

Highlights

@GT-IDEA

The shifting future



Using change management to adapt to a rapidly evolving workplace



INDIANA UNIVERSITY

BLOOMINGTON

Kelley School of Business

O'Neill School of Public and Environmental Affairs

Luddy School of Informatics, Computing, and Engineering

Welcome note

Colleagues,

During the 2019 Spring Semester, Grant Thornton LLP, a leading professional services firm, gifted Indiana University \$3 million. This gift established the Grant Thornton Institute for Data Exploration for Risk Assessment and Management (GT-IDEA), an interdisciplinary institute that spans across IU Bloomington's Kelley School of Business, the O'Neill School of Public and Environmental Affairs, and the Luddy School of Informatics, Computing, and Engineering.

GT-IDEA is aligned with the core vision of Grant Thornton's Advisory Services' consulting practice, which is driven by technology and data analytics to help businesses achieve long-term sustainability, create value, and solve problems through innovation. Students who participate in the GT-IDEA program gain experience working on real-world industry issues by utilizing data-driven technologies, engaging in case studies and competitions, and benefiting from interactions with established risk assessment and management practitioners from Grant Thornton.

This innovative approach to learning is designed to prepare students to become the next generation of even more effective industry leaders. It has also deepened Grant Thornton's relationship with IU, allowing the firm an opportunity to recruit deserving students who are well-versed in risk assessment and management.

I personally invite you to join this growing and vibrant GT-IDEA community through our various programming events that will help you prepare to be the business leaders of tomorrow. As I transition back into our firm's Advisory Services practice, I'm excited to pass the reigns to my teammate Wade Kruse as the new National Managing Partner of Advisory Services and look forward to following the continued successes of GT-IDEA!

Sincerely,

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Deans welcome notes

The GT-IDEA program brings together three Indiana University professional schools—the Luddy School of Informatics, Computing, and Engineering, the O'Neill School of Public and Environmental Affairs, and the Kelley School of Business—to foster ideas and collaboration across a range of areas and topics such as healthcare, cybersecurity, and customer service. In many of these areas, impact is maximized by evaluating the technical, public, and policy viewpoints collectively. At the Kelley School, our faculty and students are deeply engaged in business applications of digital technologies and data analytics. That is what makes the GT-IDEA program very unique and exciting.

The Luddy School of Informatics, Computing, and Engineering is delighted to participate in the GT-IDEA program. The initiative has afforded faculty from the three partner schools the opportunity to more effectively network, while also allowing students to better collaborate and learn from one another. Through this initiative, we have established a model for applied, cross-disciplinary educational programming enriched through thoughtful industry engagement. While we have established a solid foundation for the partnership, we continue to enhance GT-IDEA through the addition of new programs. As a result, it has become known as one of the most valuable experiences at Indiana University for meaningful engagement with practicing professionals, which has been made possible by the dedication of our colleagues at Grant Thornton.

The GT-IDEA case competitions alone, this past academic year, brought together more than 170 Indiana University students from the O'Neill School of Public and Environmental Affairs, the Kelley School of Business, and the Luddy School of Informatics, Computing, and Engineering. In small teams diversified by school affiliation, students collaborated and consulted mentors from Grant Thornton, along with our faculty scholars, to apply creative, analytical solutions to challenging issues much like those they will face in their professional futures. Feedback from student participants repeatedly centered around the value they saw in remarkably diverse perspectives and approaches to problem-solving among their peers. The benefits of collaboration that they realized, and the impact on their educational and professional growth, perfectly captures the value of GT-IDEA and the vision of our partners at Grant Thornton and our collaborating colleagues on the IU campus.

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What Events Does GT-IDEA Support on Campus?

Since its launch in the spring of 2019, GT-IDEA has actively engaged students from the Kelley School of Business, O'Neill School of Public and Environmental Affairs, and the Luddy School of Informatics, Computing, and Engineering. We've held roundtable discussions, case competitions, data jams, and conferences. GT-IDEA engages faculty from the three schools in various student-facing initiatives, as well as networking events with Grant Thornton business leaders.

Each academic year, there are six roundtable events featuring a business leader from Grant Thornton who engages in a discussion with students from the three schools. Each school hosts one roundtable discussion per semester that provides information relative to the student competitions and additional networking opportunities.

There are also two case competitions and a data jam each academic year. These events encourage students to use an interdisciplinary approach to real-world problems. During the competitions,

students have an opportunity to be mentored by Grant Thornton business leaders, as well as Luddy, Kelley, and O'Neill faculty scholars. Each competition culminates in a conference that explores the competition themes.

Faculty workshops are hosted by the Kelley School of Business in the spring semester each academic year. These provide a great opportunity for Grant Thornton faculty scholars and business leaders to network with each other.

Faculty webinars are hosted twice per year. These webinars allow Grant Thornton and the Luddy, Kelley, and O'Neill faculty to share their research with Grant Thornton in an online and interactive environment.

The coming academic year will be filled with exciting events and opportunities for students, faculty, and Grant Thornton business leaders to connect across disciplines, build relationships, and share expertise. We hope you are looking forward to it as much as we are!





Cross Pollination

A Kelley, Luddy, and O'Neill hybrid immerses students in hands-on learning

During its third year, the relationship between IU and the Grant Thornton Institute continued to offer innovative opportunities for students from the Kelley School of Business, the O'Neill School of Public and Environmental Affairs, and the Luddy School of Informatics, Computing, and Engineering to collaborate in an interdisciplinary real-world situation. Students also had the opportunity to exchange ideas at presentations throughout 2022 during roundtables and case competitions.

New GTI Co-Director Dan Grundmann commented, "As a newcomer to the position, I've been thrilled and fascinated with the influences of the students from the three different schools." The senior lecturer at O'Neill continued, "When you're listening to their cases, you can pick out which student has the business background, which has the policy analysis perspective, and the informatics point-of-view. The students' skillsets distinguish them apart, and yet they come together to create solutions."

The unique partnership between the three schools and a third party like Grant Thornton is one of the first of its kind. By encouraging the students to collaborate with one another, students gain real-world experience while expanding their personal networks. In fact, the idea to create the institute was inspired by a recent IU alumnus.

Luddy Dean Travis Brown says, "I am frequently asked about GT-IDEA by other administrators working to emulate the success of the cross-school partnership. One of the critical elements has been our shared governance, as well as how we collectively recruit student participants from our respective schools. We have remained agile when working to develop programming which ensures that the partnership remains strong through providing value to all of the students and faculty involved. Our overarching goal was to get students and faculty working together across the three schools, and the initiative has proven especially effective in that regard. GT-IDEA has become known as an exemplar of industry engagement at Indiana University."

Now that case competitions are woven into the fabric of each school's opportunities, students seek them out. That said, one of the most successful case competitions to date took place during the summer of 2020 in the heat of the pandemic. The summer competition was meant to make up for the canceled spring competition. The sort of "pop-up" competition caught the attention of more than 80 participating students, who seemed grateful for the opportunity to connect, albeit virtually, with classmates.

To get students working together and speak so highly of it is really an accomplishment," Grundmann says.



Cybersecurity in the Future: The Realities of the Future Societal Defense Scape

FACULTY RESEARCH WEBINAR



April 30, 2021

Presented by:

Diane Henshel is an associate professor at the Paul O'Neill School of Public and Environmental Affairs. Her areas of interest include ecological and human health effects of pollutants and chemicals, holistic and cumulative ecosystem human health, as well as cyber security risk assessments.

The biggest problem with cybersecurity is that it always trails where we need to be. With our increasing reliance on cyber systems, we are getting ourselves deeper and deeper into a situation where we are going to be more and more vulnerable, not just to the hackers, but to climate changes.

All industry and most major institutions start with the National Institute of Standards and Technology (NIST) framework as a way of evaluating where their risks and their vulnerabilities are. They use NIST to identify where they need to improve their security, increase their defenses, and be more active. Hopefully they are also able to identify what training needs to be done for their human users, which sometimes happens and sometimes doesn't—and sometimes happens *effectively* and sometimes doesn't.

One of the problems with the NIST framework is that it's such a long process that it's only done periodically. Ideally, it's done every year or every couple of years, but there are a fair number of institutions that don't even do it that much. It's a framework that is not dynamic—it's a go-through-the-process-to-assess-your-situation framework. And the framework does not really address most of the problems of cyberspace. It addresses what's going on specifically in an individual organization and what an individual group of IT managers are having to confront or address. But it doesn't address humans very well, and it certainly doesn't address the realities of our cyberspace, which are not, as you know, isolated little universes all by themselves that you can protect. They are all interacting universes.

Additionally, there is very little thought about what's happening with climate change and how that could be impacting institutions, as well as how cyber could be impacting climate change—it goes in both directions. One of the biggest problems that we have in cyberspace is that we protect from an individual organization perspective—and, when you consider the electrical grid, from a joint organization perspective—but nobody has started to address the problem that we aren't a single, isolated network; everybody is connected. There are all these different types of defenses happening in different places, which by itself is a problem. The

weakest link in any single place that you're connected to introduces vulnerabilities, no matter how protected you are.

We're all using satellites more and more right now. And important satellite information is beamed through the air, which can be captured, or the satellites themselves can be hacked. When you talk to the army about it, they believe it is protected because they have seven layers of firewalls. When you remind them that if somebody can get through one layer of firewall, they can get through seven, even if it takes a little bit longer, and the army just looks at you blankly. Most "protected" satellites are not really protected against advanced persistent threats that are well-funded and supported by multiple states, such as Russia, China, Iran, and North Korea, which has an increasingly capable army of hackers. The United States is not the only hacking-capable government, and we are indeed targets. It's also not only the government being targeted, but also industry, academia, and even individuals—if an individual can give them access to something that somebody wants.

Cyberspace is never going to be well protected if we don't recognize the complex set of networks that are working together. Within an organization, someone may walk in with a watch that's connected to their cell phone that can connect to the intranet of that of that organization, for example. If the watch is compromised, so is the cell phone, and so is the organization. There are compromises on a regular basis and there is always a weak link. We have this very inconsistent protection among all the connected networks within the greater society.

Humans are a weak link

The most important weak link is, of course, humans. We are defenders, we are users, we are hackers, and we are importantly, unfortunately, human. Even the best-trained, most careful person makes mistakes. Most people are not well trained or careful. All people are—at some time—not careful because they're tired, they're overworked, or they're stressed. Until humans are appropriately incorporated into the assessment, evaluation, and management of risk more effectively, we will never be fully protected in our

network. And our advanced, persistent threats know that. They're skilled at working with systems and people—they're getting very good at social engineering. They can be very patient. There's good evidence of their plotting and persistence over months.

The NIST framework doesn't take human vulnerabilities into account very effectively, so if managers are relying upon NIST to try to make sure that their networks are effectively protected, they're never going to be properly paying attention to it. So, we need to be modeling, evaluating, and managing the human aspects of cyber risk far more than we are. We need to be managing it not just for the human users but for the IT managers who are overloaded—when they are under stress, their perception capabilities and ability to detect changes decrease, so things can get by them.

There are also cultural differences between human attackers in terms of their approach. Knowing what those are can help protect against different kinds of incursions. If people are trained to focus on hardware and software patterns, they are not necessarily good at paying attention to the human side of the issue. Understanding how a user might misuse their network or introduce vulnerabilities often follows after mistakes have been made and the networks have been attacked. It's not a good thing to break your leg before you know how to walk along the path.

It is also difficult for people to think about patterns that are present over an extended timeframe. We don't yet have a very good way of assessing the changes that advanced persistent threats present. There's so much information that has to be bound together and very few organizations have the kind of resources, bandwidth, and memory to devote to pulling in all that information and constantly running machine learning on it.

Interfaces are vulnerabilities

One of the biggest problems that is being completely neglected in almost everything is the fact that interfaces are always a point of vulnerability. There are interfaces between types of tech and those interfaces introduce vulnerabilities. When you're trying to protect with different types of tech, you're focused on your own type, not on that interface, and it's a good place for a malicious person to insert a change to alter something.

If you look at two nerve cells, there's an awful lot of biological interruption of information between the two nerves. This is an example of what can happen



in cyber systems as well. There is a place between in which the information has to be converted, and then there's interpretation on the other side. It is very much that point of interface that's hard to monitor and hard to track. An easy example of this kind of problem is a "man in the middle" attack, where they go into the junction between the two points of interface. When you're dealing with different kinds of tech such as IoT systems—which have very small bandwidth and very little memory—they really can't have complex AI type of protection on them. The kind of information that they can relay would not necessarily be the kind of information that the server needs to see to fully protect that IoT entrance into the network.

Since interfaces are always a problem, one of the things that we've been doing is focusing more on machine learning. Unfortunately, it's a new toy and there's an overreliance on new shiny things until we figure out why they're not so shiny and where the varnish is tarnishing. Machine learning is extremely easy to follow, but it is only as good as the best of the training sets, and that assumes a system that is not dynamic. When it assumes a system that is static, we know that's not reality.

As the landscape changes from the perspective of what's put into the system, how people are using the system, and the new applications that are introduced, the attackers are always learning. Machine learning is very bad at identifying zero-day attacks. There are few new attempts to do better on zero-day attacks—most of them are claiming they can do things I find hard to believe, but we'll see!

Understanding how a user might misuse their network or introduce vulnerabilities often follows after mistakes have been made and the networks have been attacked.

It's not a good thing to break your leg before you know how to walk along the path.

Taking machine learning to a dynamic situation is another step up that is called autonomous intelligent defense systems. These are theoretically self-learning, so there's a fair amount of neural network-based training, but, as I've mentioned, we have very different kinds of systems that they have to be installed on. A big server-based system may have a well-supported, AI type of dynamic defender, but the small inputs into it—the sensors, for example—are not going to have that kind of capability. We can't assume that we're as good as the best of our AI systems. We can only assume that we're as good as the worst of them, especially because we keep adding more things to every network. There is complexity built into every subnetwork and subsystem, and that's very difficult for the autonomous intelligent agents to work with. Meanwhile, we still have that same problem between the autonomous agents of these interfaces. The work on autonomous agents has, so far, been insular within a given system. I haven't seen a single paper that's even started to look at the interface, especially when there are major differences between the capabilities of what's being interfaced.

And second, there is already hacking at interfaces between systems, and this is just getting worse. We have a huge amount of technology being implemented into smart cities to help, say, make them more sustainable. New automation helps people get around easier which benefits people that are disabled or elderly or make cities so much safer. We all know the mantra about why smart cities are so great, except they are also introducing a huge terrorist potential that people are beginning to recognize, but not really address at this point.

We have an amazing tendency as humans to look at the new tech and say, "let's see what we can do with it" and then implement it before we fully understand what the vulnerabilities are. When we implement new tech that provides access to a huge amount of information, we introduce a huge number of vulnerabilities into whatever is connected to it. Even if you considered the systems by themselves—smart cars on the transportation grid, for example—we're promulgating all these smart cars as people have talked about the problem that the grid is potentially hackable. This introduces vulnerabilities for actual hijacking for people,

and people recognize it, but there isn't very much being done about it. Instead, there's more work on building out the transportation grid and getting more autonomous cars out there. They are much more worried about whether or not they're going to run over people than whether or not somebody is going to be hijacked.

Technology and climate change

As we do more with smart cities, everything is going cyber and therefore being hooked up to the network—the bigger Internet. The point of it is to make it easier to control, easier to manipulate from a distance. It's great if there's a storm and nobody wants to be out in it and something needs to be done in a building. However, that technology is invariably introduced before the proper protections are on it.

When the National Guard was working with water systems across Indiana, they worked across large and small water systems. The biggest water systems were already partially computer controlled, and the smallest water systems had a tendency not to be—they were mostly offline when it came down to valves and stuff like that. That's not true anymore. That was only five years ago in 2016. Now most of the small water systems are being converted to online systems. It's amazing when you look at the American Water Power Association and what they've been doing—the whole point is to be able to protect water systems and manage them more effectively. But the protections just are not there.

The electrical grid still has large numbers of old servers that are built on common business oriented language (COBOL). They've recognized that they have to switch over, but every time they begin to switch a system, it's exceedingly expensive. So there are still electrical companies that are hooked into the grid that are using servers that are piecemeal-managed. COBOL, which stopped being taught in the 1970s or 1980s, is starting to be taught again as the problems with these historic systems are recognized.

Climate change is one of the reasons we are moving towards more tech. It helps reduce energy use; it helps protect water use—it truly improves our sustainability. But it's not very well defended and least defended of all are the interfaces between them. It introduces hacker

vulnerability, including terrorist potential. There was a water system in the south that was hacked recently. They weren't sure who did the hacking, but it was clearly an attempt see how they could manage water systems.

I will offer you two different examples of the potential for terrorism. New York City's water supply runs through pipes from the reservoirs in upstate New York to downstate New York. These pipes are accessible through valves that are out in the middle of nowhere that somebody could get into and put poison in. That's been acknowledged and they say they are monitoring it. If somebody wanted to kill off everyone in a high value building, do you know how easy it is? Air intake valves are right at the edge of buildings, they're rarely checked, and you can very easily put in a volatile poison and poison the whole building with no problem whatsoever. It completely freaks me out honestly. I brought it up at an EPA discussion several years ago, and when I mentioned it, they said "I guess that's an issue we have to deal with."

Another aspect of climate change is that it has introduced more variable weather. We haven't been prepared for some of these changes. Hurricane Sandy swamped out a whole bunch of major servers—and I do mean major—these servers fed buildings down on Wall Street. That was theoretically never supposed to happen and I think by now they have moved the servers out of the basements. But no one has double-thought through all the places that are vulnerable to the climate change impacts. It's not a holistic analysis yet and that's a problem.

We are not ready for what's happening today. We will always be more vulnerable to the advanced persistent threats because they already understand the current technology and they're thinking ahead of us. Unless we start thinking ahead about protections, before we implement systems, we will be left constantly vulnerable. Furthermore, industry and end users really must be incorporated into overall governance, not just getting feedback on the back end. There needs to be more integrated analysis and evaluation and implementation, and it needs to be integrated across not just within one government but across all governments, globally, because the Internet is global.

