



iSchools and Industry Partnership Proposal:

The CMU Risk and Regulatory Services Innovation Center Sponsored by PwC

iConference 2018

Abstract: In 2017, the Heinz College of Information Systems and Public Policy at Carnegie Mellon University established the Risk and Regulatory Services Innovation Center Sponsored by PwC. Leveraging CMU's world-class thought and research leadership with PwC's strategic client-engagement expertise, the Center conducts research on data analytics, information privacy and security, and other critical areas in the risk/regulatory/compliance sphere. The Center has initiated over 13 projects, connecting a dozen CMU faculty across five Colleges with numerous PwC professionals. This case study will provide highlights from projects funded by the Center. Our case study/presentation will share insights on how, working closely with PwC resources, CMU faculty, students, and staff have been researching and developing solutions to help industry and public sector entities solve some of their biggest challenges. We will discuss Center origin and development, its research projects, leveraging value-added university-wide opportunities and lessons learned partnering with industry.

[The Heinz College at Carnegie Mellon University](#)

The Heinz College of Information Systems and Public Policy at Carnegie Mellon University is home to two top ranked schools: the School of Information Systems and Management and the School of Public Policy and Management. The Heinz College is a center of excellence on issues that span people, policy, and technology research, and has deep strengths in combining data science with decision science and social science. The Information Systems, Information Security, and Public Policy programs aspire to educate men and women of intelligent action who use technology and analytics to solve important societal problems. The College was awarded the UPS George D. Smith Prize for educational excellence in Analytics and is the only academic institution that has won both the Von Neumann Theory Prize for research and the UPS Prize for educational excellence from INFORMS.

The Heinz College is home to a multi-disciplinary faculty whose backgrounds span economics, computer science, operations research, statistics and information systems and management. Its faculty has close partnerships with colleagues in engineering, computer science, social sciences, the design school and the business school and there are educational programs (undergraduate, masters and PhD) that span school boundaries as well research centers. This culture of multi-disciplinary and collaborative work were key

to establishing the risk and regulatory innovation center.

The rapid digitization of society and business is raising fundamental questions about both business opportunities as well as new risks. It is also providing a new approach to thinking about regulatory compliance – from both the perspective of the firm as well as that of the regulator. A holistic approach that takes a “systems” point of view is required that adopts a multi-disciplinary lens to the study of risk and regulatory compliance.

The RiskReg Center

To advance the way organizations such as businesses, governments, and other stakeholders use new information technologies, in 2017 the Heinz College established the Risk and Regulatory Services Innovation Center Sponsored by PwC (RiskReg Center). A distinctive feature of the RiskReg Center is the deep partnership between PwC - with its depth of knowledge about industry, government risk, and regulatory problems - and CMU’s depth of scholarship in technology, its social and business impacts, and a history of foundational work motivated by real problems.

The RiskReg Center is devoted to the purpose of supporting and performing education and research in areas including information privacy, security, and data analytics. The Center was formally launched in January 2017 with \$11 Million in funding support from PwC. The Center is composed of a Faculty Director (Professor Alessandro Acquisti), a Deputy Director (Alka Patel, JD), and a Governance Committee that includes Deans of four CMU Colleges (including the Dean of the Heinz College of Information Systems and Public Policy at Carnegie Mellon, Ramayya Krishnan), and senior partners from PwC. The collaboration with PwC, including its partners and clients, is managed at the Center through a deeply committed PwC Project Leader (Neelam Sharma). Under the Center’s funding, numerous PIs from Colleges across CMU campus are conducting research – in collaboration with PwC partners and clients - on data analytics, information privacy and security, and other critical areas. Many of the projects focus on research issues that arise in highly regulated industries, including designing, implementing and optimizing systems to address risk, regulatory and compliance problems. More information about the center and its governance structure and leadership is at <https://www.cmu.edu/risk-reg-center/>.

The RiskReg Center has a variety of goals, including creating distinctive experiential learning opportunities for students to work on current real-world problems, providing thought leadership in these areas, and developing research projects on which PwC partners and personnel with relevant expertise and CMU faculty, staff and students jointly collaborate. Under the latter goal, the Center has now funded over 13 research and student educational projects. The projects are heterogeneous in length, focus, and composition. For instance, ongoing and completed projects have included both short-term projects with strong educational components (e.g. semester-long exploratory applied research projects with Master students’ participation) and long-term, research-focused projects (e.g. multi-year projects with larger teams that include PhD students and post-doctoral fellows). The projects have connected a dozen CMU faculty members across five Colleges, so far, with 17 PwC professionals, and they have covered the focal areas of study at the Center: Analytics, Cybersecurity, and Safe Cities. Further below, highlight some sample projects funded by the Center. Each of these projects were problems brought to the center by PwC and scope defined through work with CMU faculty and staff administrators.

The Presentation Format and Objectives

Our presentation will address in depth the university/industry partner journey, successes and challenges encountered, best practices derived from experiences, and may include participation of university faculty and/or industry partner via short video interviews or in person appearances.

