial Aid
Lead Category	Orientation
New Lead	Testing
Program	Other
Program Version	Student Demand Score
DateofBirth	Employment Opportunity Score
Birth Year	Degree Fit Score
sycampusid	Competitive Intensity Score
school	Overall Score

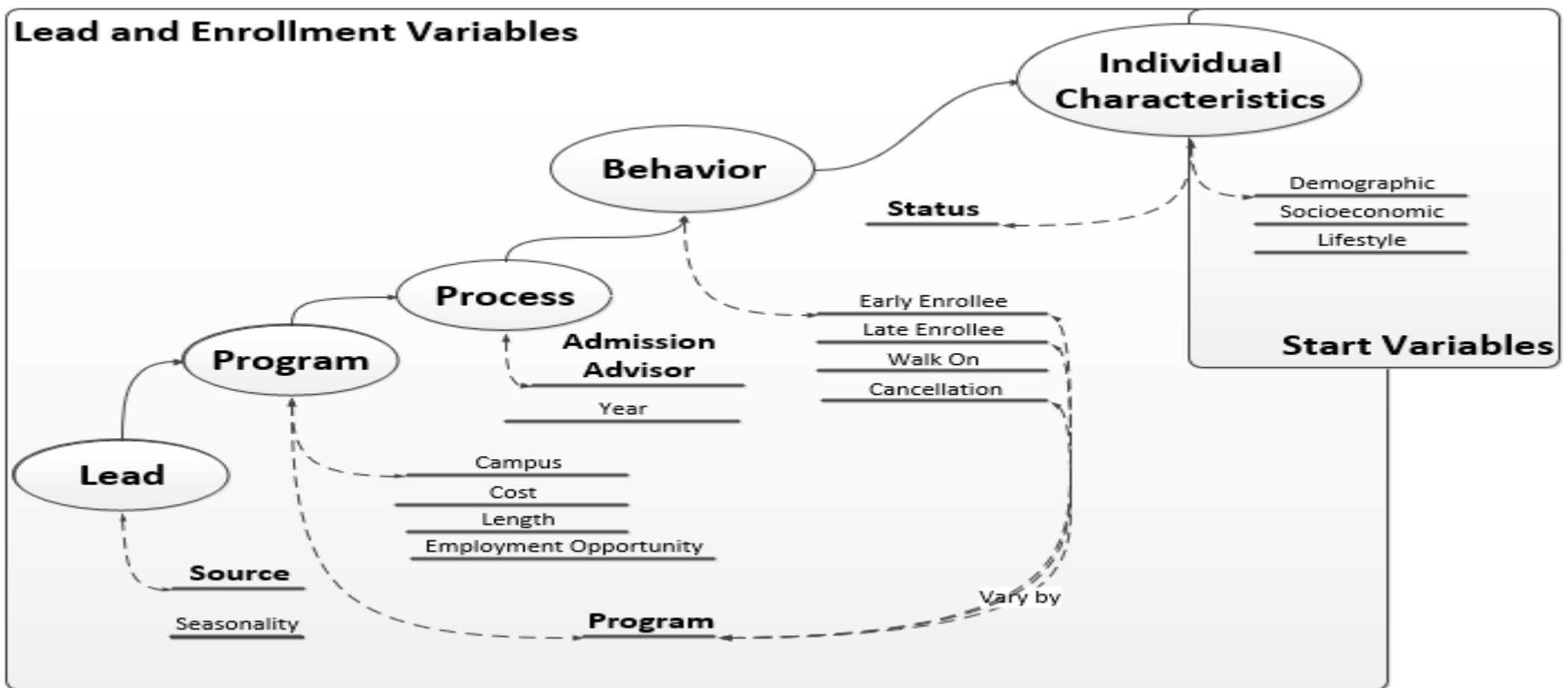
Leadmaster includes data regarding marketing leads,

- The file includes 437,963 records from Jan 2011 to Sept 2017
- Lead information includes
 - Significant dates between the Lead Date and the CV Start Date, which indicates that a lead was successfully converted to a start in the applicable campus and program;
 - Lead source and lead source category
 - Admission Advisor
- Upon enrollment, student information including name and sometimes age, ethnicity, sex, student number; and Test scores, exist.
- Gray data regarding demand, employment opportunity, degree of fit, competitive intensity and an overall score is not available for all records.