Community Preparedness for Extreme Heat

FACULTY RESEARCH WEBINAR



April 30, 2021

Presented by:

Dana Habeeb is an assistant professor in the Luddy School of Informatics, Computing and Engineering. She is trained as an architect and urban designer, which informs some of her research areas, including human computer interaction and design, proactive health, animal informatics and computer interaction, proactive health informatics and sustainability, and technology.

Most people don't realize that more people in the United States die of extreme heat than all other national disasters combined. We can see this, for example, in heat waves in Chicago and California. But there have been more intense heat waves, such as the heat waves in Europe in 2003 and Russia in 2010 in which tens of thousands of people lost their lives. These two heat waves rank among the deadliest natural disasters on record, and really illustrate the importance extreme heat plays for public health.

We see that cities are particularly vulnerable to extreme heat because of what's known as the urban heat island effect (UHI). The UHI effect is when we see higher temperatures in a city than surrounding rural areas. This temperature differential is due to the way we design and build our cities and displace natural vegetation with impervious surfaces such as buildings, roads, and parking lots. All of that elevates our temperatures in cities.

Not only do we see a temperature differential between cities and rural areas, but we also see that temperatures vary dramatically within cities. This means we need to deal with microclimate effects that we see with cities, depending on how we're designing our neighborhoods. These topologies are called local climate zones, which urban climatologists are using to better depict temperature variations in cities. As an example of these microclimates, I used some sensors in different parts of the Indiana University campus. When we look at a hot day in September and look at the temperature in the Luddy parking lot (96° F), then the temperature in Dunn Woods (87° F), even though the sensors are close together, we still see upwards of around nine degrees difference between these two locations.

Not only do we see that cities are consistently hotter than the rural areas across the United States, but we also see that cities are increasing at a faster rate than the planet. Temperatures in cities are outpacing the effects that we're seeing from global climate change. All of this makes our communities more vulnerable to extreme heat, as well as the fact that cities are experiencing more trends in heat waves.

I've tracked heat wave trends in large U.S. cities across many decades. And I've looked at the trends regarding their frequency, duration, season, and intensity. These trends are increasing across all

four of these different categories across the United States. But when we look at cities specifically, we want to try to identify cities that were vulnerable to extreme heat, and so we identified cities with trends above the national average and at least two of these heat wave characteristics. We didn't find these vulnerable cities clustered in specific regions of the United States—they are spread throughout the country. Cities that might not consider themselves hot popped up as vulnerable, such as Portland and San Francisco.

Cities really need to be planning for heat even though they might not think they're vulnerable to it. San Francisco has the fastest heatwave season trend in the United States. We started our analysis in the middle of June, and by the end of the analysis, the heat wave season had changed by more than a month and a half—heatwaves were starting at the beginning of June/end of May. It is important for cities to be able to tease out their risk levels to extreme heat.

Since doing this work and publishing it, I've worked with the Environmental Protection Agency to turn this into a climate change indicator for the U.S. It is now one of 16 climate change indicators that are being used by the U.S. Global Change Research Program to help communities be able to assess and better understand their risk level. Our climate is changing and we are becoming more vulnerable. The past seven years are the hottest years on record, with 2020 and 2016 tied for the hottest year ever on record from start to finish.

Cities can prepare better emergency response plans. We find that cities are often ill-prepared to respond to extreme heat. They can look at their staffing and their infrastructure resilience because infrastructure such as roads and railroad lines fail during times of extreme heat. They can also increase other types of infrastructure for communities, such as cooling centers. Extreme heat is known as a silent killer, so it's important to educate and make the public aware of the risks.

Cities can also manage their ambient heat. Some of the research that we did looks at climate action plans for different cities across the United States, which showed that nine out of 10 U.S. cities were pursuing policies to reduce greenhouse gases, but only one in eight were pursuing policies to manage ambient heat. Basically, managing ambient heat is dealing with and trying to mitigate the UHI effect.



Smart cities and environmental sensing

We see a movement with smart cities to put ubiquitous, low-cost sensors in our built environment. We're seeing this with regard to mapping environmental exposures as well. Why should we use sensors for extreme heat? As I've mentioned, temperatures can vary dramatically within our cities, but they often only have one meteorological station to represent the temperature. That's not an effective way to represent the heterogeneity of temperature we see in our urban environments.

Urban climatologists often use satellite data to look at temperature, but satellite data has limitations with regard to spatial and temporal resolution, as well as the fact that it looks at skin temperature and not near-surface air temperature. It is really that two meter, near-surface air temperature that we associate with negative health effects. So, we're seeing a movement across campuses and cities where they create these sensor networks to look at heat exposures. One of the most extensive ones is the Chicago "Array of Things." They are planning to install hundreds of these modules throughout Chicago, and those sensors will capture more than just environmental data, such as air quality and temperature data—they will also capture video and sound. This data is publicly available, and they just released it this past year.

So, I'm starting to deploy some environmental sensors here on the IU campus that look specifically at temperature and relative humidity to really track how temperatures are changing in our built environment. I've also put some of the sensors out into community gardens and more agricultural spaces to capture not just relative humidity, but also look at soil moisture and the role that plays in surface air temperatures.

So, we're working with this data to look at where we can identify changes in extreme heat and areas that are experiencing more heatwaves than others, but also at how we can visualize and better explain this data. We're trying to show the difference between the locations of the data, as well as diurnal temperatures with regard to maximum/minimum temperatures, which are important

for communities to understand, as well as the risk level during different times of day for a community.

This project is being funded by the National Science Foundation. I'm looking at both in-situ sensors and on-body sensors to look at exposure levels in the built environment. I've been really interested to look at whether we can put sensors on our bodies to look at heat exposures. I'm really interested in validating the sensors. These sensors are being used extensively, and I've been curious to see how well they function. We're looking at heat exposures rather than personal heat response. Personal heat responses target and try to understand how well our body is responding during times of extreme heat, versus our exposure levels.

For our wearable studies, we surveyed the ways people are looking at this in the literature in the research field to find out what common sensors are being used and where they're being worn on the body. We identified a series of sensors and placed them on different spots on our body, then walked around campus and did an assessment co-locating these with our in-situ sensors. What we found was that these sensors didn't perform as well as we would have hoped, specifically in areas of high impervious surface or in direct sunlight. The sensors that are most often used in the research aren't really designed to be worn, so they're not functioning as well as we need them to during times of extreme heat exposure. We found that when the sensors are in full sun, such as the parking lot of Luddy, they tend to overheat.

This is an important discussion regarding wearable sensing technology. We must understand the validity of our sensors to understand what types of data that we're collecting, and to make sure we're not putting noise into the system. We must understand the systems that we're creating.

With the sensor network, I'm interested in looking at not only the urban climatology effects of UHIs, but also how we can create new long-term outcomes by creating sensor networks. We can look at better understanding our green infrastructure performance: how we can tie it to smart irrigation or water harvesting and how this can be integrated better into emergency response plans. Currently, we are questioning how temperatures vary in the urban environment and how we can map these urban temperatures to give real-time, hyperlocal temperature data to people as they move through the built environment. So, when you're walking and you check the temperature, it is not just taking the meteorological station that

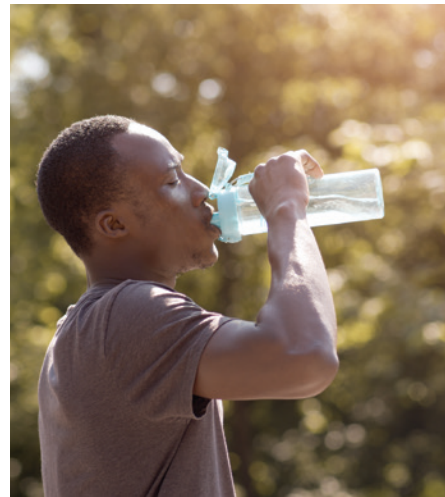
could be miles away, but it also represents the exposure level right where you are standing. We're mapping the built environment through machine learning, and classifying the built environment based on different types of local climate zone classifications. We are using high-resolution morphological variables to better understand how temperatures are changing.

We are also looking at outdoor temperatures and local temperatures in the built environment to understand how that impacts building energy use. So, using both a tree canopy assessment that campus has conducted during two different time periods, and looking at high-resolution building energy data, we're trying to tease out how the local built environment variables can impact building energy use. How does energy demand change if we put a building in the middle of a parking lot versus in a forested area, for example? We're mapping these local scales and micro-scales to see if we can tease out important features. Some of those important features include a larger scale area—how much grass is surrounding the building has an impact.

Community preparedness

It's important for communities to plan for local climate change. We now have over 190 cities around the U.S. with freely available data accessible, and a methodology to track their extreme heat changes and exposures. When we're thinking about our own risk level, it's important to understand changes at both the local and regional scale. We're also working with IU's Prepared for Environmental Change Grand Challenge initiative on how we can give better data to communities so they plan for climate change, and specifically for extreme heat. I've been working with our Urban Green Infrastructure team to map green infrastructure in our communities. We just released a data platform so that communities and residents and important stakeholders can access high-resolution data that looks at climate change, the local climate zones that we've been mapping, as well as very detailed green infrastructure.

I'm leading a project with the Environmental Resilience Institute called the Beat the Heat program for local governments in Indiana. We're working with two communities to help target specific extreme heat emergency response plans. We will be looking at historical health and extreme heat data to better understand risk levels, educate these communities about extreme heat, and help them develop targeted policies that they can implement to help protect themselves, and especially their most vulnerable populations.



Currently, we are questioning how temperatures vary in the urban environment and how we can map these urban temperatures to give real-time, hyperlocal temperature data to people as they move through the built environment.

There are three main design strategies that cities can use. One is Albedo strategies, which is when we change the reflectivity of the surface of the built environment. A couple of examples include Austin, which has cool roof strategies, or Los Angeles, which has an aggressive cool streets/paving strategy. Some are also looking at waste heat strategies, which bring in energy efficiencies.

Cities can also invest in vegetative strategies, which have been shown to reduce the UHI effect by up to 50 percent in areas with sufficient rainfall. Chicago's very aggressive green roof policies trade out and increase floor area ratios for different developers. Large cities like New York and Los Angeles have extensive tree planting campaigns, where they plant over a million trees to manage and take care of their urban canopy, which is extremely important for community resilience during times of extreme heat.

Vulnerable populations

It's important to understand who is vulnerable to extreme heat and to be able to identify our vulnerable populations. The very old and the very young are very vulnerable. We also see that athletes have been identified as needing to be targeted for extreme heat vulnerabilities.

Age, income, and isolation are important variables for vulnerability. The fact that the very old can often be isolated reduces their ability to respond during times of heat—community involvement and programs have been shown to be very effective there. Access to air conditioning is one of the most important aspects that impacts individuals with regard to income. Individuals with preexisting conditions, such as diabetes, cardiovascular disease, and respiratory disease, are also more vulnerable to extreme heat.

Exposures of extreme heat vary dramatically within a city, so it's important for cities to be able understand where exposures are high. This is strongly correlated with the number of impervious surfaces or lack of green space in communities, as well as the type of housing that people have. A lack of transportation can increase one's daily exposures to extreme heat. I really like this quote, from Arnob Chakraborty, a researcher in Illinois, which says "We need to better understand where the most vulnerable people are in order to get to them quickly and to reduce their vulnerability over time through planning."

Materiality & Social Considerations

KEYNOTE SPEAKER,
O'NEILL CASE
COMPETITION



September 24, 2021

Presented by:

Mark Lemon, Grant Thornton
Senior Manager, ESG &
Sustainability

I grew up in Greencastle, Indiana, about 45 miles north of here, where my dad is a professor at DePauw University and I played on the high school soccer team. I went to Kenyon College for my undergrad degree and studied political science with a concentration in environmental studies. There's where I became interested in environmental issues, particularly environmental politics and began working for a long list of environmental and social causes, including the Aspen Center for Environmental Studies and the Connecticut Public Interest Research Group.

I did that for three years, but then I really started thinking in terms of my career, and began looking into schools with an environmental policy program. Having been from Indiana, the O'Neill School of Public and Environmental Affairs was a very obvious place, and I spent two fantastic years in Bloomington at IU. I also had a research fellowship working for the city of Bloomington's Environmental Commission, where I was able to do the greenhouse gas inventories of the city. That experience is still very relevant to what I'm doing now.

While I was in my second year here, in fall of 2008, the economy was in absolute freefall—we were in the midst of an economic crash. I took the opinion that when anyone was recruiting on campus, I should definitely put my resume and interview for jobs. When Grant Thornton (GT) came through, I submitted my resume, but saw tax audit advisory and thought "hmm... boy, I took the one required public finance class." I sat down with the GT partner, and told him, "you sound like a great company, I just want to put out there I'm not an auditor. He said "we're looking for smart, capable people that can solve problems. What are you doing at SPEA?" We ended up talking about the research that I had done for the city, which obviously resulted in a job in a couple of years, and I'm still there. I've had opportunities to look further into things that I'm interested in, and build my skill set, so I just wanted to put out a little bit of a plug for you to put yourself out there. Leaders are very interested in empowering smart people who are capable of solving problems. That's really at the foundation of what consulting is.

Corporate Social Responsibility

Grant Thornton is a pretty large firm, but we haven't necessarily been as mature in ESG as a lot

of other companies historically. There are things that the firm has done well for a long period of time, including pretty significant community involvement. But over the last few years, a lot of companies are coming to the realization that ESG is not going away. In our annual reports, we've been publicly disseminating information, and then really getting into materiality, which is where a lot of companies struggle because there are so many different reporting frameworks and standards. What we advise clients on and also decided to do internally is to really focus in on key foundational areas, such as financial risk (material EFG issues), data security, and workforce diversity and engagement. Over the last couple of years, we've identified a couple more areas based on who our stakeholders are and what is actually important to our business—specifically, digital innovation and transformation. Every company is different, so every company's ESG journey is different and you need to make sure that you're taking into consideration what's truly important for your company or organization and making sure that ESG makes sense to whatever the community is.

With that as background, our core values and purpose are to make business more personal—our North Star is to take care of our people, to be there for our clients, and keep our firms strong. The environmental piece plays into this. In every survey you look at, 86% of millennials consider looking at a company's ESG profile as they consider where they want to work.

The reason we first got into greenhouse gas reporting is because we have clients who have large, sophisticated supply chains and we were in that supply chain and they said, "We need you to report your greenhouse gas emissions, because you're in our supply chain and we want to have an accurate understanding of that." And the second reason was just keeping our firm strong. We are a for-profit enterprise that advises companies on things that are important to them and drives results for their businesses—that's how we continue to build work. GT has identified ESG as something that we need to be not only doing internally but we need to be advising clients on. We started taking stock and decided that pushing our environmental programs was important to us as a firm.

In 2010, we had our first client request and we actually outsourced that work, but we started



there. By 2014, we started seeing more clients asking about how to disclose carbon emissions. At that point we also hired a corporate social responsibility director and an associate director of community involvement. The firm was really starting to put some resources into this. When that director was hired, I immediately emailed them and said, "Hey, we're reporting data that's four years old. Can we update that?" They said, "sounds like a great idea—put something together."

We went through the process of conducting an internal inventory in 2015, which we disseminated internally, but the challenge we have is that we don't own any of our office space, so we have to get energy consumption data from our landlords. I could only get about two thirds compliance, which was frustrating but learning how to do it was a great experience. By 2019, the list of clients who want this service was getting much longer, including a significant client that told that they needed to have active participation in Corporate Social Responsibility (CSR) activity. My second biggest goal was to hire an external firm to help think through visioning and planning. We published our first full Corporate Social Responsibility report, which I would say was fairly limited and fairly specific. But then we made the commitment that we need to be doing this.

I think the real sea change was in 2020, when we hired a new Chief Compliance Officer. We began to look at the disclosure process more closely and ask "How is this integrated in your SEC briefings, and who is approving them? Can you actually

prove that this is integrated in your decision-making or not?" to try and prove that ESG is part of C-suite decision making. We did go through a full greenhouse gas report and issued a 2020 CSR report that was actually a pretty drastic improvement on the 2019 version.

At the same time, our client required that we set an emissions reduction target. So now, not only are we having to disclose the CDP to reduce it 55% by 2030, but it's also going to start being a consideration for our business. In 2021, we publicly committed to that 55% emission reduction by 2030. As part of that, we've developed strategies to reduce travel and office energy consumption. We have new travel policies coming out, and we are talking about reducing our office footprint by 20% in the next two years through renewable energy credits and having more efficiency in our offices. We are going to be a lot firmer about entering into any lease that doesn't give us control over lighting. So, we're committed to the target and starting to execute strategies. And here in 2021, we've just signed on to net zero financial services provider commitment, which is a big deal.

We're not a particularly significant carbon intensive industry, but we've worked with a lot of companies that are. And a part of this commitment contains some fairly specific language about advising the companies that you work with to make smarter decisions relating to an ESG climate focus. It's a really exciting development that I'm hoping will be transformative.

2010

Outsourced first ESG client request

2014

Saw more clients asking how to disclose carbon emissions; hired a corporate social responsibility director and an associate director of community involvement

2015

Conducted an internal inventory

2019

Published first full Corporate Social Responsibility report

2020

Hired a Chief Compliance Officer

2021

Committed to being a net zero financial services provider

2030

Goal to reduce emissions 55%

Focus on Delivering Distinctive Client Service

ROUNDTABLE

October 6, 2021

Presented by:



Mark Lemon, Grant Thornton Senior Manager, ESG & Sustainability



Anthony Pember, Grant Thornton Managing Director

Mark Lemon: We're going to focus on delivering distinctive client service. At Grant Thornton we try to make sure that we're focused on creating solutions for clients to make sure they meet their needs. Every industry, and every entity, operates differently and has unique challenges and unique missions, so we really want to home in on what those challenges are and create solutions that meet them.

