ISE-585 Strategic Management of Technology and Innovation

Units: 4 units
Time: Two 110-minute lectures per week Wednesdays and Fridays 2:00 – 3:50 PM

Course Section: 31585
Location: GFS 101 and via IPodia

Prerequisite: A graduate student standing in engineering is required (or approved by the instructor).

Instructor: Paul Lu
Office Location: GER 201
Office Hours: Wednesdays 4:00 – 5:00 pm and Fridays 4:00 – 5:00 pm
(Additional office hours are available by appointment – send me an email)
Contact Email: Paullu@usc.edu

Teaching Assistant:
Contact Email: TBD

COURSE DESCRIPTION:
Principles, strategies, practices, and real-world case studies of how new technology and innovation transform the paradigm of the technology industry.

I. Course Overview

The upcoming 4th Industrial Revolution accelerates technology development and awakes engineers' innovation mindset. Traditional approaches to technology-focused businesses are being challenged while emerging technologies and innovation are reimagining industries. The allure of driving efficiencies and transforming processes through technology and innovation has inundated organizations with many possibilities. However, to realize the value, organizations need leaders at all levels to identify, assess, and plan the integration of the right opportunity within the business context. This course provides students with the foundational skills in strategic management to rapidly identify and assess potential technology and innovations through objective, data-driven methodologies and develop integration plans.

The privatization of space exploration, autonomous vehicles, and educational technology are examples of how technology and innovation have transformed industries. When SpaceX launched its first rocket, Falcon 1, the idea that space exploration could be economical and sustainable was a tectonic shift in the traditional mindset at NASA and has led to others innovating in this "Space." Similarly, autonomy and artificial intelligence (AI) are becoming more ubiquitous and disrupting the development of passenger vehicles and delivery logistics, and they are accelerating predictive economics in customer service businesses. Most recently, the impact of the Coronavirus-19 pandemic has transformed the traditional modalities in business processes and operations and, most significantly, in education and learning. These

examples share a common thread: an opportunity, whether planned or not, was identified, and organizations had to adapt accordingly. Leaders at all levels of these organizations were challenged to leverage an agile and innovative mindset to quickly identify, assess, and integrate advancements in technology and innovation into their operations.

Although technology and innovation are intended to drive efficiencies, accelerate growth, or mitigate risks, adopting the right technology and innovation for the proper purpose and at the right time is key to recognizing the intended gains from integration. Therefore, it is imperative for leaders at all levels to "reimagine" how integrating new technologies and innovation will impact their businesses. They will need the foundational skills to identify opportunities quickly, assess the value, and plan the integration of technology and innovation into operations to realize any benefits.

This course examines principles and practices (i.e., case studies) where technology and innovation have transformed traditional business paradigms and identifies best implementation practices. Based upon the 'lessons learned, students will develop a mental model of strategic management of technology and innovation that includes identifying opportunities to adapt it to the industry. Once technology and innovation have been recognized, students will use quantitative and qualitative metrics to assess the value of integration into the business. Finally, students will develop an implementation plan that identifies the necessary organizational and operational changes and the impacted stakeholders to recognize the gains from adopting the technology and innovation.

By exploring and incorporating the process of strategic management into a practical application, students will develop the foundational competencies in identifying, assessing, and integrating technology and innovation with applicability across industries.

II. Learning Objectives

By the end of the semester the students should be able to:
• Develop entrepreneurial thought processes to accelerate ideation.
• Mitigate heuristics and biases in technology management.
• Analyze industry structure for technology opportunities.
• Recognize and create opportunities for technology convergence.
• Understand historical disruption and develop forecasting skills.
• Organize a team to efficiently execute disruption in environments driven by engineers, users, and/or stakeholders.
• Optimize technology management under constraints.
• Assess current cutting-edge technology commercialization opportunities.
• Review opportunities through technical, financial, and strategic lenses, and integrate them into systems engineering practice.

In addition, you will learn the following skills:

• Critical thinking: Create hypotheses, gather data through primary and secondary research sources and draw conclusions in environments of high uncertainty.

- Collaboration: Share ideas and form group work products in impromptu and organized team environments without formal structure
- Communication: Create and deliver concise, compelling oral and written presentations; convey the essence of the critical thinking process and defend conclusions rationally.