Data Issues – Merging, Duplicates, Business or Process Understanding

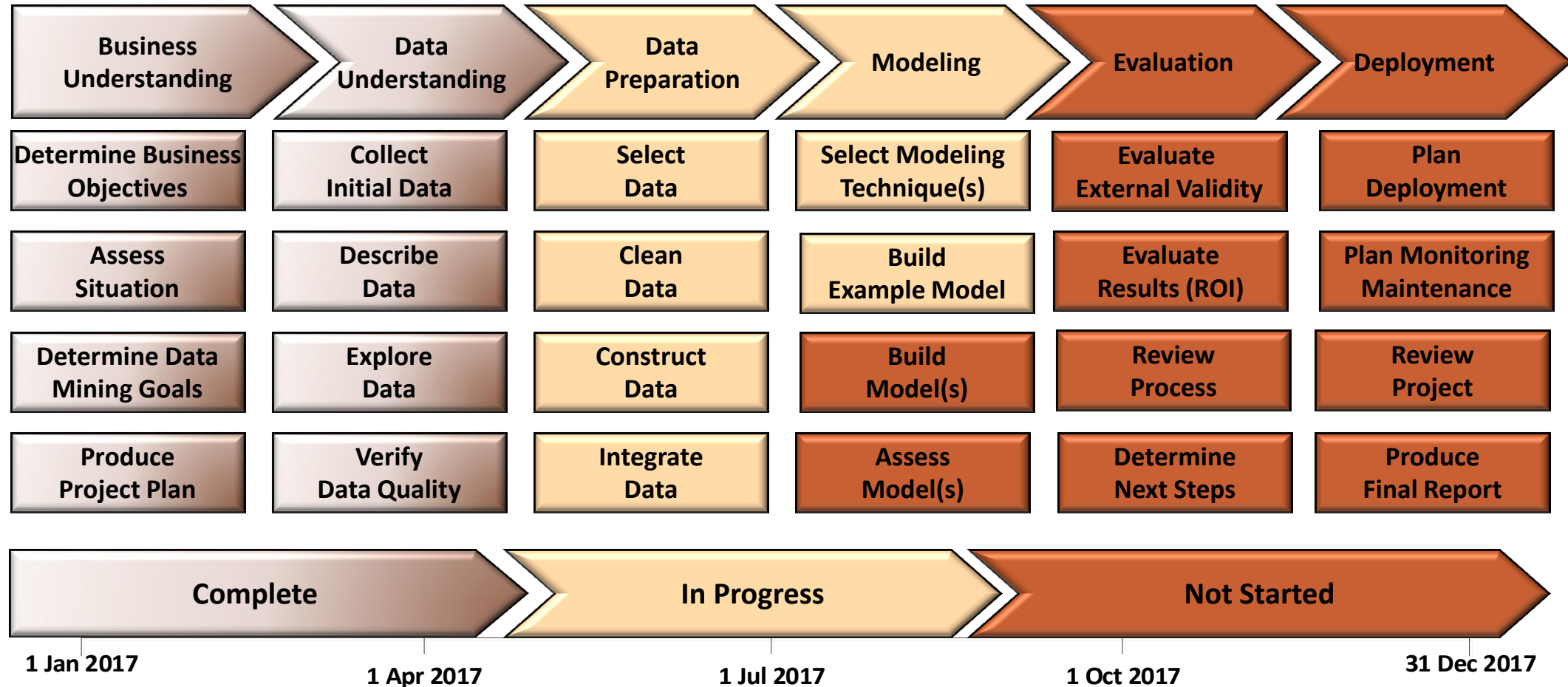
- The file includes 437,963 records from Jan 2011 to Sept 2017

Operations, Student Behaviors and Attributes, Derived Measures

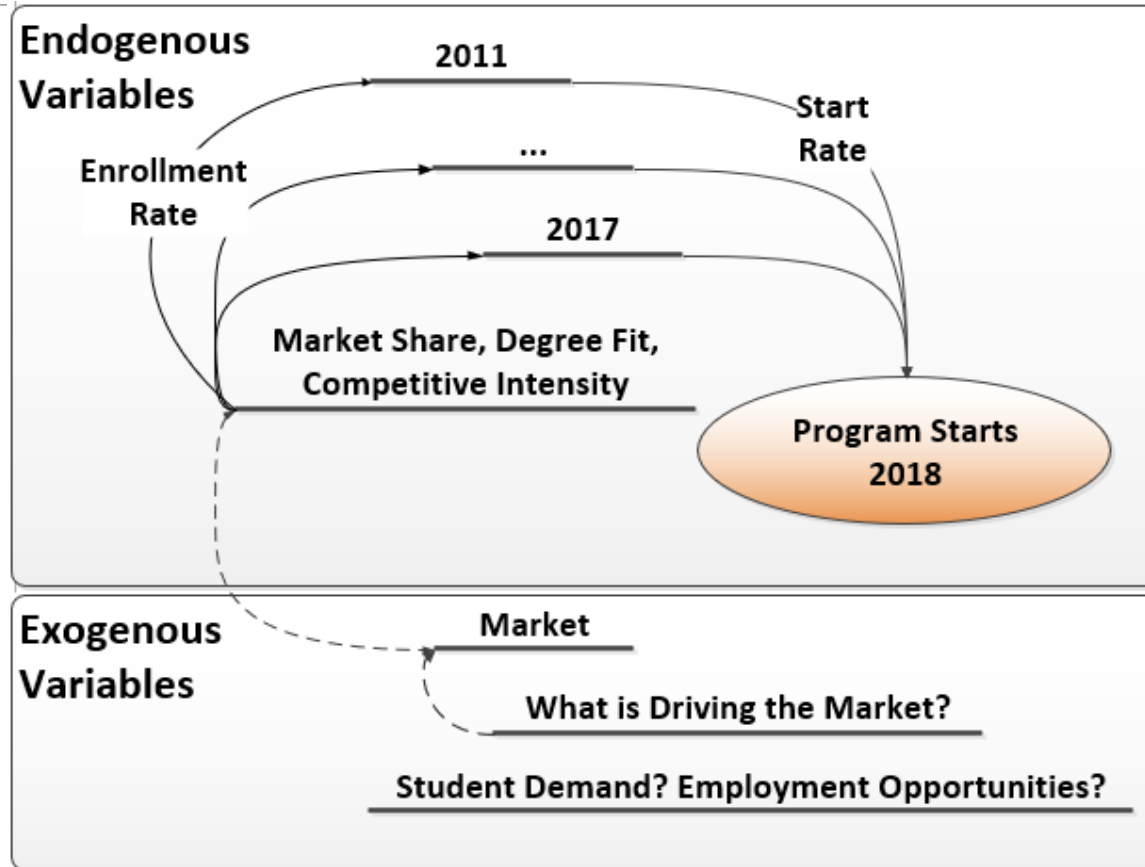


The Process – SCRUM meets CRISP

NOTE: % Complete = Total WBS Effort – (CMP + 1/2 INP)



Student Starts – Business Objective and Analytic Statement for Conversions



What is the forecast of enrollment by program and campus for next fiscal year?

Provide a 'Yes' or 'No' Classification of incoming students.