We'll start off by talking about what we do and how we got here. I'll talk about our ESG sustainability group and how we work with clients and then Anthony will talk about finance transformation and the plethora of work he's done in that field.

I'm a 2009 MPA from the O'Neill School of Public and Environmental Affairs. I grew up in Greencastle, Indiana up the road—my dad is a professor at DePauw University. I went to undergrad at Kenyon College in Gambier, Ohio, where I studied political science with a concentration in environmental studies. I got really interested in both American politics and environmental issues—particularly the ways the government was or was not helping further environmental awareness and environmental stewardship.

After Kenyon, I worked for a pretty long list of environmental and not-for-profit organizations for three years, really trying to focus on policy implementation. I spent a summer at The Aspen Center for Environmental Studies leading interpretive nature hikes, which I would strongly encourage if you are looking for a cool internship. Towards the end of my work with environmental advocacy, I really felt like a lot of the arguments that we were making about the need to reduce mercury emissions from power plants—particularly when we were talking to members of Congress or our local rep—weren't met with a lot of substance.

So, I became drawn to the MPA curriculum, and my attention was drawn here because it was number one and I still had an Indiana driver's license, so I had in-state tuition opportunities. I spent two awesome years at the school doing the environmental policy natural resource management program and policy analysis. For those of you who know the MPA curriculum, I chose to focus on macroeconomic policy implementation and the quantitative lens of the policy analysis curriculum—evaluating how things are implemented and the most efficient way to do it.

That led me to my career. I graduated in 2009, so I was looking for jobs in 2008 when the economy was in absolute freefall. I took the strategy of if anyone was on campus and interviewing, I was going. I thought that was the responsible thing to do. Grant Thornton came to campus, so I put in my application and got an interview spot, which I found out later was fairly competitive. Then I realized I didn't know what Grant Thornton was, so I quickly Googled it. I learned that it's a tax audit advisory, so I sat down in my interview and said, "hey I took the public finance classes required for the MPA, but I'm an environmental policy person." The partner that I was interviewing with said "we're looking for smart people that can solve problems, let's talk about what you've done." It obviously went well. I was offered a job, took the job and have been at Grant Thornton for 12 years. I've progressed from an on-campus hire to senior manager in the Environment, Social Governance, and Sustainability (ESG) group.

Anthony Pember: I'm originally from Canberra, Australia—the Federal Capital for those that don't know—lots of politics, just like Washington DC, just smaller. My father works for the United Nations, so at a young age I moved to Africa where I lived in Malawi for about three years, Botswana for a couple of years, Ethiopia for a few years, then I finished high school in England.

In college, I ended up going back to the Australian National University in Canberra. These days I'm working in a financial transformation role, yet I graduated in organic chemistry. When you try and work out how someone in organic chemistry ends up in finance, it's funny. Between high school and college, I started off at a company called St. George, which is a large bank in Australia. I decided to see what it was like working in a real job before I started college. I decided not to go with that bank career, but they offered to send me to college part time. After that I started working for Sterling Health and Plough—some large pharmaceutical companies. I did a whole lot of different things—working in statistics, manufacturing marketing—I did all of it.

Then around 2000, someone said they were looking for someone to do "activity-based costing" work. No one comes out of college with career aspirations in activity-based costing, but they basically said, "we're looking for someone

who can solve problems." So, I was going for this job no one had even heard of, but I said, "I'll try it out." So, I completely changed careers and started doing consulting and working in an advisory role.

I started working with this company called Pilbara Group, and we were doing costing work for the Department of Defense in Australia, then we put in a bid for the US Navy. This is a small Australian company, so I told my wife we could go work in America if we won this bid but thought we were never going to win. Six months later, I was told "remember that thing in America? We need you to be there in two weeks." So, my wife and I packed the kids up and traveled to Jacksonville Florida, where six months turned into nine months, which turned into setting up the company here in the states. I was CEO of that company for many years—it was a software consulting company. Then we moved my family and the business up to Virginia and I began working for Grant Thornton in 2014.

At Grant Thornton, I do quality cost performance—cost and performance management. It's trying to take what things cost and then compare it to how you perform and try and look at things like return on investment.

So why do I do consulting? It's a challenge. Every client is different, and it's good working with a team. As we work with clients and with our internal teams, each problem is unique and is enjoyable to solve. At the end of the day, we've done something useful and provided value to the client.

Mark Lemon: So, let's get back to distinctive client services and our roles and Grant Thornton. As I mentioned, I'm in our sustainability and ESG group. ESG has become a mega topic for corporations and our government, but also on the global stage. It includes a lot of action around climate change, with the other forefront issues being diversity, equity, and inclusion, which gained momentum after George Floyd's murder. At Grant Thornton, I've spent several years working with Anthony on activity-based costing, while keeping my foot in the environmental door, doing environmental policy and natural resource management, including our CDP—Carbon

Disclosure Project—reporting. I review Grant Thornton's environmental footprint annually. We have production targets, and we track progress against those targets.

We've realized there's a need for companies to understand what ESG is, what it means to their business, and what to do about it. Several companies have done a lot of really great work on sustainability, including big name-brand corporations: Microsoft is committed to be carbon negative, Coca Cola has a strong carbon program. A number of these larger companies that have the resources to invest see climate risk as a real risk of business, so they're not going to invest in companies with significant climate risk. The Fortune 500s and 100s of the world have been early actors. Where Grant Thornton operates is helping what we would consider the middle market—companies that don't have the resources of a Microsoft—figure out what ESG means to them.

There are three buckets that we use in our work with companies. The first one is just navigating the landscape—helping them understand all the reporting frameworks, like the Global Reporting Initiative (GRI). It can seem so daunting to look at the GRI reporting framework. It's hundreds of pages long and there are scores of things that you can disclose. Mid-sized companies aren't sure they have the resources to handle that or don't know how to get started. That bucket is what we call a materiality assessment, which is a six- to eight-week engagement during which we sit down with their stakeholders, so we understand who those groups are—employees, customers, investors? Then we work to understand what the material issues are for each of those groups. The things that come up are generally climate issues, social issues, or governance issues. We help them cut through the noise to understand the top 3-5 things that they should act on right now instead of trying to address everything at once. We focus on the things that are a) important to the business and b) going to move the needle. That's what I spend over 90 percent of my time on right now.

Once you know what your important issues are, the second bucket is understanding the company's footprint and how to report on it (continuing with the carbon example). Grant

Thornton has a strong background as a tax audit advisory consulting firm. For 100 years, we've helped companies with financial reporting and financial diligence. We take those practical skill sets and move them into ESG—how to disclose the CDP, how to issue an annual sustainability report, how to make sure that the stakeholder groups are getting information in the way that they need it. For example, if Black Rock owns 11 percent of the company, we need to make sure that we are accurately dealing with our climate risk and have a plan to address it.

The third bucket taps into my background with policy analysis at the O'Neill—now that you understand your footprint, what is material to you, and what your baseline is, what do you do about it? Right now, everyone is committing to net zero. The Intergovernmental Panel on Climate Change (IPCC) has said that by 2050, at a global level, we need to be sequestering as much carbon as we are emitting, or reducing carbon emissions beyond that, ideally. If you're an oil and gas company, you're very carbon-intensive by definition, so how do you offset carbon emissions between now and 2050? Can we invest in renewable energy technology? What is the optimal way for a company without endless dollars to spend to do that?

The overarching solution that we have is tax audit advice, so we're providing assurance for all the information that's being disseminated. The way that the market has evolved is that 10 years ago or so, a lot of companies began putting out metrics on various ESG topics, but the questions that rightfully started being asked were "how did you come up with this number—do you have an intern with an excel spreadsheet that's cranking this stuff out or are you following the appropriate standards? How are you reporting? How are you collecting the information or calculating your emissions?" We're making sure that all of that is in the report in a consistent, transparent way so that stakeholder groups have assurance that the numbers are accurate.

Every company's journey is different, so I do our CDP reporting. As industries go, professional services like Grant Thornton's are not particularly carbon intensive. Our emissions are primarily from business travel

Every single one of these clients and the clients within these groups has a slightly different problem we need to solve.



and running the electricity, heating, and cooling in our office. As a company, we are looking at reducing our business travel or being smarter about our resources. Can we start being smarter and more intentional about renewable energy credits? For all the problems that COVID has caused it has opened our eyes to the fact that we can do business remotely. We have several folks from our team that are observing us from the computer, in the office and elsewhere.

Anthony Pember: I'll say more about what I do, which is custom performance management and cost budget management. I work out of our financial transformation business advisory area in the public sector, providing what we call "solution offerings." We have several things that we bundled together in custom budget management, which is broken into three main groups: cost management, revenue management (which may seem a little odd when we're talking public sector but it's still relevant), and strategic project management.

All organizations have a budget, and when you're in the federal government there's a very complex budget process. It's very regimented—not just in their processes, but also the technologies they use. We try and improve it to make it more efficient. We help them consolidate things beyond just the budget, such as groups of their offerings or products, groupings of investments and portfolios, groupings of things that they're paying for, such as services. We come up with solutions for that investment management process as well. Cost management varies depending on who you are. If you're someone like the Department of Defense, you have all sorts of multiyear programs that you need to estimate, like whether one manufacturer is cheaper than another manufacturer, requirements like whether you need an F-35 Strike Fighter versus an F-15—all sorts of complex business cases.

We help clients with those sorts of things all the way through technology business management, which is IT saying, "what is it costing us as an IT organization to support

the rest of the organization?" then being able to show that to the rest of the organization. A lot of what we're doing, particularly for federal clients, is Activity Based Costing (ABC)—managerial costing or cost transparency are some other ways to think of it.

Then we do revenue management. If you're a business in the commercial sector, you're trying to make money to make sure you can pay for all the things you want to do. In the public sector that's less obvious, but there are organizations in the federal government that are fee-funded. When you take a flight, you can look at your bill and see that there are all sorts of fees and charges, particularly if you're coming from overseas. Some of those are government departments that are fee-funded to do the things that they require for the public, like putting passports together. They need to know the costs and what to be charging, so we help them with that sort of thing.

Every client is different, but every client is kind of the same. One interesting anecdote

involves Dolly the sheep. Several years ago, a company called Trans Ova Genetics was bought by another company and they wanted to work out what their most profitable product was. The company does *in vitro* fertilization for large animals—usually agricultural. So, if you're a farmer and you've got the best dairy cow that you've ever had, you can get it cloned for a lot of money or you can use *in vitro* fertilization to improve the genetic line for your livestock. Trans Ova could provide someone with an embryo to be implanted in a cow, help them buy a pregnant cow, or just provide the calf that comes out of the end of that process. Each one of these has different costs, each one has vastly different resources required, and they didn't quite know each one of those things really cost, so we helped them solve that problem.

I've also built different solutions for oil and gas. One was that we have all these oil rigs across the world, and we know how they operate today, but over time they have changed. When we first start out with an oil

rig, the companies will fly crew in from overseas to start it up, they'll teach local people how to work with it, and then 5, 6, or 7 years later it's staffed mostly by those local people. So, there are different costs over the course of time, and they wanted to know what the long-term profitability for an oil rig is, and to find out when it becomes unprofitable. So, we ran scenarios in which the price of oil plummeted and built very complex models to help them look at the profitability and endurance. Another thing about oil rigs is that they're expensive to get rid of when they no longer give oil. And there's a requirement for all oil companies to decommission an oil rig in the field at the end of its life. We're talking about decommissioning billions of dollars when there's no revenue coming in, so I must report these billions of dollars as a future liability. We had one client with hundreds of thousands of oil rigs across the world, and they had to work out a decommissioning spreadsheet. They weren't comfortable with the numbers they were running because the people in Australia were doing it differently

from the people in the Gulf of Mexico and they wanted a consistent, forward-looking model to help them estimate the cost of decommissioning oil rigs.

We've also helped universities work out the cost of a major or the cost of course to see if there is a difference in the cost of teaching an engineering degree versus an English degree. Or if there is a difference in teaching Accounting 101 at one campus versus another campus. That price differential may be understood—it may be that you don't make money on some of these programs and it's not a problem because it's meeting the mission of the institution. But understanding those sorts of things is helpful for many universities.

So, moving back to the idea of distinctive client service—every single one of these clients and the clients within these groups has a slightly different problem we need to solve. But they're all essentially the same sort of problem and we just have to find different solutions to meet their individual needs.

How the Pandemic Changed Workplace Expectations for Businesses and Employees

October 22, 2021

Presented by:

Brian Reynolds, Principal,
Digital and Cloud Solutions at
Grant Thornton



Joy Taylor, National Managing
Partner, Organizational and
Operational Transformation,
Grant Thornton

A conversation with students

Joy Taylor: I am 54, I live right outside of Philadelphia. I have four children, and I also have four foster children that live in my home with my family, so we are a busy household now. I have been a consultant for almost 25 years, with Grant Thornton since it bought my company about three years ago. Over my career, I have seen an extensive variety of clients and varieties of industries, but my real superpower is organizational change management, cultural readiness, and leadership alignment. At Grant Thornton, I am the national managing partner that oversees what we call organizational and operational transformation. What that means is I have a couple hundred people that report up through me, who are focused in the areas of supply chain, human resource management, business change enablement, agile and program leadership, and operations transformation. I consider myself to be incredibly lucky because I have an extraordinary team.

Brian Reynolds: Unlike almost anybody I know; I have had one job interview in my life. I worked for Pricewaterhouse Coopers (PwC), before they were bought by IBM. Then I followed a partner that I worked with to Grant Thornton about 15 years ago. I ran the IT practice within our public sector for several years, then I became responsible for product management, and solution build around an internal innovation initiative to replace some of our commodified services—or low-rate services—with automation. Then I served as our Chief Information Officer (CIO).

Today I'm responsible for cloud in the public sector, including our relationship with AWS. I spend most of my days focusing on cloud-related solutions. Understanding needs and being able to focus on empathetic design are key to an agile mindset or design-thinking mindset is fundamental. That's where we begin even our most technical work.

I was looking online, and I noticed in the Indy Star newspaper that there is a lot of figuring and sort of refiguring from local companies in response to the pandemic. Cummings, Eli Lilly, and Bridge

Diagnostics are all cited in the article. Six months ago, they all thought they were going to be returning to work, and are now slowly the backing away from that, or instituting vaccine mandates or other sorts of programs. They're all working with the very best of intentions, trying to do what is right for their employees to balance personal safety with personal liberties.

Some of our clients don't believe working remotely has resulted in more accountability or productivity. There is, especially with government clients that I have, a gap in trust as staff don't want to return to the office and management does. I have a client in Texas that never left the office and doesn't understand why his teams don't want to come back full-time.

One of the things we'd like to understand from students with the spike in COVID rate right now—as you all thought about coming back to school, what was most important to you?

Live poll: Nearly 75 percent of students at this event said being able to attend school in person was most important to them

Brian Reynolds: Tell us, what did you miss last year that you hope to get back this year in person.

Student responses:

"Interacting with classmates, being able to collaborate. It was hard to hold individuals accountable the way you can when you meet up in person—online was a little bit difficult."

"I found it was easier to meet up, but because I had never met the other student in person it was hard to connect online. It was less conflict but mostly because we had zero communication outside of a Zoom call."

"Since we didn't have that personal connection people were more afraid to have difficult conversations with conflicts. So, people would just agree with the first person who offered up an idea to kind of just get it done and get off the call. I think

that made our quality of work go down... especially for like group presentations. You didn't have the risk of being really embarrassed in front of the group, so people would put less effort into presentations and preparing for them."

Brian Reynolds: I found it difficult when I was dealing with an ambiguous topic, or where there was brainstorming, or any sort of wheel-turning that had to be done. When we had to be creative, I really missed being in the room. I feel like we didn't make decisions for days that we might have made in an hour or two if we had been in the room together. Do you think that in person, you can help each other be more accountable?

Student: I think the lack of the ability to have a side conversation was very difficult. When you're in a Zoom call with 30 people, or even just eight or so for a group project—only one person can speak at a time. You couldn't just jump in and add something—you had to wait until the other person is done talking and then wait your turn to go. In the competitions, I sometimes just gave up.

Brian Reynolds: I thought tone became important. There were a couple instances where I unintentionally came off as a little aggressive or was misunderstood. I became cautious. And I think less passionate, because I was worried about not being understood. Did you feel people were less engaged?

Student: I pay more attention to how I'm phrasing things in a virtual environment because you can't really read a person quite the same through the screen. There were situations where I may have seemed passive-aggressive when that wasn't my intention.

Joy Taylor: I spend almost 60 percent of my day working with clients on change management and communication—verbal, written, and nonverbal. What we've come to realize is that when you are online, your facial expressions are a component of your tone, volume, and content. You must be very careful. Sometimes when I'm on the screen, I'm looking at myself talk to you, which is annoying. When you face your colleagues, you're looking at their faces and seeing if they're paying attention, or if they're multitasking and things of that nature.

Brian Reynolds: I kept trying to figure out how to put my camera in the right place so I could do something else and appear to be listening. We have a phrase at Grant Thornton: "Be here now" because of the importance of respecting another



individual when they're presenting and working with you instead of multitasking. I found it a test to adhere to that principle at times with remote work. There was just too much temptation to do something else.

I noticed as I was preparing that it's not just workplaces, it's universities, you know, I think you're in a state, it was. Looks like some controversy about vaccine mandates. I live in Texas where I can tell you a mask has taken on a political meaning as a sort of an infringement on personal liberties. My six-year-old (I have children 26 to six) my little boy is one of these three kids in his class of 18—and there are probably 10 in the whole school—who wears a mask. Everybody has a different set of values here about this. Did you have the same kind of controversies here or was there more compliance or common-line and thinking about the practicality of wearing masks?

Student: I think Monroe County having a mask mandate took all the pressure off the school about having to choose masks or not, they just simply had to comply with the county. It could be less of "I'm upset with Indiana University," and more "Monroe County's doing this," so it took all the pressure off the school.