III. Course Schedule

Week 1)	8/23 and 8/25	The Convergence of Technology and Innovation
Week 2)	8/30 and9/1	The Future of Things: Business, Commerce, and the Economy; Advertising; Entertainment; Education; Healthcare; Longevity; Transportation; Real Estate; Food; and Energy
Week 3)	9/6 and 9/8	Migrating into the Future
Week 4)	9/13 and 9/15	Future Threats and Innovative Solutions
Week 5)	9/20 and 9/22	An Exponentially Faster Future
Week 6)	9/27 and 9/29	The Dynamics of Technological Innovation
Week 7)	10/4 and 10/6	Strategic Implications for Technology and Innovation
Week 8)	10/11	Innovation Project Selection
Week 9)	10/18 and 10/20	Communication, Coordination, and Collaboration (the 3Cs)
Week 10)	10/25 and 10/27	Implementing Technological Innovation Projects
Week 11)	11/1 and 11/3	Mastering the New Product Development Process
Week 12)	11/8	Sustainability, Technology, and Innovations
Week 13)	11/15 and 11/17	Leading and Managing New Product Development Teams
Week 14)	11/22	(Thanksgiving – no class)
Week 15)	11/29 and 12/1	Deployment Strategies/Peer Reviews
Final week	12/13	Submit Journey Review / Lessons Learned

IV. Learning Activity and Grading Scheme

Class experience

ISE 585 is not a "spectator" sport but a combination of laboratory and lecture courses. We will use lectures, class exercises, case studies, individual and group projects, and guest lectures. You will learn tools to create and analyze potential opportunities, and you will apply these tools in class discussions. You will benefit the most from this class if you complete all the required readings and participate in class discussions.

To achieve these objectives through a stimulating and active learning experience, the course will be centered on discussion rather than on lectures. We will use various methods, including problem-solving class exercises, role-playing activities, individual and group projects, and guest lectures. Evaluation will focus on using and applying content rather than simply acquiring content, emphasizing your ability to understand the "so what?" new information.

Blackboard communication

Course communication will take place through announcements in class, emails, and on Blackboard (blackboard.usc.edu). All emails will go through Blackboard; therefore, it's imperative that you have a fully operational Blackboard account with a current and correct email address posted. You are responsible for regularly checking Blackboard for announcements and new

materials and delivering your assignments. Emails rejected because your account is full will not be re-sent.

Flexibility in the course plan
Because we invite community leaders as guest speakers, we sometimes are forced to adjust the course plan to accommodate their schedules. Please be flexible, as my goal is to give you a highly experiential classroom. This course plan may be modified as the semester proceeds; I will give you ample warning, and current information will be posted on Blackboard.
In addition, while the class is highly structured, I will modify the plan if necessary to accommodate students' desires and backgrounds. Special projects are encouraged upon approval. Your expectations are important!

Guests and invited speakers
From time to time, we may have guests or invited speakers. You are expected to be prompt, so you can greet them at the beginning of class.

Assignment submission policy

Assignments must be turned in by the due date. They must be submitted electronically.
via Blackboard. Any assignment turned in late, even if by only a few minutes, will receive a grade deduction in the following way:
  • First 24 hours after the due date: 10% penalty
  • 24-48 hours after the due date: 20% penalty
  • After 48 hours: No credit will be given

Additional notes
  • If your internet service breaks down on the due date, you must deliver a hard copy at the beginning of class.
  • If you cannot attend class on that day, make arrangements for it to be delivered to the classroom by the start of class.
  • You are certainly encouraged to submit files before the deadline. Please keep copies of all your files and emails until the end of the semester.
  • No hard copies will be accepted. Ever!
  • Late or not, you must complete all required assignments to pass this course.

Teams
By Friday of the third week of class, you must join a class team.
  • Teams must consist of 3-4 people.
  • One team member should email the roster to me by 5 pm so we can configure Blackboard properly.
  • If you do not have a team by then, email me, and I will address this.
  • No changes in team composition will be accepted after teams are formed. You are indeed stuck.
  • I will begin posting rosters as teams form. Note your team number to make things easier for all of us.
  • All teammates will receive the same grade on team submissions. You will be able to evaluate your teammates in a peer review process at the end of class.

Evaluation of class participation

The attendance, participation, and class exercises portion of the grade is 100 points and is evaluated in several ways. Obviously, participation requires attendance. It is impossible to earn a participation grade if you are not in class. Missing more than one class session during the semester will affect the participation grade. You will have the opportunity to do an extra credit reading assignment to compensate for a missing class.