- Yes – indicates prospective student will start program
- No – indicates prospective student will NOT start program

CART Modeling –

Exogenous Variables: Market Share, Student Demand, Employment Opportunity

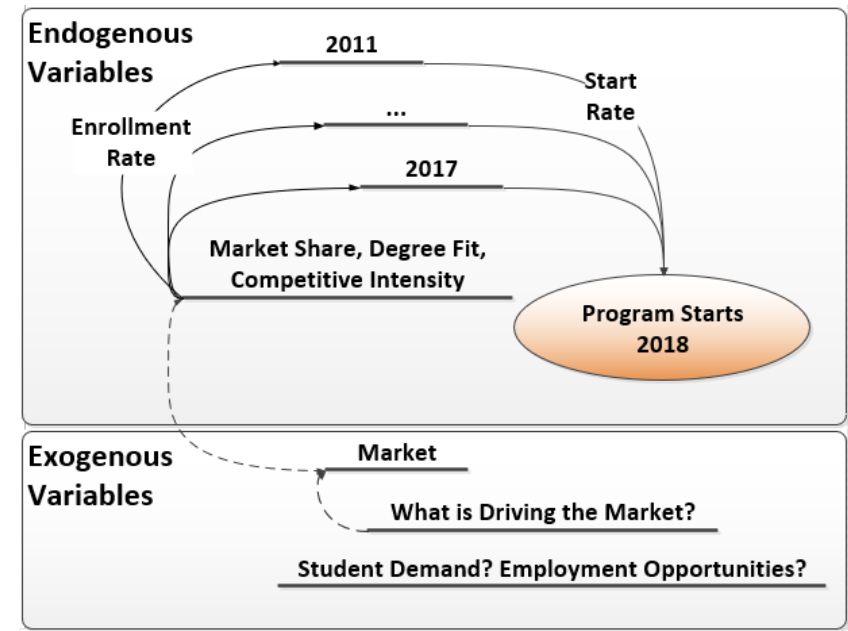
Analytic Statement – What predicts a lead conversion?

- Lead(Start) = f (**Market Share**, Degree Fit, Competitive Intensity, **Student Demand**, **Employment Opportunity**)

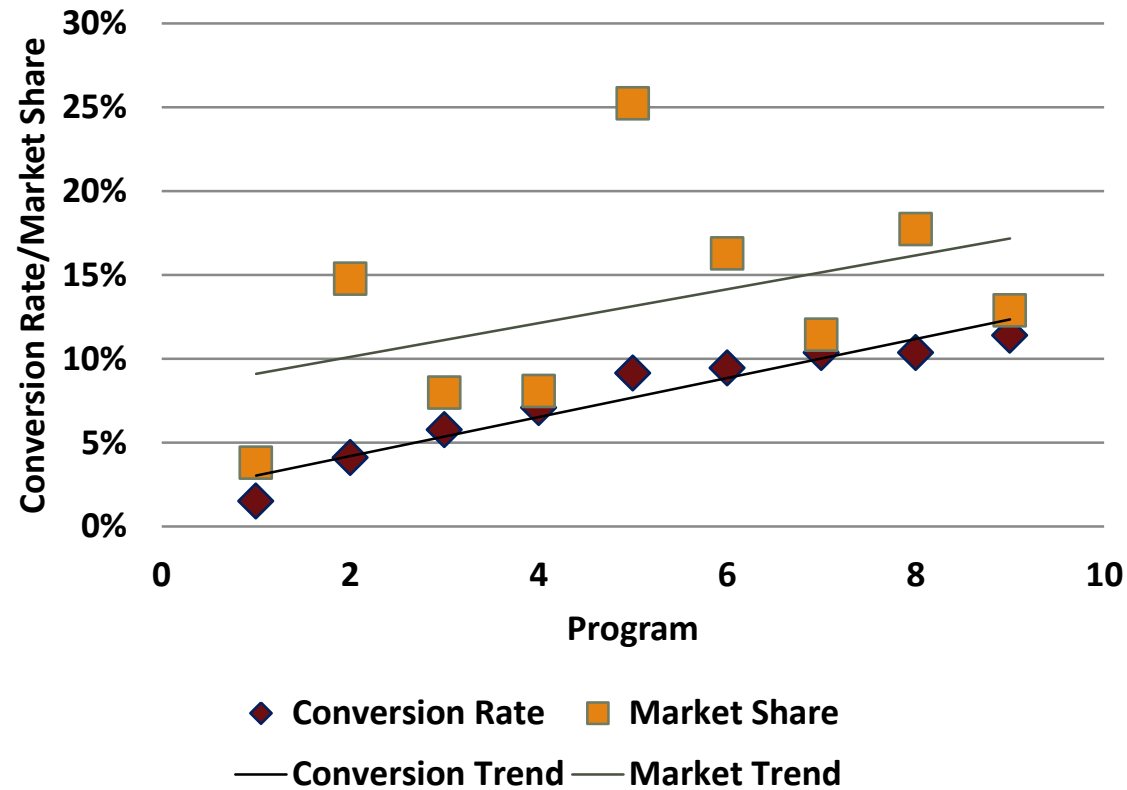
Test Sample			
Class	N Cases	N Mis-Classed	Pct. Error
0	193	152	78.76%
1	12	1	8.33%
Learn Sample			
Class	N Cases	N Mis-Classed	Pct. Error
0	728	541	74.31%
1	67	3	4.48%

Business Objective - What drives starts?

- How many program starts can I expect next year and more importantly, or how can we change history!



Market Share - Is it an Actionable Model Insight?