Brian Reynolds: So, the government made the decision and the school followed. How did you all feel about that?

Student: I was very happy about the vaccine but frustrated at first about the masks because adds

another layer of misunderstanding when you're talking with people. But I think both are really needed to make people feel comfortable being in person.

Being back on campus and in the classroom, as you started back to school, what did you feel? Excitement or anxiety?

Faculty member: I'm a teacher in the O'Neill school and I personally get a lot of value from teaching in person. I've taught online even before the pandemic, so it's not something that was new to me, but it is not my preferred way to teach. I think that I come across much better in a personal setting, but at the same time I have three children at home that are all too young to be vaccinated. To me there's anxiety about coming back into the workplace and being exposed to something that I could take home to these people who are not at all protected.

Student: I'm a college sophomore, so last year was not a normal experience. I was just so excited to finally have the college experience I've been waiting for. It's just everything from being back in the classroom to forming close relationships with classmates even seeing football games in person.

Brian Reynolds: What about those of you who are anxious? We have a vaccine mandate—what made you anxious after that?

Student: Not having ever gone to a college classroom or a lecture hall, I had no idea what that was going to be like. There were a ton of unknowns walking into the college for my sophomore year. It was a lot of anxiety there as well as the way time management became very different. My walk to class is about a half hour, so it just takes a ton of time in a day.

Brian Reynolds: So, you went through your whole first year and never had the chance to acclimate to what college life would be like. Now that you're here, there are extracurricular groups and hobbies associated with whatever school you happen to be in. Are you joining those sorts of groups more aggressively than you might have?

Student: Last year I made a real effort to get involved because it was my freshman year and it was online so I knew it might be

hard. This year I've had to learn to prioritize a lot more because of that 45-minute walk—you can't be involved in everything, so you have to choose which ones you really want to be involved in.

Brian Reynolds: That can be the case in a job too. There are so many things you could learn, and you've got to make the choices that are best for you in business—those are good lessons, I think. Time management is, in my own experience, one of the most important executive skills—how to prioritize, how to triage, how to recognize what is coming to you the fastest, and how to make sure you get to that stuff first. This is one of the hardest lessons, I think.

Faculty member: At a more meta level, it's reassuring to hear young people talk about wanting to learn in person. I had heard from a lot of my industry partners that maybe this is the tipping point for universities—now that everything's online, we're going to start pulling away from residential programs. I'm not seeing that. My students were very, very eager to get back in person with each other.

Brian Reynolds: I wondered if we are moving away from valuing a liberal arts education. You see more and more jobs that require a tech competency that can be learned through certification programs. But I see more value in broad exposure to lots of ideas and being able to discuss those ideas and change your mind. I think in some ways it may strengthen the appetite for education.

Let's move on and talk a little bit about what's happening in the world.

Joy Taylor: We wanted to enter the conversation with some interesting data points in the marketplace regarding what is happening in the world:

- As of last week, 75 percent of adults had already gotten at least one shot of the COVID vaccine. But the question is who are the other 25 percent and what do they represent? Are they people that have deeply held beliefs? Are they immune compromised? Are they politically driven? Whoever they are, they're walking among us. These are adults so it doesn't include the

population of children who have not been approved for the vaccine yet.

- There are some companies that have been doing well because of COVID—cleaning services, delivery services, grocery stores, liquor stores, gaming companies, fitness equipment. Telehealth has certainly dramatically increased. And if you have a car to sell, today is your magic day.
- There have been changes in attendance for sports and other events. The food service and vendors that exist at events are just getting punched in the face. Merchandise purchases are way down.
- There have been some unexpected shifts for school-aged children: Students learning to play an instrument went down 58 percent.
- Hobbies during COVID mirror those from the Great Depression, but with some technological advancement. Tie-dyeing of clothes is big thing these days—lots of TikTok activity in that space. Board game sales are up because families have been spending more time together. Gardening has become quite the privilege and the honor that people take pictures of and share with their friends. Breading is up. And cycling—Peloton has made a lot more cyclists out there than ever before.
- Out of stock items due to COVID—at the very beginning you couldn't find paper towels and diapers were real problem. Thermometers, water filters, board games (for obvious reasons), puzzles, yeast (for all those bread makers out there), a Nintendo Switch (couldn't find one if you wanted one). And again, fitness equipment.

Do any of these items hit home for people?

Student: I worked at a grocery store at the very beginning of the pandemic, so I got to see firsthand, all the missing items. Minute Rice was a huge one, and we were just constantly out of toilet paper.

Brian Reynolds: I remember not being able to find anything that I could sanitize

surfaces with or paper products. And I would see people rolling out and store with four or five packages of these things. I started to worry that the worst of us was showing up. I don't think that happened. Was that a worry for any of you?

Student: I spent a lot of time walking around neighborhoods because we weren't going to the gym as much and we saw a gentleman with his garage door open and he had stacks of toilet paper around him. It was rows of toilet paper, and he was reveling in his stash.

Joy Taylor: Doomsday preppers and coupon extraordinaries—the people that have those stashes—I think they made out like bandits.

Brian Reynolds: So, there was a lot of trepidation out there—there still is. And a lot of worry and maybe even bad behavior. But I think there was also some real goodness to come out of this. One interesting study included about 75 quotes from individuals and what they were thinking and feeling—they were interesting and surprisingly uplifting to read. The majority of Americans experienced something that they considered a detriment to or limitation on the way they lived, and at the same time, a new opportunity. Some people learned new skills or picked up new activities, pointing out that there has been good and bad here. I think that's important.

Another thing that struck me in this study was folks commenting on fact that kindness was in bloom. Despite all that was worrisome about what was going on, there was goodness. There was kindness. There was empathy. There was an interest in helping others and a recognition that that can be rewarding. I think about the last four years and all the way the country has become more separated. It's a really hard thing to see and say when there was so much loss, but there has also been some real goodness in this time—some folks who changed the way they think.

My sister's a teacher and your professors have experienced this—but the workload for some professions was just incredible. Few appreciated how hard they worked to keep up and do well. It's a big word. So, there were also things that came to light—I know I like not commuting every morning. I liked the fact that I didn't turn the camera on some days because I hadn't taken a shower and my hair was sticking up all over the place. There were just so many things that made it more comfortable.

I used to have this break where I you know I had to get home for dinner, and I had to get in the car and pick up my kids for a sporting event or something else. I found that collaring of my day disappeared, and my work went on well into the evening. I found the preservation of my personal time to become something that was increasingly difficult. Folks would schedule a meeting for eight o'clock at night without much thought, or at dinnertime, I don't know. Did you all find that your school projects had fewer constraints and so things flowed into other parts of your life?



Student: I think as a high school student, I experienced the opposite because I was so used to going to school for like seven-ish hours a day, and suddenly we didn't have classes for seven hours. I just did my homework during the time I was typically in school.

Student: I had to make sure that I stopped doing homework in my bed. I could not go to sleep at night because I've been awake all day in my bed, and it had become a workspace. I still have to be very careful about that—in my dorm room I only had a desk and a bed, and I was stuck there all day, every single day a week, so it became difficult to find space

Based on several surveys taken regarding corporate executives and their perception of remote working arrangements, we found:

84 PERCENT are concerned about the ability of managers to manage remotely

81 PERCENT are concerned about employee morale

76 PERCENT are concerned about productivity

75 PERCENT were concerned about those home life distractions

Now I want to add a small twist to these numbers: This data was collected [in late 2020]. Now these numbers have changed dramatically because there is such a war for talent.

Brian Reynolds: How has your quality of life improved? Was anything introduced to your life that worked better? More time with family?

Student: My experience with my family was that we were all in the same house, but everyone was in their own corner of the house on their Zoom all day, we never really saw each other. There was never a time when we were all offline together, so it felt like it just pulled us farther apart in many respects.

Student: I got really into my art stuff. I'm more of a math nerd sort of person, and so doing hands on stuff like that was interesting for me.

Student: I can now solve a Rubik's Cube and ride a skateboard.

Joy Taylor: Brian and I thought it might be interesting to make a little bit of a pivot here to what's happening in businesses today and for the clients that we are serving.

Every organization is struggling. No one has the perfect answer. No one has a foolproof plan, and the truth of matter is organizations are going day by day, week by week, month by month. But there have been several surveys that have taken place over the last six months regarding corporate executives, and their perception of what is happening regarding these remote working arrangements.

Here are some of the statistics we found—84 percent are concerned about the ability of managers to manage remotely. That's a big number. If you think that the vast majority of your leaders may not be managing their teams or managing delivery of work efficiently or effectively, that can cause a lot of mistrust. It can also cause organizations to question their ability to achieve their strategy or execute on the tasks and initiatives that they have in play.

Evidently, 81 percent are concerned about employee morale. We believe that's because human beings are social creatures. When you can't interact, touch, feel, engage, laugh, make fun of, solve problems with, or challenge each other, employee morale does go down. Your greatest asset in an organization are people. People often think that the products that companies sell are their assets—it's how they certainly generate revenue—but you cannot generate revenue without the people. So, if we have morale issues, it's a real problem across the board.

Seventy-six percent are concerned about productivity. At the very beginning there were

many organizations—I sadly worked with two—that felt they couldn't trust *any* of their people working remotely. I was horrified working with organizations who literally didn't have a value system that was able to create trust in the absence of physically seeing people. I hope that these organizations change their way of thinking and find a way to trust that people want to work, like to work, and are indeed very productive when they have flexibility. There are now more people out in the world that don't work a nine to five job, but might do a 6 a.m.—8 a.m., take a break, send their kids to school, get back online at nine or 9:30 and work till two or three, spend some time with their kids again and get back online after everyone's done with dinner—working the hours that work best for them. I'm a big fan of that, I believe in flexibility, and I believe there are organizations making that shift.

Then 75 percent of organizations were concerned about those home life distractions. We've always had distractions. And so, simply be prepared, should you choose at one point in time in the future to go into you know a job or a career—make time for your home life distractions. Everyone should have them. But 74 percent are concerned about the lack of visibility of employees when they don't know how people are spending their time. I think that's a general concern for people managing individuals—how do they do it and when do they get it done. But I think some of these things are shifting with technology.

Now I want to add a small twist to these numbers: This data was collected a year ago. Now these numbers have changed dramatically because there is such a war for talent. Organizations are making complete shifts and allowing extensive levels of flexibility so that people can have the work-life balance they need.

Organizations are moving towards caring for their people. They're trying to make sure that recruiting efforts and onboarding experiences are different, because they're now remote. Promoting a sense of connection and loyalty in the workplace has—quite frankly—become one of the most significant challenges for organizations. There are a lot of changes taking place in the talent area, and you should consider that an exciting opportunity for your education right now. How do you feel about being an employee in the future? What do you want from your job?

Student: Just lots of money.

Brian Reynolds: There is an interesting video on YouTube and its message is that autonomy, mastery, and making a difference are what motivate people. Pay people enough and that's comfortable, but it's not motivating. Those of you who are approaching graduation are entering a market where talent is the resource that's hardest to find. You have the opportunity to make a choice and focus on something that you want to master, where you want to make an impact. That is important to think about—it's not just money. Is there anything in particular that you demand from your employer?

Student: Something that COVID really showed me is that I need change. One of my classes last year had the exact same lecture format every single day. But in another, my professor was doing different interactive activities. The constantly changing, evolving space made me feel much more engaged and happier to be there. I want that to be something that guides my career as well.

Brian Reynolds: I think that's what attracts a lot of people to professional services—the idea that you meet with a client, you can solve a problem, and in some cases, you continue to work with them, but in a lot of cases you're also moving on to the next challenge. There are people who just love that challenge—give me a new problem, let me see if I can solve this, let me show you how smart and clever I am. Those are things that I personally look for in a job.

Student: I would just want to make sure that there's a clear work and personal life boundary—and that the employer really respects that boundary.

Brian Reynolds: You all probably take classes that talk about concept of sustainable pace—the idea that when we ask people to be heroes, they can only be heroes for so long before they burn out. Then quality goes down, unplanned work goes up, and they become less productive. Challenges and stretch goals are important, but so is the ability to realize that work is not life.

Joy Taylor We're not out of the woods, COVID is not over. Companies are going to continue to monitor and adjust, keeping in mind the three priorities of people, customers, and clients. There's no fast answer. But attracting, retaining, and investing in talent is absolutely at the forefront of every company's mind. I'm not joking when I say that there is a war for talent. There is stupid money being spent to find the right people and to change the face of business. They're looking for unique skills, capabilities, and the right attitude.

Everyone will continue to have different comfort levels surrounding in-person and return to work activities. The companies that we work with are all over the board. Brian and I have clients who want 100% in-person, while others who are 100% virtual. And nobody has the right answer or the complete answer. We're still in flux and the job right now was to simply support the needs of teammates and customers as they see it happening day to day.

Brian Reynolds: One shift for many companies is the notion that the customer is always right regardless, at the expense, and the impact on your employee—that thinking is not productive. It's not going to build long-term success. I think I think companies that are thoughtful about culture realize that by building up their people, they will deliver on the client's needs.

What our clients have needed over the last 18 months has really shifted. Early on we had clients that were concerned about solvency—and many didn't survive. Then there were needs about how to respond and how to navigate the pandemic. Then we had a period where things stabilized, how do we now lay the ground to prosper. The ideas of basic design thinking or basic empathetic design concepts—spending time understanding the problem, the unmet need, the challenge in the in the user experience or client experience or customer experience. The temptation to solution right away instead of listening first is something I think we all struggle with. We all want to have the right answer or intuitive genius that we can bring into the room, but most people don't have that. Listening and building and understanding and improvising is important. It keeps us from looking past what might be simple or obvious answers.

Now we're helping them recover. We're helping them think about how to expand, move, and grow this business. Do you think if we didn't listen when they were struggling, and worried, that we'd be their counsel or trusted at this stage in the lifecycle? Taking the time to understand is the investment and the payoff is to build trust, you build personal relationships. And those relationships allow you to be the organization that a client turns to, because they know you have their best interests at heart.

Culture is king. Attitude is everything. I'm delighted that organizations care for the needs of their people. Don't be afraid to ask those kinds of hard questions that you need as you transition into getting that job, whenever that time comes.

Does your Budget Process Create Cyber Risk?

KEYNOTE SPEAKER,
LUDDY CASE
COMPETITION



November 5, 2021

Presented by:

Russ Ficken, Director of Cyber Security, Grant Thornton

Legacy processes, in government and in larger companies, have the potential to have blind spots in decision-making, particularly when there's competition involved.

My professional experience includes 15 years in the federal government managing software portfolios for Housing and Urban Development (HUD), the Nuclear Regulatory Commission, and the White House. At the regulatory commission I also managed IT operations. In the White House I worked on public policy. In 2017 I left the government and went 100 percent commercial. I worked at Dell Secureworks—a managed security provider to Fortune 100 companies—providing security service, cyber security services, and I've been with Grant Thornton for almost one year.

I'm going to be speaking to you about legacy processing—systems that continue to utilize older technology—and the risk it may make in the cyber world. When you think about working for the government, particularly for a clearance process, there are 29 sections to fill out, 136 pages, if printed. You get to provide the government your name, social security number, citizenship—these are common for most applications. Then it starts to get fairly deep in your life: where you live, where you went to school, your employment activities, military history, marital status, marital history. You provide information on your relatives, your immediate relatives, foreign contacts, foreign activities, your mental and emotional health, your police record—hopefully, you don't have one of those, but if you do, you provide it. You disclose use of illegal drugs, your use of alcohol, and your financial record. The government estimates the form only takes 150 minutes to complete. Because I really wanted that job, and I wanted to get it right, I had a migraine the first time I filled it out. Reaching out to family members for their information, and to track down some of this information, can be difficult.

The bottom line is, in 2014, the Chinese government stole my file, along with 330 million records that the Office of Personnel Management held. How can something like that happen? I'll give you a hint—it looks a little like World Federation Wrestling. That may be a little bit of an exaggeration, but you do have different equities coming to the table making a pitch for a limited budget.

Generally speaking, this is a standard makeup of an organization, and this scales to the private sector also, it's not limited to the federal government. You typically have some generalized buckets. First, you have one entity running the mission—why the organization exists. Then you

have something like HUD that writes grants, regulation, and oversees some degree of enforcement. Then you have something like the Nuclear Regulatory Commission, which plans and inspects the commercial use of nuclear power.

Then there are special projects. On the commercial side these can be valuable and interesting moves into other markets. In the federal space it's not just improvements into how the mission is done, it's other things that pop up. From my experience living through Hurricane Katrina, a housing crisis, and Fukushima, and COVID—who knows what the future holds, but this is a very prevalent source of funding. It's competing in interest to run a business. But in finance—I'm poking fun at them a little bit—they run the process. They seem to always win in that process. It's mind-blowing. Then IT and security are running up at the end, needing to implement all that's asked of them to implement. But they also must keep running the legacy environment; not only building new stuff and keeping the old stuff running, but every year there are new compliance requirements. There are new ways of doing business and lots of new policy changes. It all takes money, and all these players are competing for the budget.

In the federal space, 80 percent of the budget tends to be the run-the-business figure. This is what is required to “keep the lights on” for all those IT investments that are in play right now. The other 20 percent is what the group is fighting over. This can be somewhat of a misnomer, because in aggregate not every agency has a 20 percent to fight over. When I was at HUD, it was actually negative 10 percent. There was less money to operate the business than there was to modernize and keep the lights on. So decisions had to be made. One of the fundamental problems with this battle is that it lacks priority.

From a policy standpoint, is there a way, away from the battle, that high risk investments and assets can be identified? There is, and it's called the Crown Jewel Model. In it, we identify which assets run the government and are most important, and we wrap our priorities and decision-making around that identification. From a risk perspective we understand what's important. We understand where it is and what we need to do to govern and protect it, so that the limited funds we have can then be applied.

