Syllabus, *Ver 2.0*

Technology Forecasting (TECH 6397-01),

Time: Wednesday, 5:30-8:30 pm US Central Time

Location:

Instructors: Peter Bishop, Ramasubramanian Vaidhyanathan

Office Hours: Cameron 221, by appointment

Contacts:

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Prerequisites: None

Overview

Every year, the UH futures program offers a special topics course in the Fall semester. Topics courses in the past were on Biotechnology, the United States (during the election of 2008), Women as Builders of the Future (last year). This year, we have a double purpose for offering Technology Forecasting as our topics course. Not only is technology a main driver of change in the future, we also privileged to host Dr. Ramasubramanian Vaidhyanathan who is spending a three-month sabbatical with us this semester. Dr. Vaidhyanathan is a researcher and statistician with the Indian Agricultural Statistics Research Institute in New Delhi. We are looking forward to this partnership where he can learn about futures studies and technology forecasting and we can learn how to incorporate a modest amount of statistical analysis into our curriculum.

The course itself will be quite similar to Futures Research since, after all, forecasting is forecasting and the Research course is forecasting the Houston way. At the same time, there are number of techniques used in technology forecasting that we simply do not have time to cover in the more general course. What is more, this course also gives students the opportunity to investigate the technologies in their respective disciplines with more depth than they could in any other course.

Objectives

The student will understand and become familiar with the following:
  * The framework forecasting process
  * Data collection
      a. Secondary information collection for research and scanning
      b. Primary data collection using interviews and questionnaires, particularly the Delphi questionnaire
  * Specific technique used in technology forecasts, such as growth curves, substitution curves, road mapping

- Baseline future development and its support
- Critical thinking an approach to challenging the assumptions in the Baseline forecast
- Alternative future (scenario) development and presentation
- Technology commercialization and assessments

Required Texts

Please order online – not available in UH bookstore.
- Joseph Martino, *Technology Forecasting for Decision-Makers*, 1983
- Theodore Modis, *Predictions*, 1992
- Stephen Schnaars, *Megamistakes,* 1989
- National Research Council, *Persistent Forecasting of Disruptive Technology, Reports 1 and 2, 2009/2010* (Available at http://search.nap.edu/napsearch.php?term=persistent+forecasting&x=19&y=10)

Schedule

Week 1 (Aug 24) Introduction
- Become familiar with course objectives, expectations, and procedures
- Become familiar with the learning platform (Blackboard).
- Introduce yourself to your classmates.

Unit 1 Theory and Methods

Week 2 (Aug 31) Forecasting theory and methods
- A theory of change
- Overall approaches to technology forecasting
- Introduction to framework forecasting

Unit 2 Data Collection

Week 3 (Sept 7) Secondary Research
- Forecast accuracy
- Technology performance measures
- Information from secondary (published) sources, principally the Internet and electronic databases
- Sources of quantitative data on technologies

Week 4 (Sept 14) Technology database
- Patent searching
- Bibliometric analysis

Week 5 (Sept 21) Primary Research: Interviews
- Forecasts based on human judgments and estimates
- Historical analogies
- The skills of preparing, administering, analyzing and drawing inferences from an open-ended interview

Week 6 (Sept 28) Primary Research: Delphi Surveys
- The Delphi technique, an anonymous, multi-round questionnaire

Unit 3 Quantitative Modeling

Week 7 (Oct 5) Trend Extrapolation
- Linear regression
- Fitting time series data to general trend models
- Extrapolating those models into the future

Week 8 (Oct 12) Growth and Substitution Models
- Fitting time series data to growth and substitution curve models
- Extrapolating those models into the future

Week 9 (Oct 19) Systems models
- Identifying correlates and causes for technological change
- Forecasting technology change as a function of those correlates and causes

Unit 4 Forecasting

Week 10 (Oct 26) Baseline Forecasting
- Integrating judgmental and quantitative forecasts into a forecast of the expected future
- Identifying the implications of the baseline forecast for society and/or for a specific enterprise
- Writing up the results for client and popular consumption

Week 11 (Nov 2) Critical Thinking, Baseline Analysis
- A process for evaluating the support for an inference, such as the baseline forecast
- Alternative assumptions that lead to plausible alternative futures

Week 12 (Nov 9) Monitoring, Scanning, Breakthroughs and Wildcards
- Key quantities and conditions that indicate whether or not the baseline is occurring
- Environmental scanning as the means to keep current on change within the specific technology

- Identifying potential breakthroughs and wildcards that could alert the trajectory of a technology

Week 13 (Nov 16) Scenario Development
- Plausible alternative futures (scenarios) for the technology
- The implications of the alternative futures for society and/or for a specific enterprise

Week 14 (Nov 23) Normative forecasts
- Technological changes that would lead to specific plausible or preferred futures (backcasting)
- Technological road mapping
- TRIZ

<u>Conclusion</u>

Week 15 (Nov 30) Forecast presentation
- A synthesis of the most important findings of the various forecasts
- Related topics –
  - An ideal forecasting system
  - Technology commercialization
  - Technology assessment

Week 16 (Dec 7) Draft Portfolio
- Summary presentations
- Draft portfolio due

Week 17 (Dec 14) Final Portfolio
- Final portfolio due

Activities and Assignments

The structure of this course consists of preparing a professional technology forecast one element at a time. So most weeks will require the first draft of one of those elements. Each element will receive feedback, after which it may be revised and resubmitted. The instructor provides that feedback where appropriate, but students are also strongly encouraged to review others' material and comment or ask questions about it.