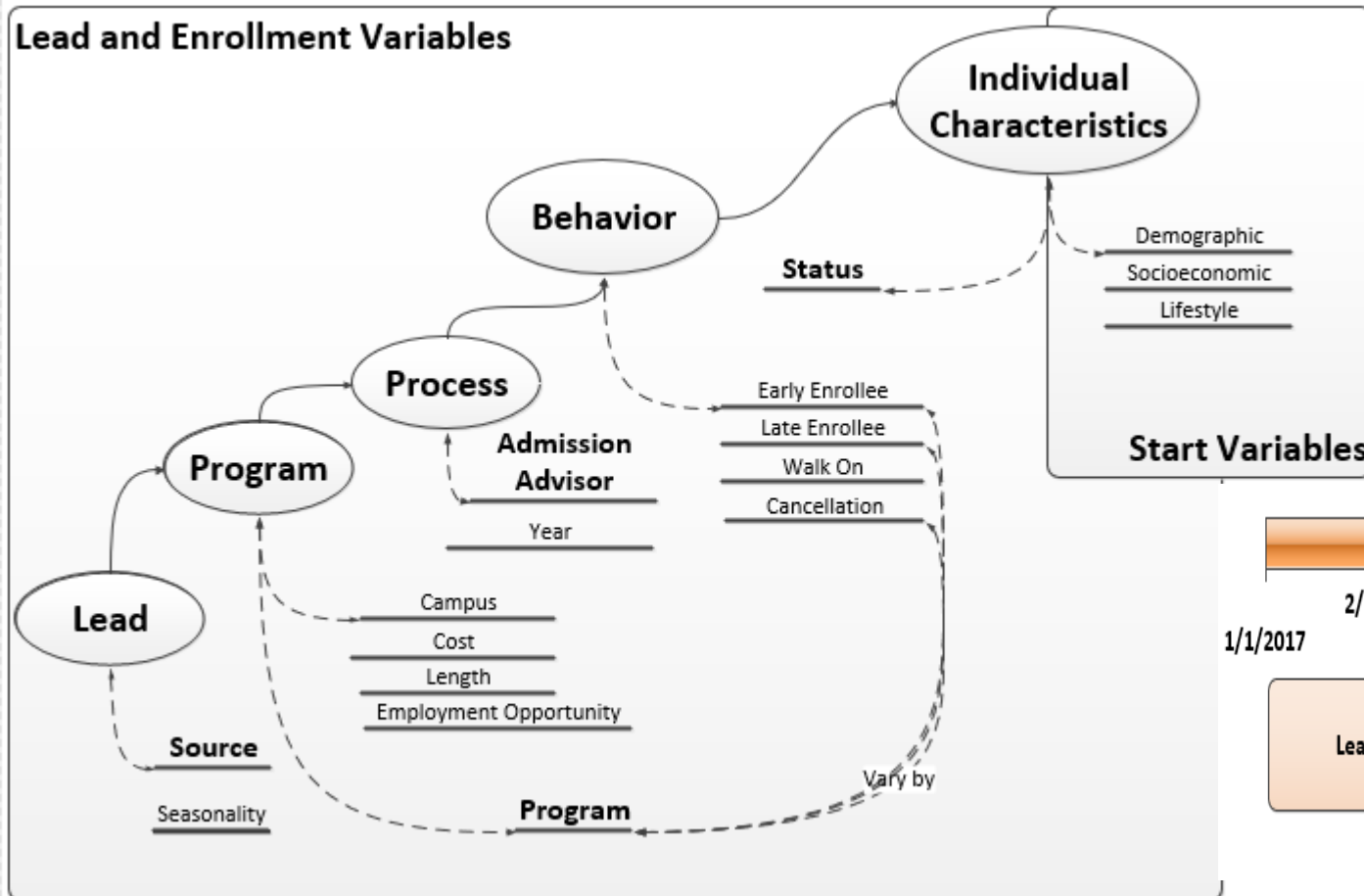
Business Objective – What action can we take to make a change in conversion rate?

- Focus on programs we have greater market share (Focus on our strengths)
- Where market share is less ? (Drop programs, or go after greater market share)
- Is our conversion strategy the same for all programs?

CART Modeling –

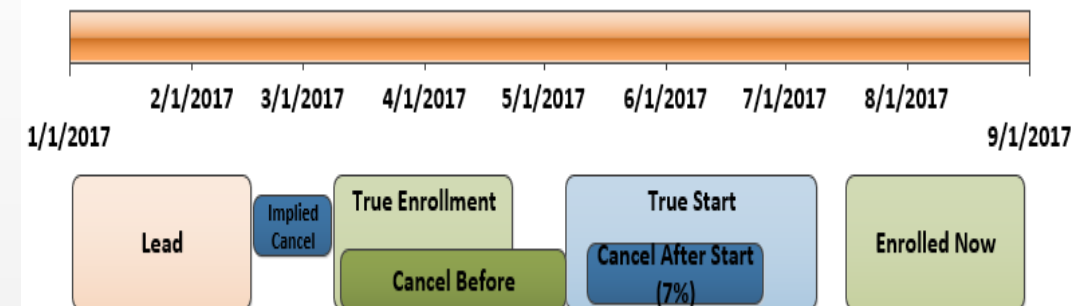
Internal and Marketing Factors: Lead Source, Status, Admission Advisor, Program and Behavior