The presentation will focus on the RiskReg Center as a case study to discuss, among other things, the

following points:

- The structure of the RiskReg Center, including its governance
- Journey of university & industry interactions to create a formal through the RiskReg Center
- Lessons learned in the process, including the important of matching industry partner needs with University needs, Commitment and dedication from both sides, and Leveraging other uUniversity opportunities in addition to the primary focus of research
- Creating an intellectual property and Tech Transfer strategy for an industry partner within the context of University policies/positions;
- Building/setting expectations and goals of partnership for success;
- Defining the value-proposition for the University, including faculty, and the industry partner, respectively, including but not limited to the following:
 - Match-making for industry partner research requests and faculty members' desires for research projects with a focus on interdisciplinary teams/work
 - Creating a diverse research portfolio of foundational and applied research taking into account factors such as project length, research areas, , and available data, and potential project outputs
 - Utilizing Applied Research Projects (similar to Capstones) for a robust student experience while performing work that leads to longer term foundational work
 - Introducing other campus-wide opportunities.
- Defining opportunities outside the research sphere for partnership success, including but not limited to:
 - Creation of Executive Education programs
 - Student recruitment opportunities
 - Exposure to industry partner's client base for potential new industry partnership creation.

Exemplary Research Projects

Example 1: Exploring Privacy and Security Risks in Blockchain Ecosystems

Principal Investigator: Nicolas Christin, Associate Research Professor, CMU School of Computer Science and Engineering and Public Policy

Blockchain technology, which creates a linear, time-stamped, publicly distributed ledger of all transactions within a system, has the potential to facilitate many transactions—for instance, by potentially replacing time-consuming notary operations in asset transfer, or providing an immutable source of transactional or contract data. But despite this potential, there are sizeable cybersecurity, privacy, and service risks and concerns associated with blockchain adoption. This project proposes to explore the adoption landscape beyond its current usage in Bitcoin crypto-currency (i.e., possible applications that have received seed funding or are being proposed), and the specific privacy, cybersecurity, and availability challenges and risks associated with public and private blockchain.

Example 2: Resilience Analysis and Design of IoT-based Smart Infrastructures

Principal Investigators: Bruno Sinopoli, Associate Professor of Electrical and Computer Engineering and Co-Director of CMU's Smart Infrastructure Institute; Anthony Rowe, Associate Professor, CMU Electrical and Computer Department; Yuvraj Agarwal, Assistant Professor, CMU School of Computer Science

In addition to supporting personalized services for humans, the technology underpinning the Internet of

Things (IoT) will also support the operations of cities, power grids, transportation, industry, and other critical physical infrastructure. Embedding widespread sensing, networking, and remote control capabilities into the physical world will increase efficiency and robustness, but also offers the potential for intrusion by malicious agents, disrupting functionality and availability, producing safety concerns, and impacting the confidentiality and integrity of data processed by these systems. With a specific industry focus, this project aims to develop a set of tools and methodologies to analyze IoT safety and security vulnerabilities and outline risk mitigation strategies, with a long term view of designing provable secure-by-construction, privacy-preserving IoT-based systems, and reviewing how the end users of IoT-based systems can establish security, privacy, and resilience from current or future systems that do not inherently incorporate security and privacy within their design. The development of best practices along with advances in technology will provide benefits society-wide, from IoT technology vendors and infrastructure owners to individual citizens.

Example 3: Deriving Enhanced Biometric Information from the Human Voice to Assist Forensic Analysis

Principal Investigator: Rita Singh, Senior Systems Scientist, CMU Language Technologies Institute

According to research published in more than 400 scientific journals representing over 30 scientific fields, the human voice carries a wealth of information, including signatures of the speaker's physical characteristics, physiological parameters, behavioral traits, medical condition, social and sociological background, geographical surroundings at the time of speaking, and objects in the speaker's immediate environment, amongst other things. At present, technologies for extracting and interpreting this information from voice are seriously underdeveloped and often unavailable. This project will address the problem of specifically detecting those physical and physiological parameters that provide cues to fraud, such as stress (which may be indicative of lies, anger, and frustration) and in-vacuo impersonation attempts (detecting an impersonation attempt from an isolated voice recording, without reference to other voice samples from the same speaker). Potential beneficiaries include law enforcement agencies, emergency response agencies, and retail, banking, financial, and other agencies that employ call centers for substantial customer transactions.

Example 4: Community Trust and Sentiment Analysis

Principal Investigator: Jamie Callan, Professor, Heinz College and CMU Language Technology Institute

In most cases there is little objective information about community reaction to specific events involving the police. Information is available from the media and community leaders, but this information can be incomplete, anecdotal, and presented from a particular perspective. This project investigates the use of social media as an alternate channel for obtaining information about the response of the community to events and issues. Trend analysis is used to distinguish between perennial and emerging issues, and sentiment analysis is used to identify the level of community support for the police with respect to different issues. The goal of the project is to provide information that will help the police to identify issues of public mistrust or perception that it may seek to address.