
**ANALYTICAL
CONSULTING LAB
SYLLABUS
WINTER 2018**

OCT 15, 2017 UPDATE

Background on the Analytical Consulting Lab

The Analytical Consulting Lab (ACL) is part of the Kellogg experiential learning initiative. The specific interest in the Analytical Consulting Lab comes out of the deep demand for business leaders that can provide guidance in analysis and focus that analysis to specific business questions. Additionally, many recruiters and employers have commented that finding talent that bridges the business and analytical communities is difficult. The ACL strives to provide a real-world learning experience for students to work with sponsoring companies on business questions that revolve around analysis. Students work in teams using analysis (broadly defined) to answer current and important business questions.

Kellogg has a strong tradition in bringing analysis to bear on business questions. In fact, the Analytical Consulting Major is the second most popular major at Kellogg, suggesting that not only does the ACL support this major, but it will resonate strongly with the goals of many a Kellogg MBA student.

Course Details

The ACL is offered as MECN-915, a full credit course. Most projects in the ACL are sponsored by Kellogg alumni, at very senior levels in their organizations. Students taking the ACL are assured a strong learning experience and a commitment from the firm to provide access to decision maker and information that will make the experience meaningful.

Details on projects, companies, and information about selecting projects is available at:

<http://kellogg.northwestern.edu/faculty/walker/htm/acl>

WINTER 2018 ANALYTICAL CONSULTING LAB: MECN 915

Department of Managerial Economics and Decision Sciences
Kellogg School of Management • Northwestern University

Professor: Russell Walker

Application Process

Students interested in the ACL must submit an application for project selection.

The application permits optimal project assignment, based on student goals, client needs, and project requirements.

Applications are accepted by the Kellogg Experiential Learning system. Students should apply for MECN 915 via the Kellogg Experiential Learning System, at:

<https://www4.kellogg.northwestern.edu/el/>

The application start date is Oct 13.

The application close date is Oct 29.

Decision date is on or before Nov 3 (before Round 1 bidding)

Key parts of this application include:

- Resume or CV
- List of courses taken at Kellogg with grades
- Description of any professional Analytical Experience (no specific experience needed)
- Description of any professional Consulting Experience (no specific experience needed)
- Special service to Kellogg
- Reasons for taking the ACL
- Goals for taking the ACL
- Project Choice #1
- Project Choice #2
- Any fellow desired Kellogg student for a team (limit of one student to specify). Team member preference is only considered if both people select each other.
- Other information that you may wish to share in your application, personal goals, career aspirations, etc.

Student teams that are fully formed (a team of 4) are encouraged and will be given special preference. If you are forming a team and submitting as a team, do make that clear in the application and stress how your team has come to select the project and how it meets your goals.

Student information in the application process is used in formulating teams and assigning projects so that goals, backgrounds, skills, and expectations are all best aligned.

Project Assignment

Student assignments to client projects will be based on individual preferences, requested skill sets and industry experience, and team member diversity. Every attempt will be made to grant students their first or second choice of projects. Student information is collected via the application. Students may select one fellow student for a project. This fellow student selection is honored as possible, if the both students select each other.

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Students will be notified about their project assignments during the term before the class. All efforts are taken to accommodate first choices, while forming teams with an appropriate set of skills and interests.

Case Packet and Readings

As this course is an experiential one, there are no specific cases to prepare. However, many students have looked for examples of companies that have excelled at Analytics. Also, as the course emphasizes consulting and best practices in a professional client engagement, there is a need to consider some of these best practices. Given this, the following texts are recommended and optional:

- 1) The McKinsey Way, Ethan M. Rasiel, McGraw-Hill
- 2) From Big Data to Big Profits: Success with Data and Analytics, Russell Walker, Oxford University Press, 2015.

These texts are easily purchased on-line, so these are not requested in the bookstore.

Course Meetings

As with other experiential courses, the focus is on the team project and its delivery to the sponsoring company.

