The Wharton School
UNIVERSITY OF PENNSYLVANIA
Department of Operations and Information Management

Syllabus for OIDD 201

Technology, Online Business Model Innovation, and Valuation

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Class Sessions: M, W 3:00-4:30
Office Hours: M, W 2:40 // T 1:30-3:30

Teaching Assistant
TBA // **xxx**

This course provides an introduction to valuing online business models and online innovation. In particular it provides an introduction to formal analytical techniques valuing business opportunities based on innovative use of information and technology. The content of the course will be divided between understanding a few key business opportunities for information-based strategies and constructing computer-based models for the evaluation of innovative businesses. The course is intended to provide a foundation for further study in information-based strategies, online innovation, strategic consulting, and private equity, and of course for further study in OIDD. This course fulfills 1 credit unit in the new Wharton Flex Fundamentals / Technology Requirement.

Course Objectives

Students who complete the course will be prepared to find online business opportunities, evaluate new businesses as investment opportunities, and evaluate their own plans for online innovation.

Required Texts

The primary text for the course is a small number of chapters selected from *New Patterns of Power and Profit: A Strategist's Guide to Competitive advantage in the Age of Digital Transformation*. Students can choose between buying the text or buying the individual chapters online at Palgrave's website for the book. Students will also need to download the Goldsim User's Guide, which is available without charge online from Goldsim at www.goldsim.com/Web/Downloads/UserManuals. A few additional readings will be provided, primarily to augment students' understanding of the construction and use of computer simulation models*.*

Course Pedagogy and Philosophy

Class time will be used primarily to provide in-depth discussion of the implications of key concepts covered in the readings and to provide assistance in the design and development of computer models that have been assigned as homework. Classes in the lab will be dedicated to assisting students in starting the construction of their simulation models. Classes not in the lab will be dedicated to in-depth discussions of key strategic concepts explored in the readings. Wherever possible, assignments will be based on the

instructor's actual consulting experience, framing and solving strategic problems for clients in a range of industries.

Assignments and Grading

There will be **one** mini-assignment just to ensure that everyone is able to start Goldsim and work with an existing Goldsim model. There wil also be **five** computer-based simulation assignment during the semester. Please note that all readings and written assignments are highlighted in **gold** in the syllabus. Dates when computer assignments, models and documentation are due are noted in **blue**. Simulation assignments should all be done in groups of two or three students.

Written assignments must be submitted electronically to the course website at the start of the class sessions in which they are due. Since assignments will usually be discussed in class on the date that they are due, it will not be possible to accept late assignments unless prior arrangements have been made.

Student Bios

Please send a word file containing a short biographical sketch, not a full resume, via email, to **clemons@wharton.upenn.edu**. Please title your attached file **201S18_I_NAME.doc**, where **I** is your first initial, and **NAME** is your last name. Please provide the following information:

- your expected concentration at Wharton
- your experiences relevant to the topics of this course
- your experience with computer programming
- your reasons for taking this course and what you hope to get out of it

Course Outline and Readings

1 W 16-Jan **Introduction to Simulation and Modeling for Business Insight**
Introduction to simulation, to modeling, and to modeling for insight and judgment. Describe various types of simulations. Describing various purposes of simulation: as a chance to observe sensitivity of model to various assumptions, for models that are much more general and much more powerful than spreadsheets. Describing simulation as a form of experimentation. Describing iteration and Monte Carlo simulation as a form of experimentation.

The course uses simulation to value investments in the presence of risk and ambiguity, and why information systems innovations have high elements of both.

Why we use simulation, especially to deal with problems where our intuition breaks down and closed form mathematical analysis is not tractable, especially with randomness and feedback loops. Incorporate Forrester's original Sloan Management Review Article on limits to intuition in the social sciences.

Course Philosophy: Take real problems for strategy, especially from strategic consulting, and construct models to assess alternatives and make recommendations.

Describe the types of simulation: Stochastic vs deterministic // continuous flow vs. discrete event // examples of each // Overview of simple barbershop queueing in Pseudocode and in Goldsim.

Simple examples of simulations and the sort of outputs they produce.

Read: http://static.clexchange.org/ftp/documents/system-dynamics/SD1993-01CounterintuitiveBe.pdf
Read: Online Goldsim Manual, Chapter 1

— M 21-Jan **No Class — Martin Luther King Birthday**

2 W 23-Jan **Introduction to Goldsim**
Location: In the Lab
Introduction to Goldsim and the F-80 Goldsim lab. Starting Goldsim. Running a model. Togelling between run mode and edit mode. Entering parameter values. Viewing results, exploring results and various takeaways from Monte Carolo experiments. Inserting Pool element, Previous Value element, and adding flows.

Build and run Akerlof model. Show both the pseudocode and the final model. Vary the buyer's premium, vary the residual value, and examine the stability of Akerlof's insights. Adding History output.