Attendance at all class sessions is critical to the participation component of the course and to learning in general as we will discuss material not found in any textbook; in addition, we will undertake several in-class exercises and strategy-building sessions that require your regular attendance. As part of the emphasis on successful teamwork, you will be evaluated on your ability to listen to and learn from others. Please arrive on time so as not to disturb the class, be a guest speaker, or interrupt the professor.

To give everyone a chance to participate, I use "cold call" techniques. You will get two free passes in the semester; if you are having a bad day, please let me know before class starts, so we don't make your bad day worse. Otherwise, you are expected to be ready to discuss any of the readings or topics scheduled for the day.

Assignment and Grading Detail

Deliverable	Max Pages	Due Date	Team (T)	Individual (I)	%
		Week	T	I	
Potential concepts	2 (report)	6: 9/29 F	50		5%
Potential concepts presentation	10 (deck)	7: 10/6 F	50		5%
Down-select presentation/ The Business Case	15 (deck)	8: 10/11 W	100		10%
Commercialization strategy	10 (deck)	10: 10/27 F	100		10%
Product Development Plan	10 (deck) 5 (report)	11: 11/1 W	100		10%
Due Diligence report/Risk Management Plan	8 (report)	12: 11/18 W	100		10%
Opportunity Report	5 (report)	15: 12/1	100		10%
Opportunity Pitch	10 (deck)	15: 12/1	100		10%
Peer Review	Excel	15		100	10%
Journey Review/Lessons Learned	7 (report)	Final		100	10%
Participation				100	10%
TOTAL			700	300	
GRAND TOTAL				1000	100%

Evaluation of your written work

You may regard each submission as an "exam" in which you apply what you've learned according to the assignment. I will do my best to make my expectations for the various assignments clear and evaluate them as fairly and objectively as possible. You will have the grading rubric in advance to understand the assignment requirements. If you feel that an error has occurred in the grading of any assignment, you may, within one week of the assignment being returned to you, write me a memo requesting that I re-evaluate the assignment. Attach the original assignment to the memo and explain fully and carefully why you think the assignment should be re-graded. Be aware that the re-evaluation process can result in three types of grade adjustments: positive, none, or negative.

V. Reading Materials

Required reading materials
Text: "Product Development for Technical and Non-Technical Managers and Practitioners, 1st Ed., Lu, P. Kendall Hunt (2021), ISBN: 978-1-7924-7707-2. URL: he.kendallhunt.com/lu

Lecture notes for each learning module will be provided by the professor weekly. Each week is devoted to the study and exercise from the learning module (see Section III). Each learning module is organized as 4 or 5 key concepts, explained by a set of PowerPoint slides with sequence animations.

Recommended Reading Materials

1) *"Digital & Information Technology Strategy Journal"*, S. Kristina, Firmconsulting.com
2) *"Strategy, innovation, and change challenges for management",* J. Murray, C. Markides, and R. Galavan, Oxford University Press.
3) *"The innovator's dilemma: when new technologies cause great firms to fail",* C. Christensen, Harvard Business Review Press.
4) *"Goldratt and the theory of constraints: the quantum leap in management",* U. Techt, Ibidem-Verlag.
5) *"Process Reengineering: The key to achieving breakthrough success",* L. Roberts, ASQC Quality Press.
6) *"SpaceX from the Ground Up: 6th Edition",* C. Prophet, Independent.
7) *"Integrating program management and systems engineering: Methods, tools, and organizational systems for improving performance",* E. Rebentisch and L. Prusak, John Wiley and Sons.
8) *"The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators",* J. Dyer, Harvard Business Review Press.
9) *"Creativity, Inc.: Overcoming the Unseen Forces that Stand in the Way of True Inspiration",* E. Catmull, Random House.
10) *"Thinking, Fast and Slow",* D. Kahneman, Farrar, Straus and Giroux.
11) *"The Road Less Stupid",* K. Cunningham, Keys to the Vault.

VI. Course Website:

Course communication will take place through announcements in class, emails, and on Blackboard (blackboard.usc.edu). All emails will go through Blackboard; therefore, it's imperative that you have a fully operational Blackboard account with a current and correct email address

posted. You are responsible for regularly checking Blackboard for announcements and new materials, as well as delivering your assignments

Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be

done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.