When I worked in the White House, we did just that. This idea was introduced in 2015

immediately after the Office of Personnel Management (OPM) breach. We identify systems and data assets that are either essential to the operation of our government or are generating data that is perhaps interesting to adversaries. Later, two or three years ago, we extended that definition to say that anything supporting those two categories should also be considered a high value asset (HVA).

We set apart key pieces of the infrastructure—software systems, processes—away from the budget “food fight,” and establish a prioritization system for protection in the government sector. We bring industry best practices to wrap around these high value assets. More importantly, we have a management approach, not only within an agency, but also with the White House and across government, where we're focused on what's important. At a time, pre-OPM, the focus was on whatever we were talking about at the time. There wasn't a prioritization structure in place. Now we have one. So the first order effect of this policy is that agencies are now able to manage their risk posture for their high value assets. They also are now in position to better place funding on the right things each budget cycle. But the second and the third order effect is now the White House has a better way to describe high value assets across government. You get a high degree of harmony for other cross-functional capabilities.

Again, we're discussing how we allocate limited funds we've identified as high value assets. Agencies are happy, and we have cross-functional capability. The White House now must model to see things that they couldn't before. Before President Obama asked after the breach, “What's next? What's vulnerable?” We didn't have a list, and we didn't know. It could be anything. That's different now though. Now Cybersecurity & Infrastructure Security Agency (CISA) exists with its vast range of capabilities at protection of high value assets. It's a rapidly growing agency year after year, and they're growing double digits in their capabilities. GSA Technology Modernization Fund (TMF) is a funding mechanism for protections. The bottom line is not only did the high value asset program provide clarity, it is in fact a multiplier from a capabilities perspective.

began asking who wants to be a manager, who wants to be a subject matter expert. It's a trick question. The reality is that organizations are getting much, much flatter to improve the government. The government certainly has this perception that it's a bureaucratic behemoth. There are five, six, seven layers of management in the organization. Again, all of that's true. But if you're working on the hottest project, they are going to call you into these conversations. My point is the awareness that legacy processes, in government and in larger companies, have the potential to have blind spots in decision-making, particularly when there's competition involved. When you enter the workforce, be aware of the consequences of the fights you enter, as it may not be apparent what you're fighting for. But there are, unfortunately, downstream consequences.

Question: When you're trying to figure out which systems are vulnerable, how do you go about doing it? I assume there are complex measures. Are people transparent? How did you go about doing the big audits to ascertain what's vulnerable?

Russ Ficken: The goal of this was to cut through exactly what you're describing. However, we're going to provide you clarity on how to choose what is in for the prioritization and what is out. Independent of those political factors, we're going to tie it to primary mission and essential functions. There's a continuity of government concept that the mission of the government is tied to. That is accepted, and the article of faith is applied here. And if those systems are tied to that, it's in.

Question: Did you develop that rubric and criteria? I'm assuming there was a meeting of the minds, saying, these are essential for the continuity of government, and therefore you're going to apply the assessment to all that apply, so that it's as partial as can be. Who were the minds that were meeting to establish this criteria?

Russ Ficken: The policy itself was developed within the executive office, but it was put upon the executive branch in terms of, “hey guys, these are the new rules.” It is then up to agencies themselves to take and run with that guidance. There's the rub. As the policy was implemented, it began in 2015-16. As far as budgets, it takes at least two years to catch up in terms of resources and the ask.

We're in the early innings of this at the agency level. They've received the guidance. It's up to them to take high level policy, above operating plans and procedures, and really develop the list, and then govern them.

Question: To micro think about the things that are necessary for continuity, safety, and production, there are obviously different levels you might choose. For instance, if you wanted to compare cybersecurity to physical security, there's a difference between having a locked front door and having a thick concrete wall. How do you then decide how important it is to have each of these different encryptions? How encrypted is money versus at what point do we stop seeing benefit? How do you judge? How do you know what controls to pick? How do you know which level you need to take for that level of security?

Russ Ficken: The government has tons of publications, but there's a process at the asset level to understand the data. The systems are then categorized based on the data. There's a guideline-based approach that says based on your understanding of the data the system is going to process, there are certain attributes to apply. That will tell you what your effective risk posture is, high or low. There's a control baseline for a modern system that tells you exactly what controls are going to apply right out of the gate. A lot of the approach to cybersecurity in cyberspace has been templated. It explains, “here are the templates, here are the processes, here's how you apply it, and here are the expected technological implementations.” The hard part is implementation, because a lot of the systems have been around for decades in some cases. When I left HUD there was a system that I walked into managing built in the 1960s. When I left, it was still there. How do you secure such old systems? Firstly, you don't want bad actors jumping in and fooling around with data. You start to worry about resiliency when you talk about systems that old. In the case of HUD, they had the last version of Unisys mainframe. The last one. So the government gets charged a premium payment just to keep it up and running. It has less computing power than a phone, but because of what it does for the country it has to run. The cost for replacement is at a massive scale in government.

Using Technologies to Amplify the Capabilities of Human-Animal Interaction

KEYNOTE SPEAKER,
LUDDY CASE
COMPETITION



November 5, 2021

Presented by:

Patrick C. Shih,
Assistant Professor
Luddy School of Informatics,
Computing, and Engineering

We go a little bit deeper than the typical computer vision to see the individual animals and figure out their social dynamics and behavior; how they're interacting with each other.

My research focuses on the study of socio-technical systems to support health and well-being, and to reduce health disparities of marginalized and underserved populations. The populations that I work with and support include those with various chronic health conditions, such as people living with autism. Some have medical adherence issues, such as people living with HIV—we use technology to improve their communications to reduce social anxiety and increase physical activities because they tend to be more sedentary than the rest of the population.

We also work with people with substance abuse, to help them keep on track with their progress. For example, if you're addicted to alcohol, then we could utilize a pocket-sized smart breathalyzer to help them monitor their progress in a reasonable fashion. And we have a first aid response care system for people with epilepsy. In this population, a lot of people don't drive—they rely on a primary caregiver to drive them because clearly, if you're driving and you experience a seizure, you can cause an accident on the road. Previously, I've worked a lot with wheelchair users and limb-different individuals and have published several papers about how we can use 3D printed prosthetics.

We've developed games for people living with autism, undertaking an iterative prototyping process with the experts, the caregivers, medical teams, and the people with autism themselves. To prototype a successful system, you really need to get all the stakeholders involved. If you're designing in the laboratory without involving real people, then what you come up with is not likely to be adopted in a real-world scenario.

In health care, we utilize big data analysis. For example, we partnered up with the Regenstrief Institute in Indianapolis, which has a lot of data through the Indiana Health Exchange that allowed us to pull information about health care access shortages and look at populations in different regions that tend to miss doctor's appointments. In rural Indiana, it's typical for there to only be one primary care facility. Some areas have mental health facilities. But there are several counties in rural Indiana that don't have hospitals. So, for a woman who wants to give birth—unless she gets a midwife or a doula to assist her in her home—she

will have to drive two to three hours to get to a hospital to deliver her child. She may have to schedule an induction a month in advance or get an Airbnb to live next to the hospital near the end of her pregnancy. When we have rural area health care access shortages, we can use health care employment data to detect the regions that need the most help.

During Coronavirus, this same data illustrated the areas hit hardest by the pandemic. You could clearly see the drop-off in health care appointments—the farther from a hospital you are, the more difficult it is for you to get access to care. Whatever challenges we're facing, the regions and the populations that are typically lower resourced will be hit the hardest.

I'm sure you have heard a lot of health care-related research topics that focus on the human population, but I want to bring your attention to a lot of the parallel work that we are doing with the animal population.

Our work with animals includes the development of health technologies that we can, for example, try to create in a controlled environment, and then later generalize to humans. We've worked a lot with the automated monitoring of mice, and smart habitats for opossum rehabilitation. We've also employed a migration tracking mechanism to track disease spreads among bats, which is relevant to Coronavirus.

I want to give you a high-level overview of these projects. We have been researching technologies for companion animals. We've also been working with animal rescues, including the Bloomington Animal Shelter and WildCare, to understand how to provide better management software to track their inventory and then coordinate volunteers. We've been looking into crowdfunding this as an effective mechanism which could potentially help shelters that are low on resources to get the equipment, blankets, food, cleaning supplies, and training toys.

This tracking system was developed in conjunction with the woman's prison in Indianapolis. They trained the incarcerated population so they could gain valuable skill sets to help them transition out of prison. They started to

train service dogs, guide dogs, or emotional support dogs—they have a whole series of programs that allow the incarcerated population to get certificates while they are in the system. The technology was jointly developed with their insights and then this has been used to train dogs. If you're familiar with dogs, the system uses a device in the shape of a KONG® toy that produced different sounds and is connected to an automatic feeder through a Bluetooth connection. If the dog interacts with the toy in a certain way, it automatically dispenses a treat. So, this is a training and enrichment device.

We also published one of the first pet tracker papers four or five years ago. As you know, the Fitbit was one of the first activity trackers for humans. We started to get increasingly interested in the relationship between having a dog and fitness. If we show you the data about your dogs not exercising enough, potentially the owners of the dogs will be incentivized to walk them more and derive more health benefits as well. We did this to understand how the owner's physical activity level correlates with their pets. We created a visualization system and a tracking system to show to our populations about this relationship.

We have also been working with Equine-Assisted Therapy facilities. IU has its own Equine-Assisted facility at Bradford Woods in Martinsville, but in Bloomington, we have another facility called PALS. A lot of the people living with autism or speech therapy impairments go through equine assisted therapy for a rehabilitation process. Humans can speak because we have the core strength to push the air through our diaphragm. So, every time we speak, we push air out of our lungs, let the air out of our mouth, and then go through this process of transforming that into voice. Children who are born without the ability to speak lack the core strength to push the air out of their lungs.

In Equine-Assisted Therapy, a lead instructor directs the horse to assist the participant by engaging them in a form of yoga. The instructors can artfully manipulate the horse to get you into a rhythm, or a certain pattern, that massages and then engages your core group muscles. Your body naturally calibrates to balance on the horse over several sessions. I've seen cases in which a seven-year-old child was able to speak his or her first sentence, and the parents would just start weeping on the spot because they heard their kid speak for the first time. But they don't have a whole lot of therapy progress-tracking abilities.

We designed custom sensors to be placed on the horse and on the human's body, and then looked at the coordination progress over time, the speed and the vocalizations/sounds they were making. To monitor progress during the therapy, the instructors can customize this interface and tailor the session to better fit a patient's progress.



We also work with laboratory mice. A lot of current medical research is built on mouse models—the impact of one thing or another on mouse behavior. We have a computer vision algorithm that automatically tracks mouse behavior. We have individual tracking ability for different mice, which goes beyond the traditional algorithms. We can accurately tell the direction that the mouse is facing, their tail's direction, and their head's direction to further inform how they are interacting with each other. So, we go a little bit deeper than the typical computer vision to see the individual animals and figure out their social

dynamics and behavior; how they're interacting with each other. We're starting to deploy this in a lot of the mouse research.

My colleague from the Max Planck Institute studies New Caledonian crows. New Caledonian crows are the smartest bird in the world—they are said to possess the intelligence of a six-year-old child. They teach their juvenile birds how to search for food. Researchers have always been curious about their communication patterns and ability to engage in knowledge transfer, as well as what humans can learn from. So, we deploy several different automated trackers and video cameras and microphones in the field, and the geolocation trackers on these birds. Like the mouse computer vision model, we engaged in signal processing, which automatically detects crow calls that we can analyze. For example, they make this distinct double call sound, which is the alarm clock call when they detect prey or see a hawk and alert the other birds in the area. Another call is a juvenile crow begging for the mother to feed it because it's hungry.

This is the first time, at least in the animal cognition world, that scientists have been able to do this. Previously, we didn't have the big data to analyze animal communication patterns and, understand bird language. What we observed was that the mother crow would fly up, home in on a nut lying on the ground, pick it up, and then fly 100 feet up in the air and drop it so the nut cracks when it hits the ground. She demonstrates this several times to show the juvenile crow how to do it even as the juvenile crow is still learning how to fly. It's an interesting sort of a knowledge transfer process. The key takeaway is to understand that technology can do a whole lot in terms of monitoring animal behavior, so imagine if we deployed this technology in the in-home care facility for humans.

The next project looks at smart habitats for opossums. During the springtime when it's opossums' mating season, they usually come out at dusk, when it's about to get dark, and there is after-work traffic. They get killed on the road, and then we'll have a group of opossum joeys left that animal control officers pick up and take to the WildCare rehabilitation facility. While they are rehabilitating, there are several different problems that they encounter. First, you

must nurse the animal back to health—you can feed them milk to get them into a healthy weight, then they develop and grow and can be reintroduced into the wild.

But at least 10 to 15 percent of them develop human attachment. If you put your finger in front of a baby joey, they will do this alligator mouth motion and that's a good thing because it's a natural instinct for them. But if they stop doing the alligator mouth motion, it means they've grown fond of the human who's caring for them. Unfortunately, by today's standards, the reward that they get for being nice to humans is to get euthanized because then there's no way to introduce them to the wild—they're going to be asking humans for food and then they're not going to be able to survive and hunt on their own. So, we need to minimize human intervention, at least for animal care, for the purpose of rehabilitation.

Secondly, they can develop a communicable disease where these white spots grow on their tail, so you need to figure out how to do social distancing across the opossums. But they often share the same space in a facility, and if one opossum gets sick, it quickly spreads to the others and they all must get euthanized. We created a smart habitat, where there is an automated weighing scale and a heating pad, which can be used to direct the location of the opossums, because they gravitate toward warmth. If we want to weigh them, we heat up this heating strip on top of the scale, and then they will move over and just lie on it. We can control this entirely using technologies, so this saves volunteer time as well. And on top of this is computer vision, which is entirely based on video collected by the camera. We use these sorts of homegrown technologies, but it is effective in the field for the successful rehabilitation of opossums.

I did some interesting research several years ago, in conjunction with Yellowstone National Park, obviously pre-dating Coronavirus. As you know, a lot of current research points to the fact that the Coronavirus originated in bats, because bats are carriers of many different diseases. Scientists have no idea about how the disease might have been transmitted among bats, because we don't have the tracking ability to study them, and we are still learning about all the different effects and impacts of transmission of Coronavirus in humans.

But bats have "white nose syndrome." They hibernate in the wintertime and fall into a deep sleep for several months. When the weather warms up, they come out of their cave. The white nose syndrome is this type of fungus that grows on their bodies during the winter and uses their body as a food source, which has wiped-out 90 percent of the little brown bat population. Scientists do not know how this disease was transmitted. So, we utilized trackers to understand the social network, because clearly bats don't have Facebook. We created trackers to understand how they interact with each other to prevent disease spread.

We used these homegrown devices that we developed with tiny little sensors that weigh about .5 grams. My colleague tagged hundreds of bats in the bat caves when the bats were sleeping—he would just pick them off the top of the cave and then either glue the sensor to their wing or inject it beneath their skin. The bat doesn't even wake up, so it's not very intrusive. I think that this technology can be applied to understanding the zoonotic disease spread between humans and animals, and among the animals themselves.

Currently we face a lot of sustainability/environmental challenges due to climate change. So, we are also looking at birds called Dark-eyed Juncos. They are native to North America, so they only migrate from Canada to the United States and Mexico. We wanted to study their migration patterns, so we could understand how climate change is impacting animals and human lives. There's a longitudinal data set that's been collected by citizen scientists and birdwatchers since the 1960s or 1970s—so we have millions and millions of data entries, over a period of four decades, about how these birds migrate.

Now we also have social media in the age of big data. So, we're looking into how we can use Instagram, or also other image-sharing platforms to understand how to automatically track bird-spotting or other animals, to understand their change in their migration pattern. We used the database of bird data on Dark-eyed Juncos and compared it with social media. We developed an algorithm to see the potential overlap and found a 75.6 percent accuracy. That meant we could extrapolate for migration patterns using social media



images, and this is a big deal. When scientists want to engage in tagging every single animal, the current state of the art is to do geotagging—you put these geocollars on animals. Scientists engage in longitudinal studies where they are tagging all the birds or tagging all the deer—this is a labor-intensive effort.

If you're able to leverage social media simply based on the photos that people post and share, we can engage in reasonable approximation of migration patterns that further allows us to understand the impact of climate change for both humans and animals. This is the endeavor we've been engaging in with the Dark-eyed Juncos. We're making a similar effort with giraffes in Africa in partnership with the Giraffe Conservation Foundation—which is the largest giraffe conservation foundation in the world—along with National Geographic and the Smithsonian National Zoo.

They have researchers that fly drones across the African continent to do population sampling of giraffes, which unfortunately also suffer from poaching activity. I personally don't really understand why people hunt giraffes—it's like a big-game or trophy-hunting kind of thing. We use thermal imaging technologies on drones to deter the poachers and understand the migratory patterns of giraffes in Africa. There's no way to tag every single animal, so we're trying to utilize satellite imagery, drones, and social media.

Locally, we have a relationship with the Indianapolis Zoo that uses drones. The drones that we deployed in Africa are the size of a small airplane, but the drones that we're deploying in the Indy Zoo are relatively small. They can carry a load of about one pound of treats. So, we designed a drone to work with in the zoo—they have an impressive orangutan exhibit that's among the largest in the U.S., with these nice 90-foot-tall towers. But unfortunately, orangutans and the great primates are similar to humans. Put yourself in their shoes—if I give you Netflix and potato chips and free grapes, who is going to go out and exercise? That's why we have an obesity epidemic in the U.S. for 70 percent of the population. Overweight orangutans face similar challenges in a comfortable, air-conditioned environment where they constantly get free treats and food.

So, my collaborator Christopher Martin is a scientist who builds video game for orangutans to provide enrichment. They're just bored out their minds, so they play video games for cognitive and mental stimulation. To incentivize them to exercise, we get these drones to put grapes and apples up on the platform, then they climb up to get them. We monitor their activity budget, which means that we can track the displacement in distance and how much time they spend climbing, so we can help them become more active.