Assign: Mini-Assignment — Mini-assignment exploring Akerlof model under a range of assumptions. Details on Canvas in Mini-Assignment under FILES / Notes.
Read: Online Goldsim Manual, Chapter 2 (Skip advanced features)

3   M 28-Jan   **Using Goldsim for more complex problems — the Fake News problem**
Students discuss findings from running their Akerlof Mini-Assignment under different parameter values.

Discussion of the fake news problem. Discussion of how fake news is written and distributed. Simple experiments for the distribution of fake news, including broadcast, narrow-cast, and precision-cast. More complex experiments for the distribution of fake news, adding forwarding/retweating and the amplification of initial strategies.

Running the fake news problem under a range of assumptions.

Due: **Goldsim Mini-Assignment**
Due: **Formation of assignment teams on Canvas.**
Read: **Clemons, short article on creating fake news**
Read: **Clemons, short article on targeting fake news**
Read: Online Goldsim Manual, Chapter 7, through **Running and Viewing the Simulation**

4   W 30-Jan   **Modeling for Insight — Understanding the Problem**
Discuss modeling for insight — working with a model to explore the implications, and why they are not immediately obvious in problems with stochastic elements and non-linear interactions.

Refining the problem statement. Creating a structural view of the problem. Idenfying your decision and your decision criteria, and working backwards to identify your outputs. Creating an influence diagram for the problem. Identifying your certain inputs, your uncertain inputs, your stochastic inputs, and the functional relationships among them.

Simple examples of simulations and the sort of outputs they produce. Show key entities and their interactions. Describe the classic barbershop model as an example of queueing. Show the rabbits and foxes model as a simiple example of pools with additions and depletions. Show pseudocode. Show Goldsim. Show output.

Assign: Assignment 1 — Students need to create the complete deterministic and the complete stochastic resonance *Golden Roof Yongle Tea Shop* model. Learning objectives: Working with interactions over time. Working with stochastic elements. Using Monte Carlo analysis to create confidence intervals for financial analyses. Details on Canvas in Assignment 1 under FILES / Notes.
Read: Read Chapters 3 and Chapter 4 (skip Containers and Time Series) of Goldsim manual

5 M 4-Feb   **Modeling for Insight — Building the Goldsim Model**
Location: In the Lab
Construct a simple model with multiple interactions. Learn to link reservoirs to stochastic and deterministic changes.

Build rabbits and foxes model as an example of additions and depletions, to prepare students for Assignment 1. Explore changes in predation, changes in sales. Explore boundary conditions, negative increases, and the use of functions like floor, ceiling, and the use of "if", to avoid a negative increase in a reservoir. Explore stochastic elements.

6 W 6-Feb   **The Theory of Resonance Marketing**
Introduction to Resonance Marketing, and the transition from traditional market *fat spots* to resonance marketing *sweet spots*.

The key role of *informedness* and uncertainty reduction in enabling resonance marketing.

The role of feedback and organic online content — word of mouth increases customers, more customers increase word of mouth, more word of mouth increases customers.

More complex dynamic state transition models, focusing on customer transitions within the system, across pools.

More formal discussion of pools, continuous change, and discrete change.

Constructing a more complex model, *Yongle Golden Roof Tea Shop*, with best, worst, and average case analysis, both deterministic and stochastic, as an example of resonance marketing. Relate this to the launch of craft brewing and other resonance marketing examples.

Explain the roles of sensitivity analysis and Monte Carlo analysis. Show how to force resampling of stochastic elements and how to define discrete and continuous distributions. Use of integrator element in place of reservoir to accept negative increases when necessary. Introduce the use of modeling for effective communication. Show how to use statistics and probabilities, as well as all "realizations," to obtain extra information from Monte Carlo runs.

Use of displays for effective communication.

Read: Online Goldsim Manual, Chapter 8 (first four sections)
Read: Read *New Patterns of Power* Chapter 4.

7 M 11-Feb   **Resonance Marketing Analysis of Yongle Tea Shop plus Analysis of Promotions on Market Size of Competitors**
Location: In the Lab
Class presentation of results from Yongle Tea Shop.

Modeling for effective communication. Significance of Monte Carlo findings when negotiating with bankers. Significance of the Orange Racoon Lion Hair problem, and the significance of timing. Is it better to have this disaster early or late? Does it depend on your need for credit early? Does it depend on the timing of your exit strategy?

Due: Assignment 1 — Deterministic and Stochastic Yongle Tea Shop, with multiple scenarios, with and without Monte Carlo statistics.

8 W 13-Feb **Resonance Marketing Analysis of Yongle Tea Shop plus Analysis of Promotions on Market Size of Competitors**
Location: In the Lab
Finish the discussion of *Yongle Golden Roof Tea Shop*, with emphasis on presentations for effective communication.