Lead and Enrollment Variables

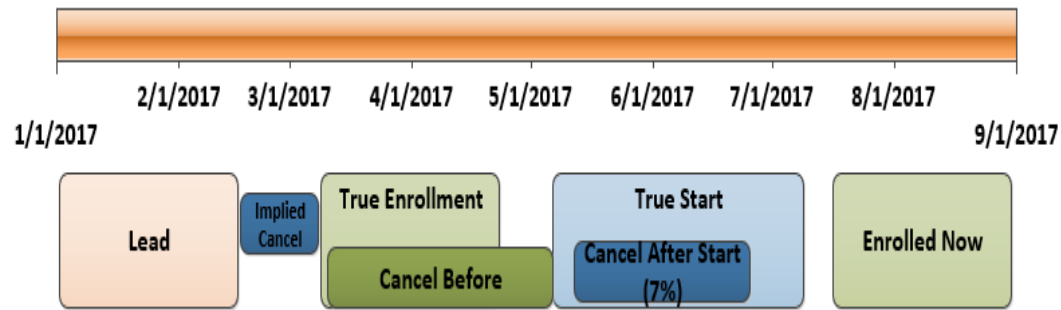


Modeling Art Meets Science

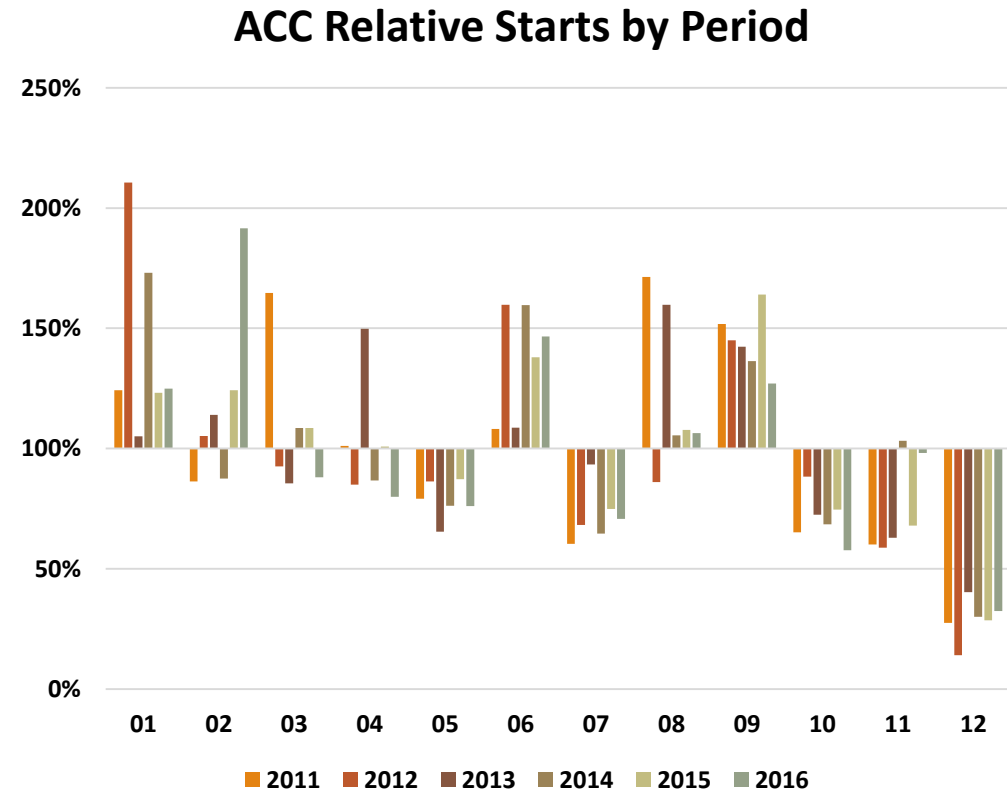
- The interaction between the admission advisor, the program being sought and the individual characteristics all variables that influence behavior.
- The key behavioral data had complex characteristics and data management concerns.
- The beginnings of understanding what a “look-a-like” qualified lead was evolving.
- These profiles could be used for increasing lift in marketing and enrollment campaigns.



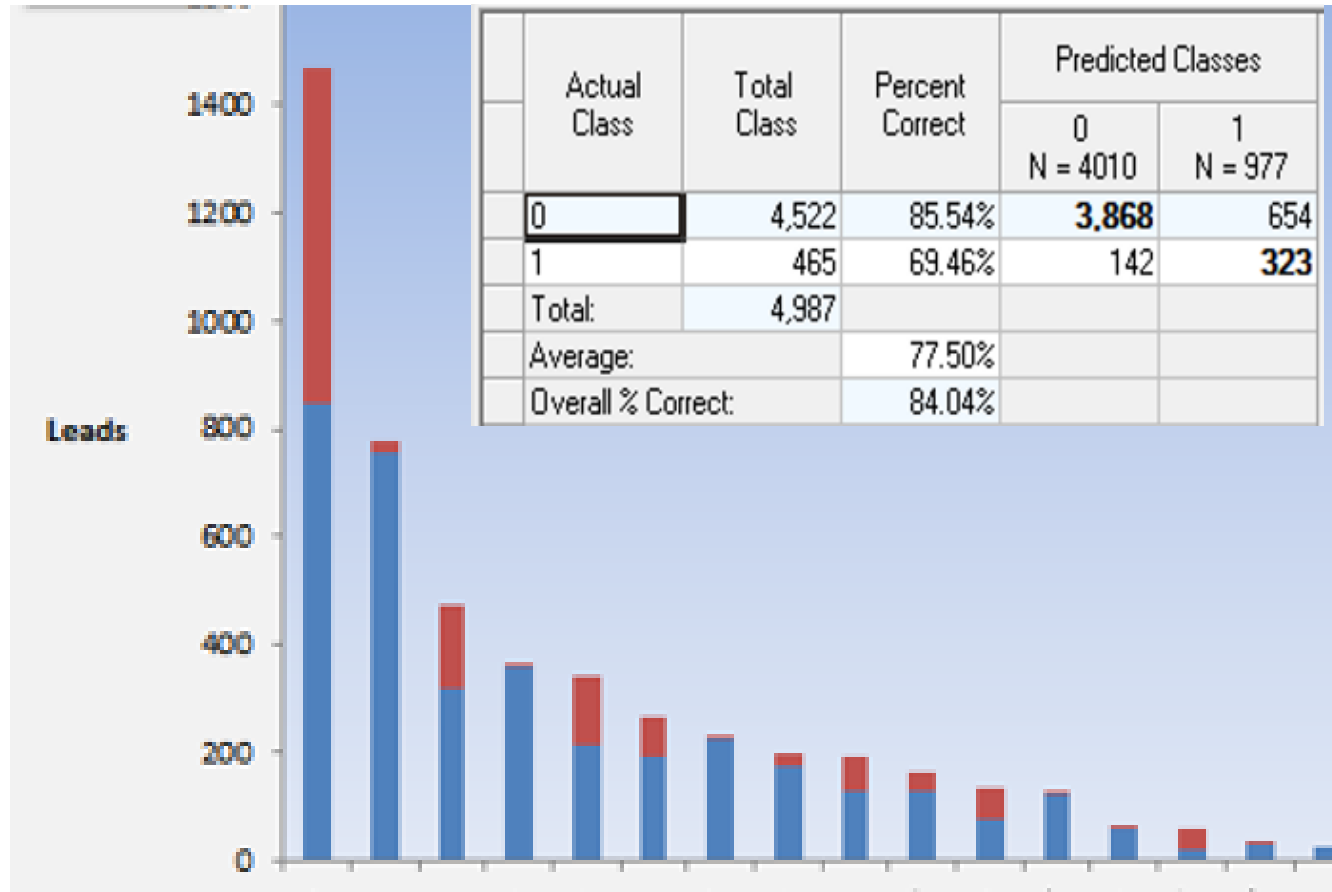
Variable Exclusions – Event Timing and Within year variation in Starts