Teams will meet with the Professor on a regularly and frequent basis in order to discuss the analysis, flow of work, final presentation and delivery to the sponsoring team. The class will also meet with the prescribed schedule to review concepts and themes important in being successful with the analytical consulting function and in order to provide presentations for the purpose of group learning.

All Group Meetings are to be held with the team and the Professor at a pre-defined time that works mutually. Meetings with the Professor and Client must conclude before 4:30PM on weekdays. PTMBA students are welcome to the class, but cautioned on this scheduling constraint. Students who cannot make meetings in person are encouraged and welcome to join via telephone.

Pre-term activities

- Project identification
- Team formation
- Identification of Team Liaison to Client
- Identification of Team Liaison to Professor
- Client Introduction
- Project description
- Schedule first group meeting with Professor
- Schedule first client meeting with Client

Week I:

- Class Session I
 - Getting Started with ACL
 - Managing Project Ambiguity
 - Managing Teams

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Overview of the Consulting Approach
Dealing with Data
Descriptive Statistics
Using Tools: JMP, Excel, @Risk
STATA Resources at Kellogg

Guest Speaker: NWU Librarian:

Using Business Databases from the NWU Library for market and firm measurement.

Bring your laptop and be ready to explore databases!

Week II:

Group Meeting I:

Developing a Work Plan, Project Analysis
Examples of Past Analysis
Use of Graphics
Best Practices in Presentation of Data
Building Points Through Analysis

Week III:

Group Meeting II:

Preliminary Analysis of Data
Teams to bring descriptive statistics to meeting with Professor
Work Plans due to Professor

Week IV

Group Meeting III: Focus on Data and Analysis
Address questions and issues in analysis

Week V

Group Meeting IV: Prep for Midpoint Check-in

Class Session II

Mid-term progress review and **team mini-presentations**
Mid-point document due at beginning of class
Mid-point team and mid-point peer feedback due to professor

Week VI :

Group Meeting V:

Mid-point feedback, planning for next phase

Week VII

Group Meeting VI:

As per team needs

Week VIII

Group Meeting VII:

As per team needs

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Week IX

Group Meeting IX:

Dry-run of presentation with Professor

Week X

Class Session III

Project Findings

Final project deliverable due to Professor and Client on last class day.

Meetings with Clients to be held and presentations made to client in person during or before final week of classes.

As in any professional consulting engagement, the students are requested to regularly meet with the client to receive input, data, direction of project goals, and feedback on the progress as needed. All clients are committed and dedicated to fulfilling the learning and business aspect of the project.

Teams may schedule additional time with the Professor as needed and as available.

Grading

Grading of the project is driven largely by the quality of the team project. The Professor will evaluate the project, its analysis, presentation, and delivery on the following major points:

- Analysis:
 - Quality of analysis (thoroughness, appropriateness)
 - Clarity and quality of model summary and description
 - Intellectual impact (was the analysis creative, novel, clever, or otherwise compelling?)
- Project Document
 - Quality of project description
 - Quality of analysis summary
 - Quality of recommendations and conclusions
 - Use of meaningful graphs, graphs, and presentation of data
- Presentation Documents
 - Quality of presentation
 - Professional impact of the presentation
 - Ability to communicate main points of the analysis and recommendations
- Team Meetings
 - Preparation
 - Organization
 - Progress

The Professor will ask the client company to provide feedback on the same above points.

Peer evaluations will also be collected from each member. Each student must rate their teammates on the following dimensions:

- Intellectual and creative contribution

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- Workload and willingness to take initiative
- Organization, preparation, and availability
- Collaboration and respect for peers

Peer evaluations will be on a 1-10 scale with 10 being excellent and 1 being poor. All peer evaluations will be treated confidentially.

All ACL students must participate, as participation is also important to make this a meaningful learning experience for all involved.

Grade Breakdown

Professor Evaluation of Final project materials and presentation:	30%
Professor Evaluation of Work plan and Mid-point review:	20%
Client Evaluation of Final project materials and presentation:	10%
Peer Evaluations (*):	20%
Professor Evaluation of Preparation during meetings and participation:	20%

* Note: The Professor reserves the right to adjust any student's final grade up or down by a full letter grade in the event that the student's peers unanimously score his or her contributions significantly above or below the overall team effort.