We're doing a whole lot of this with humans as well—trying to engage them in all different kinds of fitness programs. This is just

another way to gamify this experience for orangutans, as well as public education for zoo visitors. I think if you're able to see this technology interacting with the orangutans while a zookeeper explains this phenomenon, it promotes public awareness. Understanding the impact on animals helps us understand how we relate to ourselves.

We also created an experience using the virtual reality platform so you can immerse yourself in the environment and see how fast a cheetah can run. To understand their natural predatory behavior, you can either play as the gazelle or the cheetah, and then design your chasing path or the escaping path. To maximize the chance of survival, gazelles must engage in game theory calculations that maximize their escape pattern by generating truly random movements. But humans exhibit a lot of biases in practicality—it's difficult for humans to know how to generate a random sequence. Somehow animals can do it purely based on the chance of survival.

When you're the cheetah, you're looking for any sign of weakness—perhaps the gazelle is injured and they're to the right a little. It's almost like the penalty kick in soccer—you've got to choose one direction to jump and a one-second difference can affect your survivability in the wild. We use this platform to teach mathematical concepts, computational thinking, game theories, and what it means to generate a random sequence. But on the surface, it looks like a simple game.

Cybersecurity—the Perfect Storm!

KELLEY
ROUNDTABLE



February 9, 2022

Presented by:

Partho Ghatak, Chief
Information Security Officer,
Grant Thornton

I'm truly excited to talk to you today about information on what's happening in the world of security. I hope you find this information useful and that it will generate some level of curiosity as you shape your future and choose your career path. Today, we are going to discuss the patterns of incidents and breaches that we have seen in 2021, and look into some of the top threats that are hitting the industry and what they mean. We will also spend some time on how we can develop a robust information security program to combat these threats. Finally, we will wrap up what our future pipeline looks like. We want to know what we can do to encourage students like you to take up this profession, because we need your help.

What's going on in the world of cybersecurity?

I call it the perfect storm. Why? Because our business models are evolving and changing every day. We are growing our digital footprint by evolving cloud services providing agility and speed. We have regulatory and compliance obligations that we need to adhere to.

We also believe that we are operating in the most dangerous times that we have ever seen. We are asking our employees to defend data and critical infrastructure in an uncharted interconnected digital world. The foundation of the internet was never designed to block. It was designed and built upon trust, sharing, and collaboration. As security concerns continue to rise, there is a tectonic shift in how services are being re-engineered. The pandemic acted as a catalyst and forced our comfort zone outside of the four walls and traditional security perimeters we all knew. Remote workforce and virtual platforms have accelerated early adoption of real-time threat analysis, detection, and response, and that is still being formulated in the industry to ensure a secure IT infrastructure operation.

Our IT landscape is changing. Cloud footprint has introduced endpoints: our laptops. As the new perimeter, employees and clients were forced to work outside the traditional security defenses. Multiple cloud platforms such as Azure, Amazon Web Services, Google Cloud and seamless integration to drive user experience, have created new security challenges. The third component of this perfect storm is changing compliance and regulatory requirements. States and countries are

coming up with their own data protection laws. Fines and penalties are growing. More stringent laws are on the horizon to protect personal identifiable information (PII), personal health information (PHI), controlled and classified information, and other regulatory data. The Department of Defense Cyber Security and Intelligence Security Agency and Defense Counterintelligence Security Agency are creating new guidelines and new regulatory requirements that organizations need to put in place to keep up with the evolving threat.

The big picture has shifted. Hackers are now less likely to target payment data; and they are more interested in data that will impact business operations. If you think about it, it's not just about the third party information, it's anything that they can take down and hold hostage so that they can initiate a ransomware process. Financially motivated attacks continue to be the most common form of organized crime in this space. As most of us from the corporate world are working remotely, our workforce will continue to be vulnerable to evolving phishing and other social engineering tactics. Supply chain attacks are becoming rampant. These allow hackers access to our networks and systems, exposing them to third parties, such as in the SolarWinds incident last year. Cyber breaches continue to have huge financial consequences. The risk is disproportionately higher for smaller to medium-sized organizations, which tend to be much more reactive than proactive, and also have limited detection and protection capabilities. We also see more sophisticated attacks and ransomware that will continue to disrupt business operations and test organization cyber resiliency and preparedness. Compliance and regulatory requirements continue to raise the bar as legal and breach risk increases.

User credentials remain one of the most sought after data types, and as we migrate to cloud, the real cloud transformation can be achieved by developing a zero trust approach and adaptive security. Zero trust operates on three core principles: trust but verify, limit the blast radius, and automate contextualization, collection, and response processes.

Patterns

What are those patterns that we are seeing from an incident and breach perspective?

Denial of Service

A denial of service is when an attacker makes a machine on network resources unavailable to its intended users by temporarily or indefinitely disrupting services. During the pandemic we have noticed more people are accessing sports and entertainment from the safety of their homes. Unfortunately in the past year, digital pirates around the globe profited from this consumer demand by offering illegal access to digital content. Considering the television and film industries alone, there were over 80 billion visits to piracy websites in 2021. Since the pandemic kept more people at home, there was an increased amount of time people spent gaming. What does this mean? Criminals have more opportunity to target gamers, harvest credentials, and monitor and hack the online traffic. Last year we saw an increase in both credential stuffing attacks and web attacks. That leads to Denial of Service (DoS), and it went up by 50%. How do we stop this? From a security technical control standpoint, we deploy some of the controls at the edge level or at the security gateway level.

Web Application Attacks

It was another record breaking year of cyber attacks against the financial industry. Credential stuffing attacks are up almost 45% with SQL injection, cross-site scripting, local file inclusion. These are the most common web attacks that we have seen. Along with an overall increase in incidents, we saw new daily peaks. In the month of November, in one day, the industry reported 63 million attacks. Again, a huge entry point for the web attackers. What can we do? Secure coding practices are the best method to eliminate web icon duties. That remains a top priority for any Infosec program.

Social Engineering

We all receive phishing emails every day, every week, containing a phishing link, or with attachments that we are lead to click on. Email phishing and malicious phishing links/attachments can steal your credentials or deploy malicious code to install command and control techniques to seize your system. These tactics are overwhelming the industry. We witnessed the rise of phishing kits, introducing a whole

new approach for hackers. Crypto phishing kits, which target predominantly financial institutions and their calls to customers via SMS, have been observed to be very effective with our smartphone saturated communications environment. Each day mobile users open billions of text messages quickly and frequently, at a rate close to 100%. Crypto starts in the back by sending your SMS to victims, with reports of locked accounts or a new pay being set up. Just last year there were over 4000 campaigns that were launched through the crypto going out across SMS, and reported within a month. Security awareness and training can play a huge role to prepare our workforce to recognize these attacks and avoid the track.

System Intrusion

System intrusion references malicious activity in your networks or systems, such as Intrusion Detection Systems (IDS) and Intrusions Prevention Systems (IPS). IDS and IPS must be deployed to monitor traffic flowing through your firewall and networks.

Privilege Misuse

Privilege access means keys to the kingdom. Users with elevated system access are often targeted by cyber attackers to take control over the systems. Platforms such as privileged account management and insider threat monitoring programs should be put in place to detect and monitor privilege misuse.

Top Threats

Ransomware

Parallel to the global COVID 19 pandemic, there has been a growing ransomware pandemic. Ransomware attacks on U.S. organizations tripled in 2021 compared to 2020. Ransomware is a \$5 billion industry. They take their reputation very seriously and continuously advance their attacks with financial gain as their primary motive. Attackers are nimble, always learning, and have unlimited resources. They don't care about failings, but use them as a driver for success, eventually working out the formulas. That's what we see in the news every day. Ransomware not only subjects us to data theft, but is a business disruption. From this crisis, 30 nations have come together to discuss a counter-ransomware initiative focused on cryptocurrency

regulation, attack disruption, and international cyber diplomacy.

Despite these landmark policies and law enforcement efforts, it's safe to say that ransomware will remain a top priority threat, and it's not going anywhere. These ransomware gangs are becoming more and more sophisticated in how they select targets and how they carry out the tasks. Many organizations think that ransomware shouldn't be a concern if they have backups in place, because they can quickly bring business operations back online. But modern attacks are much more than encryption or data exfiltration to focus on maximizing disruption to business operations. In 2022, it is likely that we could see ransomware against target cloud service providers, as well as backup and archiving providers. Not only are ransomware operators expanding who they can target, but the group of ransomware attackers able to execute attacks is expanding. There is a rise of ransomware as a service. It gives low-skilled threat actors access to sophisticated malware streams, lowering the barrier to entry for the attackers. Ransomware as a service has expanded the criminal ecosystem to include lower-level threat actors who find and attack the targets before installing the malicious software. Threat actors are increasingly using bots to automate the initial attack. That gets them a foothold in the system. Ransomware groups are resilient. Even if government pressures force ransomware groups to disband or criminally charge them, they will continue to rebrand and pop back up. As an example, the group behind the recent attack on Colonial Pipeline shut down our gasoline system for some time. That whole group shut down after the attack, and shortly thereafter, BlackMatter emerged, widely believed to be a rebranded version of the same cybercrime group.

Phishing

Different tactics are deployed to seek credentials and install software. Email phishing is a very common way of getting access to credentials. You click a link and they will install malicious code that will monitor your system and start communicating in a command and control environment.

The other form of phishing that we are seeing is what we call “smishing”—SMS phishing. “Vishing” is voicemail phishing: receiving a call demanding that you need to “do this now.” There is always a demanding tone of voice urgency, for example, urging you to send your credit card information. In addition to those three types of phishing, the other form of phishing is deploying a USB drive: dumpster diving or leaving a USB on your table that you want to pick up and plug in. From a corporate world perspective, we are not in the office anymore, so those USB drops and dumpster diving have less impact these days. But phishing, vishing, and smishing continue to take a toll on the industry.

Unauthorized Access

The third top threat is unauthorized access. Once your credentials are compromised, it is very hard to detect who you say you are. So the industry is quickly moving to adopt multi-factor authentication (MFA), which has three components. The first is “who you know,” for example your user ID and password. “What you have” is owning your device. “Who you are,”—the third component—is based on biometrics. The industry is bringing together a zero-trust model, which is “trust but verify.” This will allow organizations to combat and implement least-privileged access effectively for secure remote access using a tiered network segmentation approach enabled by strong authentication and balancing business needs. It will help set up distinct encryption time when traffic is tightly monitored, user authorization, device certification and MFA.

Supply Chain

As we all are using a variety of different vendors to do business and provide services, we often use trusted third parties for their service and/or platform. A supply chain attack targets a trusted third party to offer some sort of services or software to run our businesses. Managing our supply chain ecosystem and monitoring their security posture is becoming extremely important as part of managing our risk landscape.

Vulnerability Exploitations

I feel this is the most challenging area that we have, as vulnerable systems and



architecture can be a leading entry point for cyber attackers. This is one of the most challenging areas to keep up with because vulnerabilities are being reported on a daily basis, and the systems management team or IT team is continuously patching. But we just cannot keep up with the pace in which these vulnerabilities are being reported. It is important that we have a prioritized approach. We look into our asset inventory. We look into what matters most, what a crown jewel looks like, what is exposed to the Internet, what is inside the perimeter, and then go through a privatization process from a vulnerability remediation standpoint.

Protect to Enable

We feel that it’s a cyber war out there. We are fighting this battle every day, every week, every month. So with all of these patterns and top threats that are hitting us every day, what can we truly do to protect our business and enable them in a secure manner? How can we build an effective program that continuously monitors and keeps pace with the speed of business as the threat landscape continues to evolve? Like every program, we need to have a strategy. The goal of this strategy should be to develop a program that is number one business aligned, cyber resilient, and regulatory compliant. It should be built on the foundation of three key principles.

1. Protect what matters most. We know we cannot protect everything, so how do we identify the critical infrastructure or set of

critical systems we cannot survive without. It’s important to know your critical assets.

2. In-depth security structure. Think about developing layered security. So if one defense is breached, the next defense comes up, and you can hold the attackers at bay. If the second one goes down, then the third one comes up. An in-depth defense approach helps fight the cyber attackers.

3. Security by design. As we are developing applications and solutions, we need to keep a “security first” mindset. We need to start making security requirements a part of a project, solution, or production whatever we’re designing or building, because security after the fact can be quite expensive. If you start baking in security with business requirements, oftentimes it eliminates the vulnerabilities being introduced in the production systems.

With these three core principles, we look at five core functions: identify, detect, protect, respond and recover. These are predominantly adopted from a NIST cybersecurity framework that is centered around enabling people, process, and technology solutions in a cost-effective manner that can effectively respond to these evolving threats.

Identify

This is commonly known as governance risk and compliance (GRC). This is a

foundational component of a security program that we want to build. There are five subdomains. The first one is a strategy and operating model that defines how to develop a cyber-resilient security program aligned with business needs, and then adequately protects business interests against an evolving threat landscape. The second piece is program governance. We want to establish a set of security and compliance controls to protect confidentiality, integrity, and availability of data and information systems. The third component in this space is risk management: identify and manage your crown jewels. It is important to know your risk, how you mitigate your risk, and then how you manage your receivable risk. The fourth is supply chain management. Managing risk exposures is important, and protecting sensitive and confidential information, because if there is a breach with your vendor, then that breach becomes your breach. Ultimately, we as a business are accountable and responsible to protect our client and customer information. The fifth component under the identify section is awareness and training. As a security program, we must develop a comprehensive awareness and training program to prepare the workforce to combat phishing and social engineering tactics.

We believe that employees are our greatest asset, but in information security they are also considered the weakest link in the security chain. Our workforce is our first line of defense to combat cyber attacks, and we must ensure that we have a comprehensive awareness and training program in place educating users on these advanced social media techniques.

Protect and Detect

This is the architecture and engineering unit of a security organization, and this is where all the cool stuff really happens. The team establishes architectural blueprints, security standards, benchmarks, the design and build, and the deploy secure solutions. Some of the key technical controls that we deploy as part of the security organization are email security gateway, cloud or head security, and endpoint detection and response. The endpoint is a laptop, so we put agents on your laptop that are continuously monitoring potential malicious activity.

We look into data loss prevention and deploy network security. Application security involves secure coding practices and how we can continuously scan the code that is being developed. Then before it gets deployed, scan again. The two types of application security are static application testing and dynamic application security testing. That is very important as it will limit vulnerable code being introduced into the production environment. Server and database security is very important to monitor the servers and databases. That’s where your data resides. Access control, again, is a key element of a security program. Using Role-Based Access Control (RBAC) allows users to come in and access only what they need for their daily job.

Security incident and event monitoring system (SEIM) is the platform that collects data logs from all the IT infrastructure, applications, and systems. It’s the hub of the security technical stack where everything is ingested. The platform correlates billions of data, and then identifies what malicious activity is going on. It creates incidents so that it’s not humanly possible to see what’s going on, if you have hundreds of thousands of systems, depending on the size of your organization. So SEIM helps us to streamline and go through all the logs, eliminates the false positives and looks into the real stuff.

Respond and Recover

This is our cyber defense management. Typically, this is the heart of your security program. It runs based on your security operation center model. They depend on SEIM to process billions of event logs being fed across the IT infrastructure and systems. The primary function of this platform is to monitor, detect, investigate, and respond to cyber threats around the clock. This job is very, very demanding, as you can imagine. This team never sleeps. They continuously scan and hunt the environment for unusual behavior and remediate known vulnerabilities. Automation tool orchestration and machine learning are some of the key ingredients to run an efficient security operation.

Build the Future

We are seeing an unprecedented scarcity of security talent in the marketplace, and we need you. You are the future, and I hope this discussion will make a difference and some of you will consider taking up cybersecurity as a profession. This is a growing area. This stuff is not going away. The cyber attackers will continue to attack and we will continue to defend. It’s not a matter of if, it’s a matter of when. They will get in at some point of time. Our cyber resiliency is defined by how quickly we can recover the aftermath of a successful cyber attack, and how quickly we can put business on track. From a CISO role perspective, I have not seen any C-level position that has been under more pressure and undergone more change in recent years than the role of a CISO. Cybersecurity in today’s world is a business priority, and it will continue to remain so in the foreseeable future.

College degree (MS - Cybersecurity)

I have seen the college degrees that are available and I found IU’s Master of Science program in cybersecurity to be extremely valuable. I encourage you to take a look if you are considering cybersecurity as a profession.

Certifications (CISSP, CISM, CRISC, CISA, CEH)

There are valuable industry certifications available, such as Certified in Cybersecurity. Certified Information Systems Security Professional (CISSP) is one of the gold standards of security certifications. Another certificate available is Certified Information Security Manager (CISM), from the Information Systems Audit and Control Association (ISACA). Additionally, Certified in Risk and Information Systems Control (CRISC) looks into a risk management program. Certified Information Systems Auditor (CISA) is a good certification to have if you lean towards an audit practice or information security audit practice. Certified Ethical Hacker (CEH) is a very valuable certification that allows you to think like a hacker. It creates that hacker mindset to help you step back and think two steps ahead of them and protect the organization. I seriously encourage you to explore these options and choose this as a career path. I’m very excited that some of you will.

Student Case Competition

February 18, 2022

Held at the Kelley School of Business





Rob Buhman, Principal, Enterprise Technology Strategy & Innovation (Information Technology Service Management)

Khyati Nayak, Agile Program Management Solution lead

Improving systems through the DevSecOps model

Rob Buhman: I represent the technology transformation “solution family” in Grant Thornton’s public sector practice, where I lead a lot of the solutions. One of the solutions we wanted to introduced today is called DevSecOps, which some of you may already be familiar with. “Dev” stands for development, “Sec” for security, and “Ops” for operations.

DevSecOps comes from the manufacturing world. It adapts a lot of the concepts from Lean manufacturing, such as the theory of constraints, removing bottlenecks, and managing working process, but applied to IT. The whole purpose is to try to improve speed to delivery and quality, while reducing risk.