- The Events from Lead to Enrollment and time intervals and varying sequences and lengths
- Monthly starts are typically up in January, June and September
- And down in December



Modeling - A CART Model Predicting Leads that Enroll

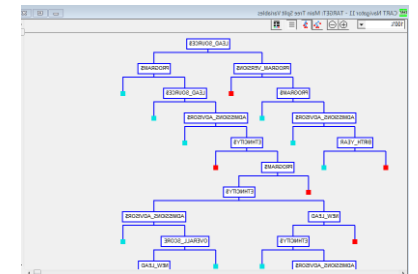


Powerful Predictors

- Lead Source
- Admission Advisor
- Program
- Status

Powerful Predictors

- 28 Predictors
- ROC =0.81

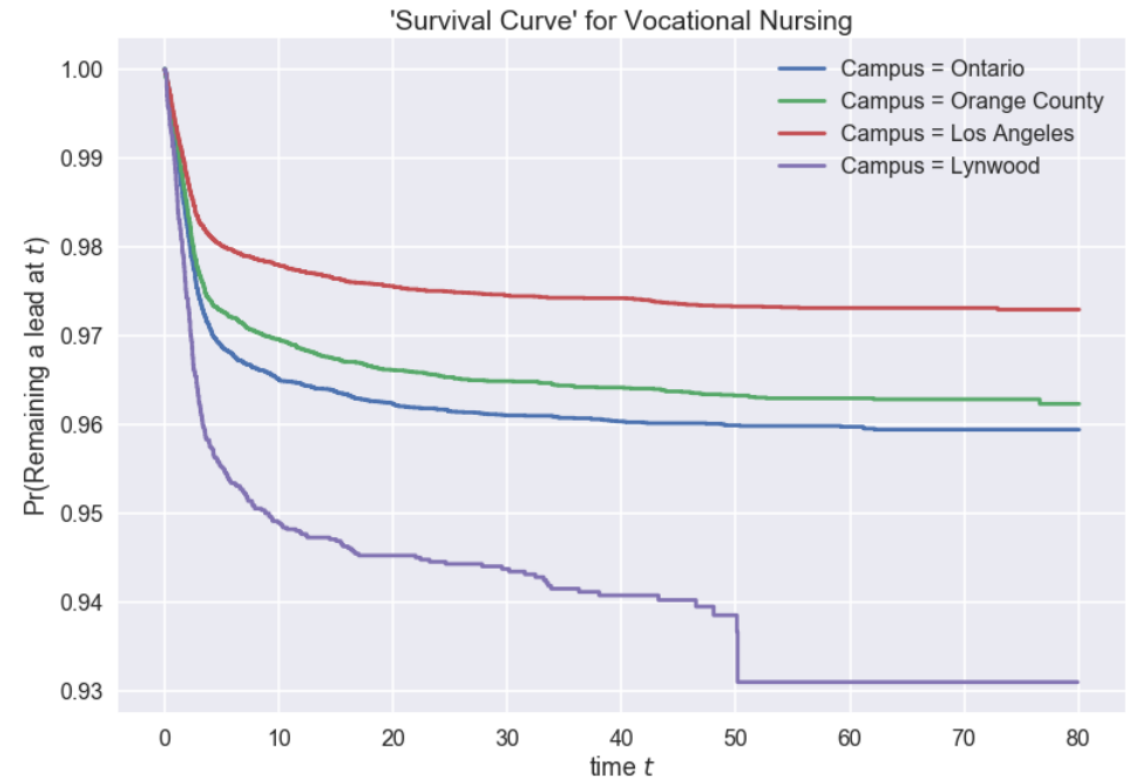


Inventory of Leads – An Approach for Time Analysis of Events

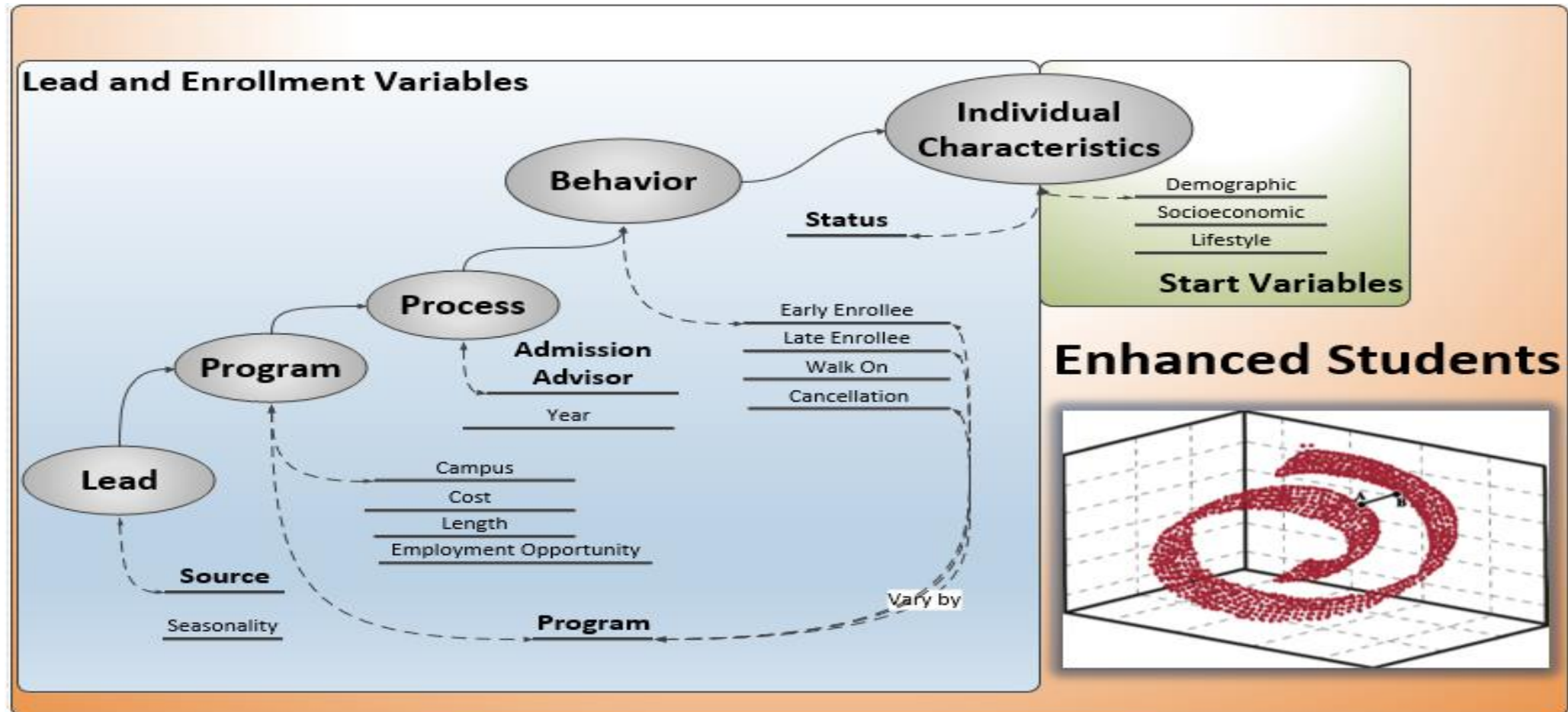
Lead to Start Modeling

2. Survival Analysis – Cox Regression (Multivariate¹.)

- $h_i(t) = \exp\{\sum \beta_j x_{ji}(t)\} h_0(t)$ where
- $h_i(t)$ is the enrollment or start function at time (t) for the i th individual out of n individuals in a study,