Begin discussion of use of models with two or more reservoirs to study competition and changing balance between two firms. The original problem — Are promotions truly zero sum? If not, why not? Should the weaker player continue promotions even if the stronger player does not? Describe the *Gas Diffusion* model of promotions as introduced at Lever Brothers. Begin construction of the two pool model of promotions.

Consider the longer term behavioral effects of increased brand switching. What if switchers become "repeat switchers," which in turn means they become high probability switchers? Describe the four pool model of promotions.

Use of documentation for effective communication to other modelers. Use of Dashboard for effective communication to non-modelers.

Assign: Assignment 2 — Students need to create the complete deterministic *Gas Diffusion* model for brand switching. Learning objectives: Working with multiple pools to model changing competitive balance between and among firms. Details on Canvas in Assignment 2 under FILES / Notes.

9 M 18-Feb **Matrices and Pools and Tricks for Extending Matrix Capabilities in Goldsim**
Matrices and parallel pools. Which elements can be "matricized" in Goldsim and which cannot. The use of vector "if" statements and multiplication to create vector calculations in the absence of necessary vector elements.

Read: Online Goldsim Manual, Chapter 10, Section on "Using Vectors and Matrices"

10 W 20-Feb **Gas Diffusion Model of Brand Switching, with and without Erosion of Brand Loyalty**
Students present their model of switching under the effects of promotions, using a two-pool model.

I present the four pool model, in which we track which cosumers have previously switched brands and the implications for their future brand loyalty. The four pool model is then used to examine the implications for the introduction of private label products.

Due: Assignment 2 — Gas Diffusion Model of Brand Switching.

11 M 25 Feb **Theory of Newly Vulnerable Markets**
The theory of newly vulnerable markets as an opportunity for new entrants to attack industries that appear mature and invulnerable to attack from small competitors.

Describe the three components of newly vulnerable markets and their history, from AT&T vs. MCI; HKSB vs. Citi; and Citi vs. Cap One.

Describe *death spiral* and behavior of NVMs over time.

Describe behavior in terms of activities: *In Play Ratio*, *Defection Rate*, *Retention Effectiveness* through Offer Matching, and *Preemption Effectiveness* by OfferMatching.

Describe managerial strategies for incumbents to respond to attack, from *ignore, preempt, retention.*

Goldsim Mini-Tutorial, creating reservoirs, additions and withdrawals, queues, stochastic elements and the distributions and triggers, time history outputs and their use to obtain distributions.

Assign: Assignment 3 — Newly Vulnerable Markets at Citi. Learning objectives: Working with multiple pools to model changing competitive balance between and among firms when engaging in more complex strategies. Details on Canvas in Assignment 3 under FILES / Notes.
Read: Capital One Case Study
Read: Read *New Patterns of Power* Chapters 1 and 2.

12 W 27-Feb **Theory of Newly Vulnerable Markets — Modeling Capital One's Attack on Dominant Players**
Location: In the Lab
Start to build a simulation of the Capital One attack on Citi. What do we want to know about the behavior of customers and what behaviors we need to include in the model? What can executives do to influence customer behavior?

What do we need to show in order to answer questions and influence behavior of executives and their selection of strategies?

Complete description of the model. Build in the influence diagram. Then build the multi-pool model, with different *in-play ratios* and different switching rates, and with different retention rates. Explore retention APR and pre-emption APR. Start building the model.

— M 4-Mar No Class — Spring Break

— W 6-Mar No Class — Spring Break

13 M 11-Mar **Theory of Newly Vulnerable Markets — Modeling Capital One's Attack on Dominant Players**
Location: In the Lab
Continue developing the model. Discuss how to handle successful preemption as a strategy without additional coding. Discuss how to vary effectiveness of retention activities. Discuss the results that you will want to be able to show. Discuss which History outputs will be required.

Assign: Final Term Project Assigned. Students prepare to present proposals.

14 W 13-Mar **Theory of Newly Vulnerable Markets — Possible Responses to Capital One's Attack on Dominant Players**

Students present their findings on Capital One attack and present their recommendations to the management team of the defending bank.

Due: Assignment 3 — Newly Vulnerable Markets at Citi.

15 M 18-Mar **Theory of Newly Vulnerable Online Markets**
Theory of newly vulnerable online markets. Theory of the brand's attack on the store. Theory of the store's response. Theory of the airlines' attack on agency-based sales and theory of the agencies' available responses.

Role of the *in-play* ratio.

Extensions to insurance, investment advising, and other product markets. When is the cooperation of the traditional channel truly essential to the provider of the goods or services? What does this tell us about the role of the channel in *inspection goods*, distinct from the role of the channel in standardized commodity goods?