Class meets on Wednesday evenings, 5:30 – 8:30 pm Central US time. Readings (and the Terms and Statements) are required before class; activities and first draft of the forecasting elements are required after class, usually by midnight of the following Tuesday. Since the week begins and ends at midnight on the night before the class meeting (i.e., midnight Tuesday) so material can be discussed at the class meeting. All assignments are due at that time, e.g., the Week 1 Assignment is due the night before the Week 2 class. Each class typically reviews the assignments of the week before, and involves a lecture, discussion or exercise in reference to the current week's topic, and some guidance regarding the assignment due the following week.

Class meetings will are held both on campus (Room 229, Cameron Bldg.) and online (Audio Call-in link on the Blackboard home page) Classes are recorded so that those who may not be able to attend class can hear what occurred. While class participation is not required, those who do participate (in person or online) report that they get more out of the course and do better on the assignments. Overall, the assignments should not take any more than 10 hours each week (including participating in class), and many weeks less. Please contact the instructor if you find yourself having to spend more than 10 hours a week on a regular basis.

Grading

In most cases, the weekly assignment is a rough draft of the portfolio product for that week. Deadlines are extended for assignments that require some time, such as interviewing and questionnaires. Feedback is provided within the next week although no grade is assigned until the end of the course. Assignments may be revised and submitted as many times as the student wishes.

All portfolio assignments are combined into an optional draft portfolio submitted on or before Dec 7. That portfolio is graded with feedback provided and returned to the student within 72 hours of submission. Students may accept the grade from the draft portfolio or revise and resubmit any products he or she wishes. The Final Portfolio is due on Dec 14. The final grade is an average of the portfolio products plus a timeliness score based on how often activities and assignments are submitted on time.

Each portfolio assignment is weighted equally, except as noted below. The Learning Essay is not read before grades are turned in so it receives an automatic A. The portfolio assignments are:

1. Research report, including patents and bibliometric analysis
2. Interview report
3. Delphi report
4. Trend extrapolation report
5. Growth/substitution curve report
6. Summary Quantitative report
7. Baseline scenario (counts twice)
8. Assumptions report
9. Weak signals, breakthroughs and wildcards report
10. Alternative scenarios (counts twice)
11. Normative scenario report
12. Summary professional report (counts three times)
13. Learning essay

Timeliness: Weekly activities and assignments are due at the end of each week—i.e., Midnight, Tuesday before the next class. Submissions turned in on time receive 10 points. Submissions turned in late lose one point for each week late. The points for all assignments are averaged to produce a percent score between 0% (no assignments turned in at all) and 100% (all assignments turned in on time). That score, suitably adjusted, is multiplied with the portfolio average to arrive at the final score. The final scores are ranked and grades assigned to clusters of scores beginning with A and working down.

Grading Criteria
- 4 points **A Far Exceeds Expectations:** Demonstrates exceptional mastery of concepts, expression, and application of course materials.
- 3 points **B Solid Competence:** Demonstrate ability to meet specifications of assignments and evaluation criteria.
- 2 points **C Minimally Met Expectations:** Demonstrates marginal performance on assignments and meeting evaluation criteria.
- 1 points **D Serious Deficits in Competence:** Unacceptable performance on assignments and meeting evaluation criteria.
- 0 points **F Failure to Meet Expectations:** Inadequate effort on assignments and meeting evaluation criteria.

Academic honesty policy All UH students are responsible for knowing the standards of academic honesty. Please refer to the UH catalog. Plagiarism, using research without citations or using a created production (such as other people's words) without quotations or citations, will result in a grade penalty or failure of the course. Internet sources must be credited according to the sites recommended citation guideline if available. If no citation guideline is provided by the web source, then the date, URL site owner, and author must be included with the web material used.

Disabilities: Students who require individualized accommodations for this course must inform the professor in order that appropriate arrangements can be made. For

information about services provided by The Center for Students with Disabilities, please call 713-743-5480.

Incompletes: A grade of "I" is given only in cases of documented emergency or special circumstances late in the semester, provided that the student has been making satisfactory progress. An Incomplete Grade Contract must be completed.

Withdrawals: Refer to class schedule for dates to withdraw without evaluation from a course. Last day to withdraw or drop without grade penalty for