Role of the Professor

The Professor serves as an aide, counselor, and advisor for the team. The Professor does not conduct the analysis, but will provide detailed direction on analytical approaches. The Professor does not serve as the team liaison or representative to the client. The team must organize itself and identify such a liaison. The Professor may accompany the team to select team meetings and or participate in calls, but the Professor cannot in practically, attend all such meetings.

In the event that the client or the ACL student team encounter an incompatibility or encounter an issue, the Professor will intervene to remedy the situation.

The Professor may also resolve project assignments, as needed.

Role of the Team

The team will consist of 4 Kellogg MBA students working as a team to complete analysis, as defined by the client as agreed to before the start of the academic term.

The team should be mindful to control the amount of time that is required of the client. This means being prepared for meetings, having a designated liaison to schedule meetings, request information, and follow-through with next steps. This level of preparation and understanding is needed as most clients sponsor this project but do not allocate a full-time associate to work with the ACL team.

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The team should expect to contribute about 300-400 hours over the 10-week period to this ACL project. This is a reasonable expectation for a team working on a project and is consistent with other experiential and lab courses at Kellogg. This translates to 8-10 hours per person per week.

The team will produce a white paper that documents the study, results, and recommendations. The team will also prepare a presentation and deliver it in person to the client and its team. A reduced version with emphasis on key findings is also to be presented at the last class.

Role of the Client

The client provides the real-world learning opportunity, data needed to complete the appropriate analysis, and feedback on the quality of the project and its analysis. The Client is not expected to solve the problem, but should provide ample expertise, data, and contextual information to the ACL team.

Prerequisites

All students in the ACL must have completed DECS core. There are no other requirements.

Some FAQs:

What is the Analytical Consulting Lab?

It is a course available to Kellogg MBA students that are interested in the use of analytics in business. Students must take specific prerequisites and have strong academic performance in such classes to take the Analytical Consulting Lab. Students work in teams to resolve a real-work business problem using analytics.

What do you mean by Analytics?

It is meant to be broad but includes the use of specific quantitative approaches, such as regression analysis, time series analysis, forecasting, market segmentation, data mining, optimization, logistical analysis, scenario simulation, and risk analysis, as examples. In particular, we mean solving a business problem using data and applying one of these quantitative approaches.

How can PTMBA Students participate?

The ACL is open to PTMBA students on a limited basis, subject to all meetings with the Client and Professor being conducted during normal business hours, which are taken as before 4PM on weekdays only. Please contact Dr. Russell Walker on any questions regarding your interest on the course. PTMBA students should organize in groups.

How can Saturday MBA Students participate?

At this time the ACL is not available to Saturday MBA students, given the need to meet in person with the Client and Professor on a regular basis outside of the Saturday format of the Kellogg Saturday MBA.

How does this experience benefit the students?

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Kellogg MBA students taking the ACL will work on a real-world problem under the direction of a Kellogg faculty member. The opportunity to apply analytical theory and learn about a business, make recommendations, and bring together many aspects of their business education is unparalleled. We also ask that the students focus on how to communicate the results of analysis in the context of business decision-making. For students interested in moving to an industry to deep in analytics after graduation or developing new business skills in analytics, this course will be very attractive.

The Analytics Pathway and corresponding majors are among of the most popular majors at Kellogg and students have expressed deep interest in developing strong skills in analytics. This course meets an interest in our students and provides them an experiential learning opportunity that will prepare them for business opportunities.

How does the Client benefit from this opportunity?

The ACL is an intensive analytics elective that attracts some of our most analytically talented MBA students. It is expected that the student group of 4 will commit about 400 working hours to the project. Additionally, the student project will be overseen by a Kellogg faculty member that has expertise in analytics and its application in business.