- β_j is the log start ratio for the j th explanatory variable out of p variables relative to the baseline level,
- x_{ji} is the baseline value of the j th explanatory variable for the i th individual,
- h_0 is the baseline function of Campus or Program or Advisor

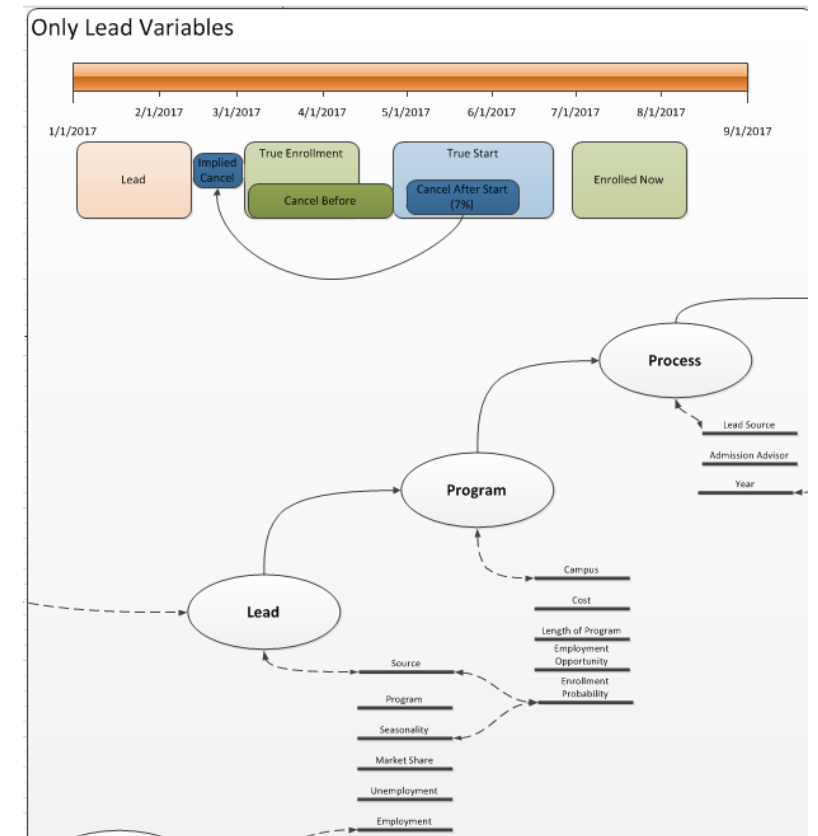


Student Lifecycle - Theory of Prospect Behavior



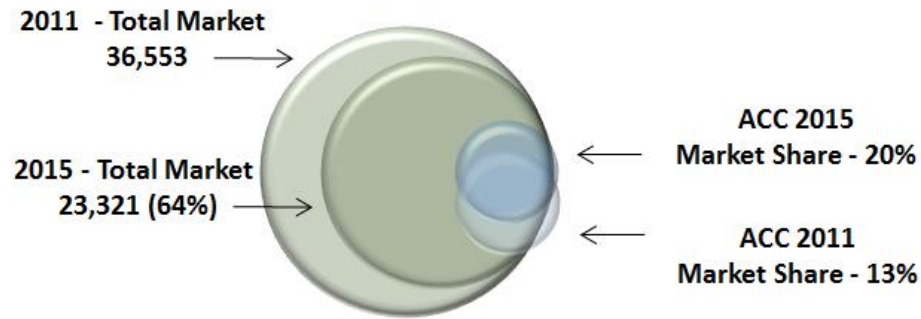
General Recommendations

- Define Your Strategic Vision – Return on Investment (ROI)
 - Integration of enrollment, marketing and operational practices with mature level of the data management process to support analytic insight
- Have a Process – CRISP & AGILE
- Prepare for Change – Data Selection & Management and Business Process Engineering
- Beware of Phantoms and Psychological Biases
- Prepare to Change History or Back to the Future