Assign: Assignment 4 — Newly Vulnerable Online Markets and Lever vs. Wal-Mart. Learning objectives: Understanding multiple complex relationships between multiple pools. Understanding the difficulty of a single manufacturer launching an attack on an established retail channel. Details on Canvas in Assignment 4 under FILES / Notes.

16 W 20-Mar **Modeling Traditional Consumer Goods Company's Attack on Traditional Retail Channel**
Location: In the Lab
Starting to build the model of newly vulnerable online markets.

Use of multiple pools for each brand (enthusiastic, loyal, and indifferent customers), with different willingness to pay. Subdivide each pool based on attitude towards and experience with online shopping, with different willingness to pay for online shopping. Model skeptical adoption and different willingness to pay for inexperienced and experienced online shoppers.

Return of the *in-play ratio*.

What else do you need to know?

Modeling pools, flows, and influences. Most complex part of the model: determining what each customer pool will do (9 pools), facing three purchase choices (Plover, Plover Online, or Brindle), with three prices, and three willingness to pay numbers. Why 9 pools? Three levels of enthusiasm for Plover, three levels of enthusiasm for Brindle, and three levels of enthusiasm for Plover after shopping online at least once.

17 M 25-Mar **Discussion of Proposed Term Projects**
Student presentation of their term project proposals. What is the question you want to answer? What do you need to know in order to answer the question? What do you need to know in order to build the model? What do you already know about the structure of your model? Why does this require simulation?

   Due: Term Paper Proposals.

18 W 27-Mar **Discussion of Proposed Term Projects Continued**
Student presentation of their term project proposals. What is the question you want to answer? What do you need to know in order to answer the question? What do you need to know in order to build the model? What do you already know about the structure of your model? Why does this require simulation?

19 M 1-Apr **Analysis of Attacks on Traditional Distribution Channels**
Students present their findings on newly vulnerable online markets for traditional consumer goods. I present summary and extensions, and then work through statistical decision theory analysis of air travel example.

   Due: Assignment 4 — Newly Vulnerable Online Markets and Lever vs. Wal-Mart.

20 W 3-Apr **Introduction to Queuing and Discrete Event Simulations**
Location: In the Lab
Start of simple queuing model. Introduce the necessary elements, random arrivals (stochastic variable linked to yellow bolt clock icon), timed operations (timed delays as yellow bolt hourglass icons), discrete changes (red bolt). Link them into pools of customers, pools of servers. Start building a simple barbershop queuing model. In Lab

   Assign: Assignment 5 — Valuing Flexibility and Comparing Design of Traditional and Flexible Implementations. Learning objectives: Understanding the value of flexibility. Understanding discrete event simulation, including parallel service queues and priority rules for service. Details on Canvas in Assignment 5 under FILES / Notes.
   Read: Online Goldsim Manual, Chapter 8 (first four sections)

21 M 8-Apr **Introduction to Queuing and Discrete Event Simulations Continued**
Location: In the Lab

Completion of the barbershop queueing model. Introduction of sequenced queues and parallel queues in a full service barbershop. Implementation of priority queueing rules.

22 W 10-Apr Building a Queuing Model for Flexible Manufacturing
Location: In the Lab
Building the queuing model for traditional and flexible manufacturing. Parallel queues, multiple job steps, and priority sequencing.

23 M 15-Apr Validation and Verification of Queuing Models
Location: In the Lab
Validation, verification, and debugging in queuing models using the barbershop model. Provide models with bugs, use output data to find the bugs.

24 W 17-Apr Analysis of Flexible Manufacturing Model
Valuing flexibility: presentations of final queueing exercise. Often information-based implementations provide greater flexibility, but often there is a significant associated cost. Sometimes it is possible to quantify both the costs and the benefits associated with flexible implementations, and to make rigorous decisions concerning the selection of an optimal implementation.

Due: Assignment 5 — Valuing Flexibility and Comparing Design of Traditional and Flexible Implementations

25 M 22-Apr Supervised Work on Final Projects
Location: In the Lab

26 W 24-Apr Supervised Work on Final Projects
Location: In the Lab

27 M 29-Apr The Costs and Benefits of Sponsored (Paid) Search
Modeling complex social problems — the problem of sponsored search. Understanding the power of mandatory participation third party payer business models (MP3PPs). Understanding the power of MP3PP Online Gateways. Understanding the tradeoffs involved with free search combined with MP3PP gateway power.

28 W 1-May Class Summary
Review of key concepts. Modeling for judgment, intuition, and insight. Uses of continuous flow and discrete event simulation. Uses of stochastic and deterministic simulation. Role of Monte Carlo experimentation for distributions and confidence levels. Inportance of sensitivity analysis. Importance of graphics and sensitivity analysis in final recommendations.

— —   Final Presentations
Presentation of final projects over catered lunch, in place of final examination, on the day reserved for the final examination.