We expect that the project deliverables, recommendations, and report will provide direct value to your organization. However, we also believe that the project provides your organization and opportunity to determine how and where to invest in more analytics. If this includes the acquisition of more analytical talent, the project provides an excellent conduit to members of our student body that are talented and interested in this space.

How does the team work with the Client?

For the student team, the partnering company is a client. They will conduct their analysis and provide recommendations through a report and presentation in the same format and in the same manner as a consulting service. The faculty member also serves as an important liaison between the partner and the student, serving to manage time commitments and negotiate deliverables. It is expected that the student team can meet with and speak with key members of your team that can help them answer questions relevant to the analysis.

Which software will we use?

It really depends on the project and your familiarity with software packages. This course is software agnostic, meaning most software packages are acceptable. The course does not have as a goal to teach a particular package, but rather to enable analytics in a business project. You are welcome to use software of your choice. Most projects can well be completed with a combination of Excel and one statistical package. Students having taken MECN 915 have found using JMP, STATA, R, SPSS, and @Risk useful. Kellogg provides support and access to STATA. Access to JMP, @RISK, STATA, and other tools will be discussed in the course. If you are unsure or unfamiliar with statistical software, we will discuss that during our first meeting. Some packages may have a minimal cost.

What about the data?

To make this experience valuable to the students and the to solve the business problem at hand, we do need access to data. It is important that the data be available before the project begins.

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Additionally, the project should make use of “scrubbed” data, that is data that is free of specific information that would be sensitive or otherwise governed by a law, such as social security numbers of customers or names of customers.

What types of business problems can be considered?

As analytics is helpful in many business functions, we are open to many applications of analytics. Specific business problems in marketing, forecasting, customer segmentation, pricing, commodity analysis, logistics, risk management, operations, inventory leveling, supply chain improvement, and scenario planning are sure to provide great analytical opportunities.

Will the analysis become public?

The work between the students and your organization is considered confidential. If necessary, the students may be asked to sign a non-disclosure agreement. If this is necessary, we ask that the non-disclosure agreement be such that it does not prevent the students from seeking employment or from building on their experience gained on the project.

From time to time, such company-student projects lead to very interesting business lessons. As a leading business school, we are interested in sharing such lessons with our next generation students and business leaders. We do this through business cases. If such an opportunity exists with your project, we will seek your permission to relate the business lesson through a case study.

How to I join the Class?

First, you must meet the prerequisites. Then submit your application to Professor Russell Walker before the deadline. The application is used to build teams, assign you to one of your top project choices.

Contact Information

Please contact Russell Walker, Ph.D.

Via e-mail at russell-walker@kellogg.northwestern.edu

or via phone at +1 847 467 2148.

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WINTER 2018 ACL Projects

Northwestern University Athletics Alcohol Sales Study and Analysis

In recent years, many leading Division I collegiate programs have ventured into selling alcohol at sporting events, such as football and basketball. These examples suggest such a venture can easily provide the university many millions of dollars in revenue per year. However, the sale of alcohol on a university campus, at sporting events, is in many ways unprecedented and introduces many real risks. Such risks include the concerns for the welfare of attendees, fan safety, university liability and accordance with state and local laws that govern the sale of alcohol.

If done, the university would also like to consider brand sponsorship opportunities. Many universities selling alcohol earmark of the funds for scholarships or other student-focused activities. It would also be worth product and price of alcohol offered at games.

In this study, you will work with the senior leadership of Northwestern Athletics and the Big 10 to:

- 1) Analyze the feasibility of alcohol sales at sporting events
- 2) Perform a risk analysis of how to operate alcohol sales
- 3) Analyze attendance numbers to provide a reliable forecast for such sales
- 4) Make recommendations on products (such as local, craft) for sale
- 5) Develop a pricing model that optimizes revenue
- 6) Evaluate the best use of alcohol-derived revenue for the university
- 7) Consider other constituents, including sponsors, neighbors, fans, students, and governments

The final presentation and recommendations will be made to the NU athletics senior management.

Analysis and Data: The team should consider analytical examination of attendance data, review of alcohol sales at out universities, development of a data-driven revenue model in Excel, and a price optimization model. A survey of students, faculty, fans, and alumni is also in scope.