Conclusions – Tactical and Strategic Vision

Total Market and ACC Market Share

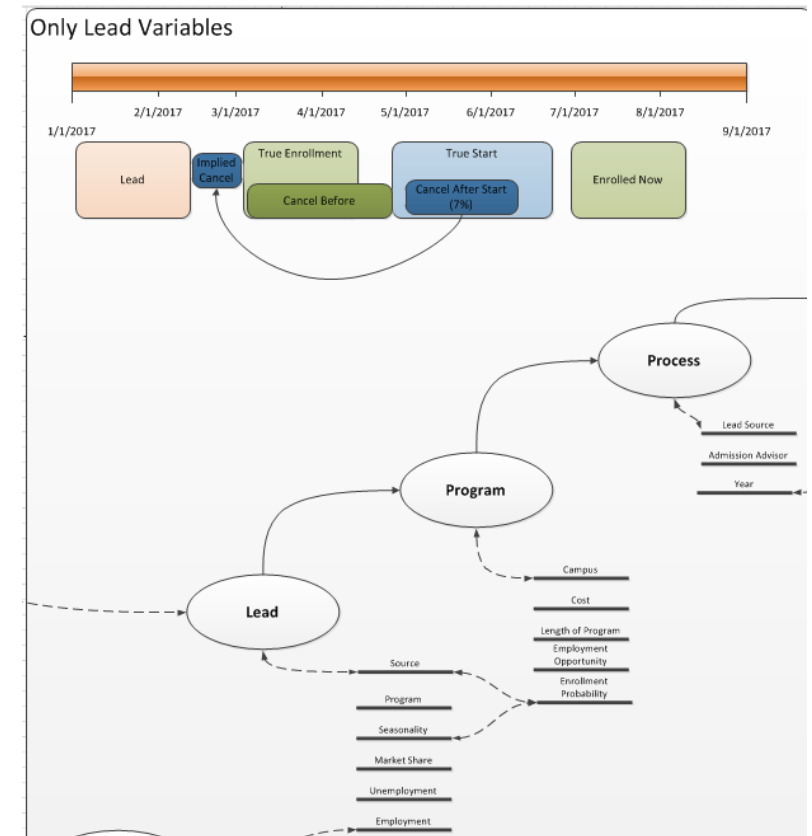


- Define Your Strategic Vision – Return on Investment (ROI)
 - Integration of enrollment, marketing and operational practices with mature level of the data management process to support analytic insight
 - Employment Opportunity and Student Demand Scores appear as significant factors in converting leads to starts
 - Up to 85 % of All Leads can be excluded from follow-up marketing or activities without significant impact on enrollment
 - Conversion success varies significantly from program to program
 - Lead source, age, admission advisors, gender and ethnicity are indicators with reviewable impact

Tactical Recommendations

Tactical Approach: Future Integration of Enrollment, Marketing and Operational Practices

- Better control of the data collection process
- Clearer data definition and inclusion of key enrollment and marketing variables
- Integration data issues can be remedied by a number of methods
 - Continue to use the existing process and run the cleansing process on each data set thereby removing duplicates, and enrollment and starts that occur prior to the lead date.
 - Conduct a more formal review of the data definitions and collection process – Business Process Engineering
 - Construct a robust data collection and management process with the collaboration of the enrollment and marketing teams.
 - Consider including appending other sources of data to allow segmentation and consumer profiles to be constructed.
- ROI measurement of the Enrollment Process specifically:
 - Inclusion of Enrollment Management Variables in addition to “Lead to Start Rate” to determine ROI of marketing and enrollment efforts
 - Eg. Conversion rate, Cost per accepted, Cost per enrolled, Show rate, Cost per lead, Lifetime Value Per Enrollment



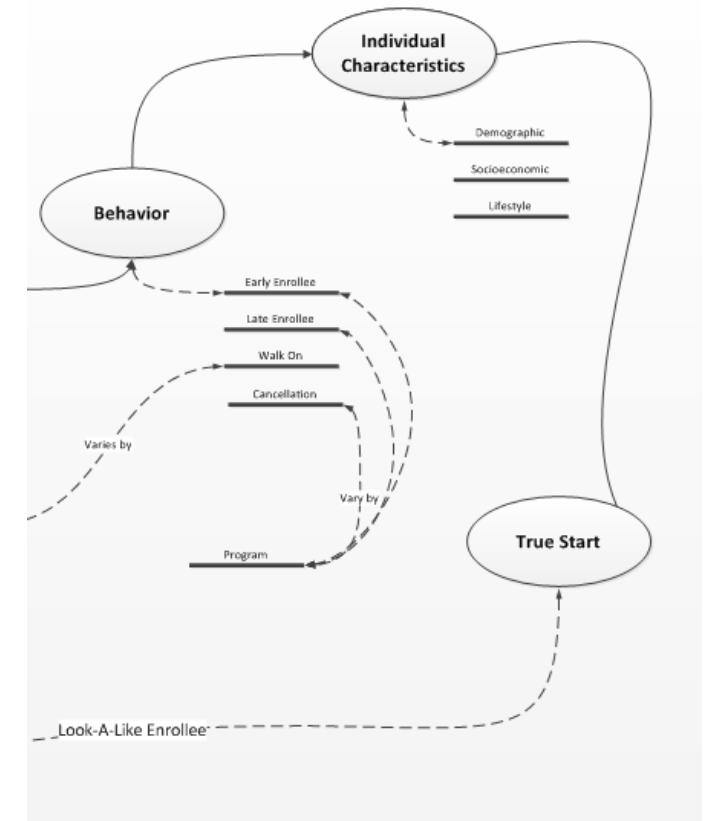
Strategic Recommendations

Strategic Recommendations

Including marketing variables and lead information are viable to fine tuning or if larger impacts are identified increasing the accuracy of ACC market share.

Further, understanding the strategic levers that ACC could act upon to increase profitability would most certainly be composed of factors that can be elicited from the enrollment management and marketing process.

Other variables including behavioral and individual characteristics would allow “look-a-like” qualified lead profiles for increasing lift in marketing and enrollment campaigns.



Questions?