But it does require a significant cultural change or cultural transformation to manage this. It’s important in AI to remove errors introduced by humans, and DevSecOps tries to automate a lot of things for the same reason. If we can automate out error, that’s the ultimate goal. If you have interest in this, there’s a great book called *The Phoenix Project*. It’s not very technical, but it walks through the life of an IT director who is plagued by lack of resources and unrealistic timelines, and manages it all through DevSecOps principles.

Kathy: We’ll look at dev cycles by looking at the federal government’s healthcare.gov website and Affordable Care Act. I’m sure you are familiar with the law that was signed in 2010 to make health care affordable and available to all Americans. It also mandated that all citizens carry health insurance. The Department of Health and Human Services was tasked to build a website where citizens can apply for health insurance at subsidized rate and based on their income and whatever options are available to them.

They worked to get the site up nationally in October of 2013. It had been publicized all over the country. Everybody was to start creating their accounts to apply for insurance, but when it went live on October 1, several issues came up. People could not create logins, and they somehow miraculously managed to create a login, they were not able to create an application. Things slowed down across the board.

So how did this happen?

It was such a big deal for the government. They spent millions of dollars setting it up. There were many factors behind this. For starters, the processes were not leveraged properly, and the requirements are not properly understood. And, I think most importantly, user testing was inadequate. When it was opened to the whole country, so many people were applying at the same time, things started breaking down.

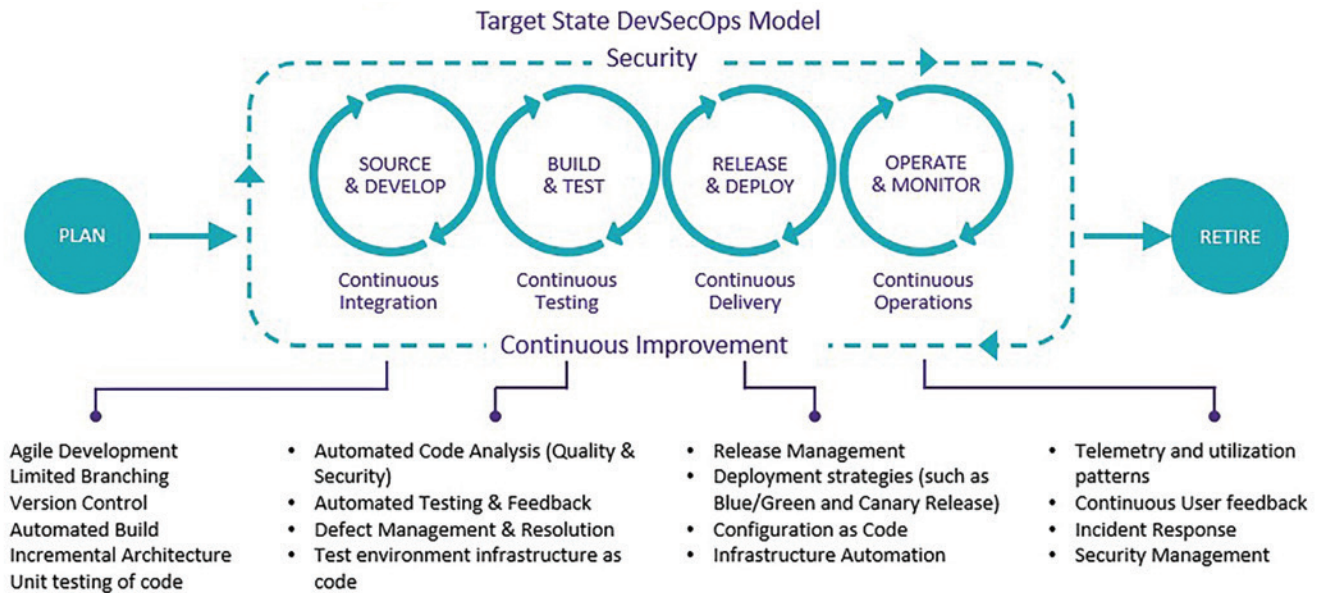
So how do we avoid something like this?

Leveraging DevSecOps would be a good answer. DevSecOps ensures strong collaboration between development, security, and operations so that there is a clear understanding of what needs to be done, what the requirements are, what is working, and what is not working. That way, when the software is released—or deployed to another environment—it is high quality, with faster and smarter security. It is a better utilization of resources with a significant reduction in errors, which can be very expensive.

So, what is this golden ticket called DevSecOps?

How do we go about it? It all started with the concept of DevOps. Before anyone adopted this approach, the traditional way was for developers to write code, test it in local environments and some staging environments, and then forget about it. Then it was up to the operations team to integrate it with the existing code. Then, when the box team is trying to build it and gets ready to ship it, things begin to fail or not work. When they reach back out to the dev team, they are told “no, it worked perfectly on my machine. Not sure what you guys are doing, but it’s nothing to do with our site. It’s perfect.”

The idea of DevOps ensures collaboration between developers and the infrastructure. That means they’re always working hand in hand, and nobody is saying “this is not my responsibility.” They are working together—it is a joint ownership of the product. If it doesn’t work in one environment, and it does work in another, that is something that you can learn from. DevOps combines developers from Lean Six Sigma manufacturers focusing on



frequent testing and feedback with HLM, which is developing in small bite-sized chunks. That way we are working on the totality at all times, and leveraging modern software tools that automate most processes associated with software.

The difference with DevSecOps is that security is added to the mix of all the DevOps tools. It requires us to think about security and compliance upfront and include it as a part of the design of a software.

DevOps is built on the evolution of software delivery. When software development processes were introduced to overcome the problems of waterfall operational development, people jumped on it and it started picking up steam very quickly. That improved that application processes significantly, but the operations and the infrastructure problems tended to linger. So that’s when DevOps was introduced to that side of the house—to address those challenges.

So how do we do DevSecOps?

There is continuous integration rather than integration of code and data with the code repository at some later point. It doesn’t sit on the developer’s machine for a long time. Anytime a developer is confident that they have created a good piece of code, it is integrated. It is basically a software development practice where code is called into a central repository. And unit testing is not performed just on the code on my machine, but also on the code that is

checked in to the repository. It involves continuous testing, as opposed to testing at the end of a predefined cycle, which is typically very long for traditional approaches.

To achieve this continuous testing, automated tests are executed to check lambda requests to update and fix the problems as they are submitted. As you check in, certain tests are automatically performed, which is possible only with automated testing. This process also involves continuous delivery, as opposed to delivering a backlog item. It can last while all types of changes to get into production. Continuous operations allow for improvements in this process by continually turning it and correcting problems. We want to ensure security by leveraging AGI with six sigma and cybersecurity concepts into all these steps. And all these processes sequentially, and strictly under waterfall, but now, we want to make sure that they’re continuously and iteratively executing.

Continuous testing and all analysis—which is automatic scanning—for purposes of developing a program before so you don’t need to run a program to see if you want to check for certain levels of validity as well as compliance expected for the standards. When you do the automatic code analysis, automated testing is the application of tools and technology to test with the goal of reducing testing efforts, which basically ensures faster and affordable and better quality software is produced.

Defect management is managing and provisioning of infrastructure to manual processes. Continuous delivery involves risk management, which is basically the process of planning designing, scheduling, testing and controlling software or beds. It is not just an ad hoc thing—there is a process. All that is taken care of when we take an integrated production environment. Deployment strategies allow for automatic deployment to staging and production environments with different versions of code so that there is better testing done. And then the next phases involve using data subjects of software to only a subset of users to instruct that all things for that end user testing is performed with more features. On submission as a board, it’s a practice of managing configuration files in our repository as your source or site. And infrastructure automation allows for our infrastructure changes to be handled via code rather than manually. And we’ll move on to the last continuous operations, which involves the elementary and utilization patterns which collect data from multiple sources, where basically the data collection patterns for monitoring and batch identification on problems, user feedback, response and security management factors.

It is important to note that each of these practices and processes are designed to support the delivery of high-quality features. As you can see, these processes involve continually being able to respond to unexpected change.

Roundtable Discussions

March 30, 2022

Held at the Kelley School of Business



Spotlight: Roundtables

GT-IDEA hosts **six** roundtable discussions each academic year. These roundtables feature speakers from Grant Thornton and cover a wide array of topics. Past topics have included ESG (Environmental, Sustainability, and Governance), Cybersecurity, and Healthcare.

Roundtable events provide an excellent opportunity for students, faculty, and business leaders from Grant Thornton to engage in and discuss trending topics.

Each of our three schools (the Kelley School of Business, O'Neill School of Public and Environmental Affairs, and the Luddy School of Informatics, Computing, and Engineering) host an event each semester. Students are welcome to attend all events. Roundtables are also a great chance to explore the other schools on campus!

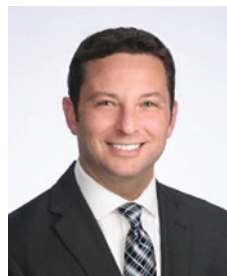


The Case for Project Management

FACULTY ALL-DAY
COVERAGE

APRIL 8, 2022

Presented by:



Scott Dalessio, Managing Director, Public Sector Digital Transformation & Management / Agile Transformation & Management Solution Grant Thornton

I've been with Grant Thornton for 13 years now. Within my role as the leader of our technology transformation service line, I'm responsible for our agile and product management solution offerings. Throughout my career, I've been in a variety of areas associated with product delivery, mostly within federal, state, and local government, although I also have some commercial experience.

I'm not technical. I'm not a coder—it's a foreign language to me. I've always been on the functional side of things. What I do—and what we do at Grant Thornton—involves several different disciplines, including organizational change management, organizational transformation, customer experience, and human-centered design. I've always been involved in IT delivery and IT project management. We'll talk a little bit about the difference between project management and product management because there is a big difference between the two.

The way that we move from project to product is accelerated with the adoption of agile principles in IT. For those that don't know the background, the Lean-Agile mindset was originally developed for Toyota production systems back in the 1960s, so it was designed for manufacturing. Those principles that have crept their way into IT delivery.

I'm fascinated by the way agile product management customer experience works because it's all about group dynamics, organizational behavior, and what makes people tick. How do we work together as a team to accomplish a common goal that delivers value, whatever that value might be. In the government or public sector, it's delivering value to the constituents. In commercial it might be helping our customers so we can increase market share. Agile is a methodology. And there are multiple frameworks of agile—different flavors of it.

In the old ways of doing IT delivery, we typically refer to it now as waterfall. To give you an example, as an organization, we may spend six months trying to understand what it is that our business or our customers want. And we get a whole list of requirements—business function requirements, and at the end of that six months, we have a document. We then turn that document over to a bunch of developers and they usually convert those business and finance requirements into

technical requirements. And then after another six months, the developers start coding it. After about six more months, you've got some code, that's great. And then you spend the next six months going through different types of testing to ensure quality before you deploy it to customers.

Now you've gone through a 24-month period from inception to deploying value to your customers. And that's just too long. The other key component of this is the question of when you talk to the customers, when they interact with that process. In the old model, it's in the beginning, when you're getting those requirements for them, and maybe at the end, when you're getting them to pilot or test the software. If anything goes wrong in the middle, you might have to go back to the beginning, so there's a whole trickle-down effect.

If you look at IT delivery over the past couple of decades, the statistics out there say that 56 percent of IT products fail to deliver the value that they were intended to deliver. More than 90 percent of don't meet their schedules or are over budget, so there's a lot of waste involved.

The idea of agile is that we reduce risk, increase return on investments, and deploy value by doing all these things incrementally. In these cycles, we do two-week sprints. We are going from something that's an idea to deploying potentially shippable products at the end of the two weeks. A simple example of this could be a print button on some form on a screen. Or we have some new data that we want to collect.

We may not ship it and deploy it every two weeks, but if you look around here, every one of us has a smartphone. When you plug your smartphone in at night, you are constantly getting new software. Many of these firms have gotten this agile process down. And the idea is that they're constantly adding and deploying new functionality to add value for the customer.

This may date me, but when my wife and I got engaged, we started to talk about merging our bank accounts. She had Wells Fargo at the time, and I had Bank of America. She had this cool new feature where she could take a picture of her check and deposit it into her checking account. Bank of America didn't have that. But Bank of America deployed an app that let you check your

balances and transfer funds across accounts on your phone. If Bank of America had waited until they had that check deposit functionality and didn't deploy anything they would have lost a lot of customers to Wells Fargo. In the business world, there's a cost of delay in doing new things.

Because the pace of business is what it is today, anyone who waits for 24 months to deploy value to a customer in the commercial world is out of it. In the public sector, customers—the constituents of this country—are demanding better access to information. The need to be able to do things during a pandemic has sped that up because of all the things we weren't able to do in person for the past two years.

We live agile every day. To use another example about me and my wife—we are both working professionals. We have two young children at home, and we don't get a lot of time to do things during the week. When we come up with a plan of attack for the weekend, we know we've got to go to Home Depot, take the kids to swim class and basketball—we have a whole list of what we're going to do on Saturday and Sunday. We prioritize them based on what's important to us and we sequence them according to what makes the most sense geographically.

Inevitably, on Saturday morning, my daughter tries on 15 different little dresses because she can't figure out what she wants to wear, and my son doesn't want to put on his shoes. Then we get caught in traffic. The next thing you know, we're over two hours behind schedule.

So, what do you inevitably do? You reprioritize and say "okay, what can we get done today? What is the most important stuff that we have to do? Let's get that done. And we'll push the least important stuff off to next weekend." That's agile. With predictive planning, no matter how prepared we are, no matter how we think our weekend is going to go, it never completely goes that way.

In something as complex as IT product delivery, there are so many moving parts that you could plan the heck out of it and it's never going to go the way you expect it to. A

lot of times, our clients will say that they are going to re-baseline their project plan, and if things end up off schedule, they're going to re-baseline items. All they are doing is spending time and energy upfront trying to plan something that's never actually going to go to plan. Agile acknowledges that change is just part of life, and we need to prioritize things to deliver value rapidly.

When you're delivering and testing incrementally, you're continuously learning to do things in small cycles so that you can pivot. When companies go too far down the path and realize that they've invested so much money in one path, the tendency is to just keep going. Then you're a couple million into an investment, that, in the end is a total failure. The idea of agile is to learn, fail fast, and pivot. It can be used for existing technologies where we are modernizing existing products, or for the revolutionary things where we're trying something that is blue sky.

For a long time, there has been this perception that commercial markets and industry were far ahead of the government in adopting these methodologies and frameworks, but the reality is quite different. Sure, you have Google, Facebook, or Apple—these large companies that seem extremely innovative. But a lot of other companies are not doing these things or not doing them well.

I want to preface this by saying that agile and product management principles are not a silver bullet for hairier problems. Many of you, I'm sure, you've heard a little thing during the Obama Administration called healthcare.gov, and what a complete disaster it was when it was deployed. That was a failed agile implementation. There were several reasons—there's a 100-page Government Accountability Office report on

it, but I'll give you a nice executive summary. An organizational shift in mindset, not just a process shift—and the Department of Health and Human Services was not prepared to do that. The systems integrator who was developing healthcare.gov had never done an agile project before, but they wanted to do this rapidly. They took on the big thing all at once and failed.

We are working very hard to help our public sector customers adopt organizational transformation. It started with agile, which I

look at as just the construction—how we get an idea and how we try to get new code in play. But the deployment of those things has not been able to keep up with the change of pace of code coming out. Thus enters the development, security, and operations (DevSecOps) approach. Now we have to build security and so we've added security. Then we really need to incorporate the voice of the customer. But how do we bring human-centered design and customer experience to the beginning of all of this and integrate it throughout so we're coming up with something our customers want or need? There is a tremendous shift with all these moving parts.

The US Patent and Trademark Office is one of our primary clients, and they are one of the most advanced in this in the federal government, because they made a big investment in and decision to do this. They've shifted everything—we're talking about real business agility. It's not just the code, it is coming up with contracts for vendors that have performance metrics about quality and making sure things are right. How do we take allocated dollars and invest them properly, so if things shift, we can adjust that funding based on prioritization.

Statistics on IT delivery over the past couple of decades say

56 PERCENT of IT products fail to deliver the value that they were intended to deliver and more than

90 PERCENT don't meet their schedules or are over budget, so there's a lot of waste involved.

The idea of agile is that we reduce risk, increase return on investments, and deploy value by doing all these things incrementally.

Trust and training in artificial intelligence

FACULTY ALL-DAY
COVERAGE

APRIL 8, 2022

Presented by:



David Crandall, Professor of Computer Science
Luddy School of Informatics,
Computing, and Engineering

Director of Luddy Artificial
Intelligence Center

I work on computer vision, artificial intelligence, and machine learning. I am currently leading a project involving untrusted artificial intelligence. This intriguing program involves 50 faculty, students, researchers across three different universities and four different campuses: Notre Dame, Purdue, IU Bloomington, and IUPUI. Our overarching motivation is to understand how AI, and machine learning in particular, is working really well and where it's not.

We started out by listing all possible things that can go wrong in an AI system. There's a large number of these in other areas of computer science, software engineering, and systems engineering. We have ways of thinking about what can go wrong in a system, and we're still developing this for AI and machine learning. Technique systems in particular, where there is a lifecycle for a machine learning system, from program requirements, to collecting training data, to learning a model, to training that model, to having that trained model, to deploying it in systems, to sustain itself in that system. Throughout that process, many things can go wrong. There are inherent problems on the bottom. It's really hard to collect bias-training data. AI systems lack the context in reasoning that people use to solve the same problems. The measures of certainty in the system are not good with these types of things. There are also the external threats that build upon fear, like people or other adversaries that might be actively trying to attack models. They do this in various ways: poisoning training data, inserting Trojans into various parts of things, hacking systems that modify how the system works, and so on.