Applications: Use of analytics for business case forecasting. Leveraging data for investments. Customer behavior analysis. Survey analysis to understand sentiment and customer preference is expected.

Northwestern Athletics is an ACL alumni firm!

Heinen's Fine Foods Prepared Food Study www.heinens.com

Objective: to evaluate the current profitability of Prepared Foods category for Heinen's. **Goal:** identify opportunities to improve profitability on a UPC level, recommend a P&L model that can be successful in the unique grocery channel.

Scope:

1. The Northwestern Team will analyze the Heinen's data and build the current financial model, challenge existing model, identify improvement opportunities and recommend a target model, that fits our industry, our company, and could be achieved with a realistic improvement plan over 2-3 years.
2. Identify and bench mark Heinen's Prepared Food operating model against other successful food service operations, in or out of the grocery channel and compare against our model;
3. Perform comparative analysis between Cleveland operating model and Chicago operating model. The two markets operate under a different allocation of kitchen related tasks.
4. Evaluate and understand discrepancies between profitable Prepared Food departments vs. less or unprofitable Prepared Foods departments throughout the Heinens chain.
5. Review and challenges Heinen's current accounting practices around the distribution of costs in order to verify the profitability of the Prepared Food department.
6. Identify Sales, Gross Margin, and Labor Key performance indicators which must be satisfied in order for Heinen's current business model to be profitable.
7. Evaluate production mix by upc for profitability (from stretch, central production, or 3rd party vendor)

Approach:

1. The Heinen's Team will prepare the financial data; this will include making any product or labor adjustments to ensure data accurately reflects store operations. Data will also include labor hours allocated down to UPC level of detail. In addition data will include current mix percentage and margin for centrally manufactured items as well as a forecast for improved mix and margin given efficiencies from the new operating plant.
2. The Northwestern MBA Team will have access to all relevant data and will be able to quest additional information as needed. Brian Vogt will serve as project liaison and facilitate coordination between Heinen's and the student group to ensure they are receiving access to all pertinent information. Brian, will also met with the Northwestern Team as needed answering questions and providing context.

Analysis and Data: The team will get to be the first to systematically mine this amazing set of data on prepared food – arguably the most critical and fastest growing section of the grocery store business. Students should come prepared understanding the implications of Amazon's purchase of Whole Foods and various meal delivery models.

Applications: Use of analytics in determining the performance of a business unit. Explore how to make this unit better. Visit a store! Learn from a family-owned grocery-store and explore the future of retail grocery.

Northwestern University Parent Donation Pattern Analysis

Northwestern University competes in the NCAA I (Big Ten) and performs on and off the field. Ranked #14 in our overall Best Colleges ranking, Northwestern University has a Learfield Score of 550.5. Northwestern University competes in 19 sports and has a total of 468 student athletes: 235 men and 233 women. Most of the student-athletes are under athletic scholarships.

Need-based scholarships are given to undergraduates who cannot afford Northwestern tuition. There are also merit-based scholarships, which are a function of a student's excellent academic potential and performance. In merit-based scholarships, it is common for parents to donate to the university, often generously so. The university has not examined how parents of athletic-scholarship student behave. Do they give more than similar merit-based students or less? Are there patterns to identify that would allow NU to increase engagement of parents in such giving?

Student will work with real, contemporary giving data of thousands of parents, and will be expected to sign an NDA. Analysis will need to consider motivations, demographics, alumni status, and student experience (among other things). Final analysis and recommendations will be made to the senior university officials in alumni development and NU athletics.

Analysis and Data: The team will have access to actual donation data. Opportunities for pattern detection, time series analysis, segmentation and data visualization exists. The team might consider a survey of current and past parents as valuable.

Applications: The opportunity is to explain variation and difference in alumni giving. Why and when do alumni give to Northwestern? Can initiatives be created to stimulate more giving? The data is real-world and shows Northwestern University's trust in the team. The team has a great leadership opportunity to explore and understand the business of philanthropy to the university, especially as related to student athletes. Teams should have a deep appreciation for the mission of the university and its goal in encouraging philanthropy.

Northwestern Athletics is an ACL alumni firm!

Principal Financial Financial Advisor Analysis www.principal.com

Purpose

The purpose of this request is to determine what interactions drive sales with advisors. We would like to create a baseline advisor model and measure what sales activities (amount and frequency) lead to an increase in sales. If we understand what steps are more likely to lead to sales, distribution and marketing can more collaborate in a more efficient manner.

Objectives

The objective of this project is to study every type of interaction that Principal Sales Reps have with Financial Advisors. We would like to determine at each step in the sales process the likelihood of increasing sales by performing that step. We would also like to have this compared to the production level of the advisor, and other segmentation sets.

Output

The output from this study will be a matrix of effectiveness in sales steps. For every activity and segmentation we would also like to determine the ideal frequency for the greatest lift in sales.

Here are the metrics we would like to compare:

- Baseline Advisor - no activities/spend in the last 12 months

Activities to measure (Frequency and Amount):

- Email sent - marketing, not opened
- Email sent- marketing, opened
- Email sent - marketing opened and clicked link
- Email sent - sales, not opened
- Email sent - sales, opened
- Email sent - sales opened and clicked link.
- Physical Mail sent
- Call attempt
- Voicemail
- Webinar
- Conference Call
- Outbound call - service
- Outbound call - sales
- Inbound call - service
- Inbound call - sales
- Director event- Advisor meeting
- Director event - Meal
- Director event - Client event
- Director event- Entertainment
- \$ spend on bd meals
- \$ spent on bd promo
- \$ spent on bd entertainment
- Portfolio inquiry - Fund Analysis

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- Portfolio inquiry - FI360
- Portfolio inquiry - matrix review
- Portfolio inquiry - pm call

Segmentation

- Low dabbler 0-10k
- Dabbler 10k-250k
- Producer 250k- 500k
- Top Producer 500k- 2M
- Elite 2M plus
- Firm top producer
- Focus short list (Firm top producer, MM top office, tier 1 or tier 2 firm)
- Channel

Timeframe

- 12 months on total sales and redemptions and 12 months of all activities

Outcome

The study should provide insight to the correct amount of interactions that each sales rep should be having with our clients. This will reduce over visiting our top producers, which will in turn free up capacity for us to expand our coverage to more clients. We expect that this will deliver the data for us to determine the correct steps to increase sales with low level advisors. We will expect this project to lead an increase in effectiveness and collaboration for all of our sales reps, marketing, and global relations team. Sales Management will be able to create reports that track the level of activities and effectiveness of our sales people.

This report will be the basis for a new segmentation and coverage model for our territories. This will allow the sales teams to start using opportunities in Salesforce to track the progress of sales in the system. In creating the ability to track opportunities, we can build out a sales pipeline and accurately predict sales flow. We also believe/hope that this can be used as the basis for artificial intelligence for our sales people. AI will be a critical step in staying cutting edge and ahead of other asset managers.

1. Objectives

- a. Issues/Challenges: Gathering all data and relating back to a common unique identifier
- b. Objectives: Determine the sales lift that every activity has with each client segment

Analysis and Data: Students will work with the senior marketing team of Principal and have access to top data on sales rep performance. Opportunities are believed to exist to leverage descriptive statistics, regression analysis, cluster analysis, and time series analysis.

Application: Great opportunity to develop the analytics behind lead generation, marketing, customer retention and acquisition. Many applications of best practices in marketing and person to person outreach, too. Excellent opportunity to develop sales lift, based on marketing investments.

TicketMaster

www.ticketmaster.com

Company: Ticketmaster Resale

Project: Resale Customer Insights

About Ticketmaster Resale: Ticketmaster Resale is one of the largest online resale marketplaces for premium event tickets and a subsidiary of Live Nation Entertainment. We feature a comprehensive online inventory of premium seating to sports, concert and theater events.

Focus: Ticketing analytics can be extremely complex due to the number of variables that could impact the conversion of a ticket:

- 1.) Event Quality – artist/team, day of week, weather, stadium size, opponent, time to event, etc.
- 2.) Inventory – pricing, quality, variety, scarcity, etc.
- 3.) Product Experience – mobile vs. desktop, site capabilities, ticket delivery, etc.
- 4.) Traffic – traffic quality, channels, etc.
- 5.) Market – competitive actions, resale laws, local and broader economics, buyer demographics, etc.
- 6.) Category – NFL, NHL, NBA, MLB, Concerts, NCAA, Theater, etc.

We'd like to expand our customer insights to identify revenue, marketing and supply growth opportunities within each of our category segments (NFL, NHL, NBA, Concerts, Theater, etc.). You will be required to sign an NDA for this project.

Analysis and Data: There are many ways to examine TicketMaster data, as a buyer, seller, and of course as a broker. The data allows for descriptive statistics, regression analysis, time series analysis, and data visualizations.

Applications: Great opportunity to use concepts in economics, strategy, and to consider the role of digital secondary markets. The data will show great patterns to reveal the interests of buyers, sellers, and the market overall. Explore how ticket markets are made

Ticketmaster is an alumni firm of the ACL!

TheQ5

www.theq5.com

Win Probabilities Based on Football Drive Data
Dr. Andy Guyader
www.theq5.com

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Currently for college and professional football games win probabilities are created in real-time analysis based on play-by-play data. Game state analysis includes such measures as score in the game, team with possession of the football and field position. Win probability models are often updated at the conclusion of each play. This project will analyzing game data not at the play level but at the drive level. It is desired to find the effect that specific starting field position has on the drive outcome probability while incorporating the score of the game and the strength of the offense and defensive units involved. In a previous Kellogg ACL project, it was attempted to quantify the effect of starting field position statistics on the probability of winning a game and season win totals. In the efforts, an expected points model based on drive data was created. An expected points model based on drive data is a new creation for this expected points model was shown to be highly correlated with the outcome of the game. The expected points model will be leveraged in this project to provide a data-driven metric to evaluate football drive performance.

To restate, this project intends to investigate the creation of both pre-game and in-game win probabilities based solely on drive data collected from NFL games. Minimal data management will be necessary on a dataset containing chronological drive data from the most recent seven-plus years of NFL games - 2,000 games with over 42,000 drives. An example of the data is shown in Figure [\[1\]](#). This project has an intended projection for a submittal to the research paper competition at MIT Sloan Sports Analytics Conference next year. The scope of the paper will be the expected points model created in the previous project and the validation of the model through its predictive strength in pre-game match-up and also through its application to create accurate in-game win probabilities.

Analysis and Data: The team will have accessed to unique drive data in football. Previous ACL teams working with TheQ5 showed great use of descriptive statistics, regression analysis, predictive analysis, and data visualization. Similar opportunities exist. Teams have the option of presenting their work at the MIT Sloan Sports Analytics Conference.

Applications: This is an unmatched opportunity to explore the strategy and probabilistic outcomes of football. Do you love Moneyball concepts? Here is a chance to strip away the bias of football outcomes and dive deep into the data.

TheQ5 is an alumni firm of the ACL!

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
1	ID	OSGID	Dnum	Team	QTR	Ydline	TimeSt	Obtained	TimeEnd	HowEnded	Plays	Yards	Year	Team	Def	DI	DI	Points	NextPts	EXP	Pts	EPAdder	EPAddec
2	2009010101	20090101	1	PIT	1	58	15:00	Start	13:16	Punt	3	2	2009	TEN		#	3	2		7	1.948	0.266	0.266
3	2009010102	20090101	2	TEN	1	98	13:16	Punt	11:24	Punt	3	2	2009	PIT		#	3	2		-7	-0.566	-2.325	-2.325
4	2009010103	20090101	3	PIT	1	43	11:24	Punt	8:20	Punt	5	2	2009	TEN		#	5	2		7	2.891	-2.891	-2.891
5	2009010104	20090101	4	TEN	1	89	8:20	Punt	6:44	Missed FG	5	70	2009	PIT		#	5	#		-7	0.000	-1.005	-1.005
6	2009010105	20090101	5	PIT	1	73	6:44	Missed FG	4:49	Punt	3	-6	2009	TEN		#	3	#		7	1.005	-1.948	-1.948
7	2009010106	20090101	6	TEN	1	74	4:49	Punt	1:38	Interception	6	30	2009	PIT		#	6	#		-7	0.942	-1.571	-1.571
8	2009010107	20090101	7	PIT	1	79	1:38	Interception	0:06	Interception	3	3	2009	TEN		#	3	3		7	0.628	-3.456	-3.456
9	2009010108	20090101	8	TEN	1	44	0:06	Interception	13:04	Punt	5	0	2009	PIT		#	5	0		-7	2.828	-2.451	-2.451
10	2009010109	20090101	9	PIT	2	95	13:04	Punt	7:14	Punt	8	33	2009	TEN		#	8	#		7	0.378	-0.628	-0.628
11	2009010110	20090101	10	TEN	2	73	7:14	Punt	2:14	Missed FG	12	60	2009	PIT		#	#	#		-7	1.005	-1.633	-1.633
12	2009010111	20090101	11	PIT	2	79	2:14	Missed FG	1:22	Touchdown	5	79	2009	TEN		#	5	#	7	7	0.628	6.372	6.372
13	2009010112	20090101	12	TEN	2	71	1:22	Touchdown	0:48	Touchdown	3	71	2009	PIT		#	3	#	7	7	1.131	6.700	6.700
14	2009010113	20090101	13	PIT	2	73	0:48	Touchdown	0:00	Interception	6	18	2009	TEN		#	6	#	0	0	1.005	0.000	0.000
15	2009010114	20090101	14	TEN	3	79	15:00	Start3	11:57	Fumble	6	38	2009	PIT		#	6	#		3	0.628	-2.500	-2.500
16	2009010115	20090101	15	PIT	3	54	11:57	Fumble	9:53	Punt	4	9	2009	TEN		#	4	9		-3	2.200	-1.822	-1.822
17	2009010116	20090101	16	TEN	3	95	9:53	Punt	8:01	Punt	3	-1	2009	PIT		#	3	#		3	-0.378	-1.822	-1.822
18	2009010117	20090101	17	PIT	3	54	8:01	Punt	5:08	Punt	6	11	2009	TEN		#	6	#		-3	2.200	-2.136	-2.136
19	2009010118	20090101	18	TEN	3	90	5:08	Punt	1:43	Punt	6	19	2009	PIT		#	6	#		3	-0.063	-0.188	-0.188
20	2009010119	20090101	19	PIT	3	85	1:43	Punt	14:51	Punt	3	8	2009	TEN		#	3	8		-3	0.251	-1.885	-1.885
21	2009010120	20090101	20	TEN	4	63	14:51	Punt	11:03	Field Goal	7	36	2009	PIT		#	7	#	3	3	1.634	1.366	1.366
22	2009010121	20090101	21	PIT	4	70	11:03	Field Goal	2:57	Field Goal	12	56	2009	TEN		#	#	#	3	3	1.194	2.700	2.700
23	2009010122	20090101	22	TEN	4	82	2:57	Field Goal	1:50	Punt	4	12	2009	PIT		#	4	#		0	0.440	-2.248	-2.248
24	2009010123	20090101	23	PIT	4	58	1:50	Punt	0:51	Fumble	4	54	2009	TEN		#	4	#		0	1.948	-1.508	-1.508
25	2009010124	20090101	24	TEN	4	96	0:51	Fumble	0:00	End of Half	3	0	2009	PIT		#	3	0	0	0	0.440	0.000	0.000
26	2009010125	20090101	25	PIT	5	78	15:00	StartOT	10:28	Field Goal	10	63	2009	TEN		#	#	#	3	3	0.691	2.700	2.700

Figure 1: Drive data example