These types of potential circumstances inspired this project. We started conversations with the experts of the Navy, specifically at the Naval Surface Warfare Center at Crane. Crane helped us identify what they perceived as being the most urgent AI problems from the government's—specifically the Navy's—perspective. We identified five hard problems, things like human trust and AI machine learning models, like how to understand how to make sure that the trust is commensurate with how much should actually be trusted; defining and measuring metrics; testing different protocols for AI systems and understanding sources of bias in in data; development of formal risk modeling for AI systems; and then, perhaps

sort of cutting across all of challenges, developing an AI workforce and talent base.

This set of urgent problems led to us receiving government funding in 2021. This project involves a big team of people from Crane, IU Bloomington, IUPUI, Notre Dame, and Purdue. It is a big project that receives about \$5 million per year, with IU receiving almost \$2 million.

During the first year, we formulated long term goals and identified concrete research problems. A large amount of effort has been dedicated to recruiting students that represent different levels of undergraduate and graduate studies to both conduct research and to educate them to make sure they're getting the right kind of training necessary to go into the workforce in an AI-literate way. Our team includes people specializing in computer science, statistics, psychology, engineering, and informatics. We have about 30 students involved in this project at the moment that are scattered between all four institutions.

Because this is such a large, complicated, involved project, we're still trying to understand how to organize ourselves and define what we're doing. We're interested in trustworthy AI, which is a topic that may never be solved. We have six dimensions of trusted AI problems to consider. We did not invent these; they are borrowed from the government, but you can think of these six dimensions as safety and robustness, explainability of AI models, accountability and auditability, environmental well-being (which also incorporates things like computational demands, energy demands, etc.), privacy and non-determination, non-determined and non-discrimination, and fairly unfairness. These six dimensions apply to all the different stages of the machine learning AI system development and deployment lifecycle, from data collection, to preparation, to extracting features, to training, to inference, and so on.

In an even higher ring, we consider the overall AI system life cycle of development. We started to think about this complicated landscape of defining a trusted AI system, which we are still working to define. We do have 11 specific projects across institutions involving about 50 people who are looking at types of specific instantiations of these different dimensions.

The Role of Children in AI

One project that students are involved in is aimed at characterizing and improving neural network robustness. While we have many different threads of research related to this topic, we're particularly interested in the role that children play in developing trusted AI. This study is a collaboration with developmental psychologists at IU who are interested in how kids learn to see the world. In AI, we are also interested in this because, as we develop tools that help us to better understand child development, we might also be able to make our AI systems smarter based on this knowledge.

However, it's important to point out the differences between the "hardware" in children and AI. Kids have chemical reactions in their brain, not digital circuits. The way that kids learn is by seeing things in their natural environment, by playing and interacting with family, and getting information about objects in a natural way. However, if I want AI to recognize, say, a car, I go to the internet and download a million images of cars to show them to the machine learning model.

Developmental psychologists are interested in characterizing the properties of this training data because of how different it is from the training data we use to train computer vision models. As a result, they have developed a kind of methodology in which they can bring a parent and a child into their lab to play together in a natural setting. There is a camera on the kid and a camera on the parent. The cameras also have eye gaze trackers to see exactly what the kid is seeing and exactly what the parent is seeing at any given moment.

Effectively, it gives us a million different possibilities with what to do with the data. Once the data is examined, it becomes very clear that the parents and children both see completely different things within the same environment. For example, the kids see the objects much closer than the parents, which can be simply explained by arm length. Children are also less deft with motor skills, which results in them getting a diversity in perspective of the object.

From here, we can do computational experiments using Agent A (the parent) and Agent B (the child) to collect information within their environment. The result is training data sets A and B, which we can use to independently train a computer vision model to see which set of data works best. As it turns out, no matter how you slice and dice the data, the kids collect the better training data.

We're working on trying to find the best structure of a training data set to help us better train AI. We've done various experiments and visualizations in an attempt to accomplish this. For example, where, for one particular object, this is like the blue toy, car, or blue car toy. We took all of the images of that car that were seen by the toddlers on the left and the parents on the right and projected them into a two dimensional space using something



called multidimensional scaling. It tells us that toddlers not only get more diversity in the training data than the parents, but it also shows this core of very similar images near the middle—like canonical views of objects—plus a whole bunch of outliers that they get when they do things with objects, like throwing them at the parent. That mixture of a core, some homogenous set, plus a set of outliers seems to be very important.

We're also working on applying the same techniques to computational experiments for other sets of data. Can we actually manipulate the statistical properties of that training dataset to make it look more like the kids' data? And if we do that, does it end up improving the classification results? The answer is yes. If we vary the percentages of the homogeneous or heterogeneous training data set that we observed in the kids, we get significantly better performance by about 5%.

Though these are preliminary results, it's exciting to have proof that studying how kids learn can inspire interesting and unexplored areas in computer visioning and machine learning to develop more reliable AI.

No matter how you slice and dice the data, the kids collect the better training data.

Putting worker interruptions to the test

FACULTY ALL-DAY
COVERAGE

APRIL 8, 2022

Presented by:



Jorge Mejia, Professor,
Operations & Decision Making
Kelley School of Business

I'm a professor at Kelley teaching for the Department Operations & Decision Making, an interdisciplinary focused on how operations and information systems work together. I've been working on a project with people who bring a cross-section of experiences to the table, including computer science, computer engineering, operations, and psychology.

During the pandemic, I played a lot of video games, like so many of you. I love them. I had a very frustrating experience while playing FIFA with one of my best friends. I usually beat this guy, which is always a good time. Then he moved into a new place where he had this amazing gigabyte-speed broadband area, and I still had my old Comcast 25-50 megabytes speed. So he beat me. I experienced this thing that gamers are familiar with. I had to slow down my frame rate. I started to notice my confidence and my abilities were just not translating. I was overcompensating and felt like I was not in the right spirit to play the way that I normally do.

The point that I'm sharing is something that many people are familiar with: worker interruptions. It's something we all deal with because we all use computers for work. If things don't move as nicely as you like them to and you experience an interruption, you must adapt. Whether we are gamers, scholars, managers, staff, etc., we adapt.

Something really piqued my interest as I was researching more around this topic of frame rates on performance. Gaming companies are aware of this, and that's why they push the idea of having workflows when you're gaming that work really well. This little video really clarified the subject for me. Essentially, if you ask somebody to ride a bike or a car on the video game with instructions to move forward as fast as they can so as to cover as much space as possible, the folks with the higher frame rate go faster. They get their aim and cover a longer distance. There's no actually good technological reason for this in theory. Whether the car is moving with a slightly different frame rate should not affect how much space there is to cover.

Being a professor who teaches computing fundamentals, I created a pilot study with my students. There's an opportunity for students to earn extra credit by participating in the game. I told the students that the extra credit points

would be based on how fast and how far they could travel in the game. The students were really excited about this opportunity. When you think of the controls, keep in mind that there is no way to fail. They are just moving forward.

But then I started to manipulate the system. I started disrupting the frame rates. I began to create actual interruptions, like "Please wait. The game is reloading." As you can imagine, they got frustrated. The one thing that I noticed is that, while experiencing the interruption, students moved the stick or the direction of the car. In this simple setup, you're in a car and you just have to move forward without touching the steering wheel. However, even with minimal disruptions to the system, the students go left or right, apparently feeling the need to do *something*. This scenario motivated us to dig deeper to find a way to polish the study for a business school journal—which hasn't been easy. These are a couple of early conclusions we took from the pilot, so don't take it as formalized.

System failures create poor performance

We observed when systems fail, performance worsens. We want to know if we can quantify this performance drop. We're very familiar with machines failing, but it's harder to make the case they impact us on the things that matter to us. Can we cross that gap? We found that this question hasn't always been answered in the context of the systems that we're using. The other thing that we wanted to do is create transparency. Ultimately, a manager wants to know what to do about system failure. Finally, we incorporated a psychologist into the study. He pushed us on why these hypotheses affect confidence. What happens when one of these things that we've interacted with fails? What is it? What does it do to us as workers, as people who are writing essays, as people who are analyzing data, etc.

I would like to make the jump that it is not just X-Box Live, that it isn't just my friends and I. If you're committing code on GitHub, as we do in more advanced classes, we're pretty well-versed in the fact that the software and systems that we use have some downtime. In my coding class, we see that. In technology, we talk about redundant systems. What happens when your first system fails? I still have to teach a class, so I need to have a plan prepared for where we will go next.



If you're thinking about a global scale of failure, think about how Zoom doesn't always have the performance that we'd like. For example, imagine being in a meeting and someone continues to ask the same question, and you're trying to tell him that you heard him. The internet connection and frame rates can create some very uncomfortable moments. I'm not sure why we don't talk about these outages more. Part of it is that people who love technology don't love to talk about the systems they are proposing to you will fail. However, if we take a slightly different approach to it, I think we can think about what we should do to manage these interruptions.

If I have not been able to reach you at the level of gaming nor with the level of outages within systems that you use, then perhaps I can evoke some trauma another way: the spinning ball. If this doesn't break your confidence, I don't know what will. We want to quantify this on a tangible task that people care about. My immediate reaction to a problem is to ask what we can do about it. We have two very simple answers.

First, people who do hard things that experience failure a lot are paid more. It's an economic argument to say compensation should account for the amount of failures an employee will undergo. Another option is to be transparent. When people experience failure, we can tell them the slowdown they are experiencing will come to an end. Think about a progress bar when you're downloading an app.

Interruptions affect workers psychologically and emotionally

We have also been asking why some psychological drivers are affected as we deal with recurring system failures. In economics, the literature about worker productivity and work interruptions is massive. For example, if a machine breaks on an assembly line, it may actually increase an individual's productivity because it allows them a break from the monotony. I don't want to downplay integration management as we talk about transparency. If you see someone working hard in a service context, someone who's hustling, sweating, acting efficiently, you feel good. You think the service is good, and your hamburger might even taste better. If you have an issue that's resolved appropriately, you feel the service provider is doing a good job. If an organization is transparent about their efforts, it can lead to a number of positive outcomes. Another point to touch on is how these interruptions and interactions with technology affect our emotions.

So there are a couple of things you can learn here. One is that our solution at schools is we shouldn't have interruptions. Another idea, one that's acknowledged much less but may be the more nuanced answer, is that your plan may not work out so you should actively manage your interruptions. Think about the blue screen of death. It's come a long way. It's so more transparent now. Rather than looking at the blue screen

of death, we see the progress via the progress bar that tells us it's 20% complete. It's an example of better communication surrounding the problems that we're having.

We ran an experiment with students and other subjects where we asked them to go through a couple of scenarios to do something tangible. One thing is straightforward and easy. The other one is a bit harder and has implications for customer service and service operations. The most popular AI task is to make a better classifier. This work is about making a better classifier with the humans who train the classifier. The subjects are presented with different scenarios. The simpler task is to better AI's image classification ability, while the more difficult task involves training a chat bot to improve communication with customers. Within these scenarios, we offered two different means of compensation: fixed pay (students working for extra credit) and pay-for-performance.

When a subject comes in, they're asked to train the image classifier or the chat bot. We set the compensation structure prior to the experiment. Then, in the middle of the experiment, we begin to manipulate the controls. We haven't changed the expectations. If you think about the controls, there is no failure. You go through the process of training your classifier, then you get paid or earn your extra credit. When we introduce failure into the mix, we do so by being transparent. We share that there is an interruption and that it will be corrected without sharing any details about what's happening. The third variation is to introduce failure while omitting transparency by neglecting to share details of the failure.

Ultimately, we observed that, without transparency, users who did well, performed worse after the break. There is nothing to stop you from going to your high rate of success. However, when you introduce transparency and link it back to the time of the breakdown, users returned to a high rate of success. We see the same trend across both fixed-pay and pay-for-performance users. In the end, we propose that confidence is impacted by the failures in a system.

Examining how decentralization affects violence against women

FACULTY ALL-DAY COVERAGE

APRIL 8, 2022

Presented by:



Claudia Avellaneda, Associate Professor, O'Neill School of Public and Environmental Affairs

I came to this country from Colombia 22 years ago without speaking a word of English. I wanted to study political science to help me understand why some countries were so developed while others are so undeveloped.

I wanted to start off by studying the municipalities, mainly because, at the time that I came here, most Latin American countries had adopted a particular type of reform known as “decentralization.” Only 26 countries in the world live by a constitution. The others are mostly centralized—like most of the countries in Latin America.

Many of the countries that moved towards decentralization did so to delegate some responsibilities to the municipalities, most of which lacked the capacity and financial resources to assume their new responsibilities. During the last 30 years, the municipalities have gained experience in both governing and managing money. I have studied municipalities across 20 Latin American countries to better understand what works in municipal performance—and what doesn't.

My motivation for this research is the very salient topic of violence against women, some that world leaders have proclaimed as a public health issue and a public administration concern. In 2015, these leaders vowed to eliminate all forms of bias and discrimination against women and girls by 2030.

My data helps pinpoint the most dangerous countries in the world for women. This study focuses on six key areas, including discrimination, health care, cultural traditions, sexual violence, non-sexual violence, and United Nations human rights violations. Using these six key areas, every country in the world was ranked to further examine which countries were the most dangerous for women. India ranked as most dangerous, followed by Afghanistan, Syria, Somalia, Saudi Arabia, the Democratic Republic of Congo, and Yemen. Surprisingly, the United States ranked as the tenth most dangerous countries for women.

While this is a global issue, my focus is primarily on Latin American countries. As you can see,

rates of homicide in women are very high in Latin America compared to both high income and African countries. In all regions, we see a varying number of women who experience physical or sexual violence from a partner over the course of their lives.

We see also that there is a lot of variation in cases of women who experienced physical or sexual violence for a partner in their lifetime. Specifically, Brazil has one of the highest rates of violence and murder against women in the world. Between 2007 and 2017, cases of violence and murder against women grew by 30.7 percent. Given that global leaders support initiatives to decrease these numbers, Brazil passed legislation banning or punishing people who commit violent acts against women.

Other countries have also begun adopting “pro women” institutions at the municipal level with positions such as Secretary of Women's Rights, councils of women's rights policies, women's shelters, and beyond. The municipalities act autonomously, and some programs are much more supportive of women's rights than others. Data shows variation as to which municipalities are adopting pro women institutions.

Like many faculty members, I frequently host visiting scholars. One day, I realized the value in hosting these scholars: they could access data sets easier than I could. Now, I tell them, “I'll host you, but you need to arrive with this data set about the women's institutions.” This is how I have collected data about many countries in Latin America.

What drives municipal adoption and establishment of women institutions? The literature refers to the key criteria for women to become represented in politics as macro level factors, like having quota laws. But now the question is whether the representation of women in politics will affect women's rights, and this is what I want to explore. An organization might have descriptive representation. For example, I am Hispanic, and I know that I represent the Hispanic population. However, this doesn't mean I will act

on behalf of Hispanic students in my school. It's one thing to represent, but it's another to actively represent. While we presume active representation, it should be noted that even descriptive representation can impact how Hispanics perceive the organization through symbolic representation.

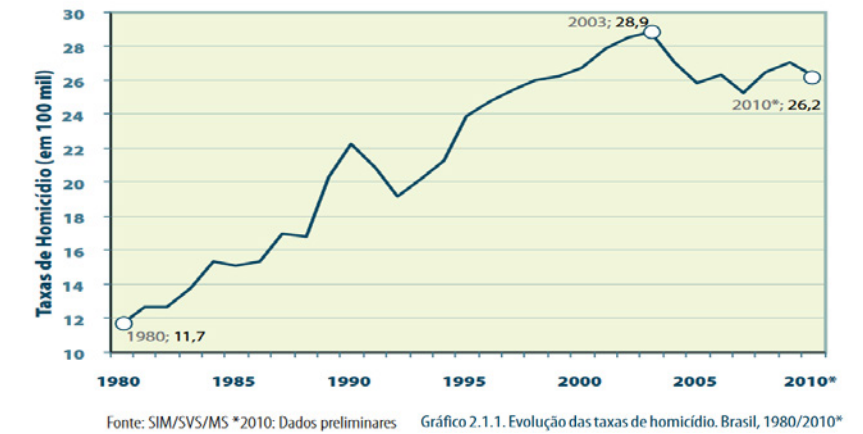
The notion is that the minority of those who represent a minority group benefit the minority group that they represent. This leads to a stamping representation, actions that are taken that might lead to symbolic representation. However, this doesn't always happen. A bilinear representation might happen. One person representing a group might not be enough to make changes within the organization. Instead, a certain number of represented people are needed to make the changes that will affect the group they represent, so the impact is declined.

We need to consider the mechanisms necessary that will allow underrepresented groups to affect policies. According to those mechanisms, represented people tend to have similar thinking and values, recognizing the similar background and advocating for that group. Some suggest that the right mechanism can allocate resources to those groups that were previously underrepresented. However, the research is still inconclusive, and we need to do more research.

We generate multiple hypotheses with this thesis. The first suggests that a municipality led by a female leader means descriptive representation is more likely to have problems that need substantive representation. Because the mayor needs to make decisions based on approved legislation, the greater the percentage of females on city council, the more likely it is for that municipality to have women institutions.

The relationship might be curvilinear, meaning the relationship between female legislators' descriptive representation and the probability of existence for women institutions is an inverted curvilinear. This shows us that a certain threshold of women legislators is needed before achieving change for women's rights. The next report suggests that the greater the percentage of female and mayoral candidates in a municipality may also explain a higher number of women's institutions.

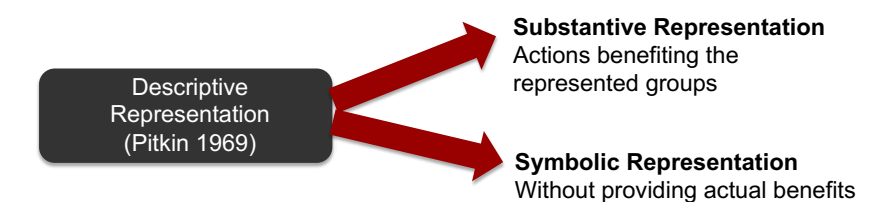
Women Homicide Rate in Brazil 1980–2010



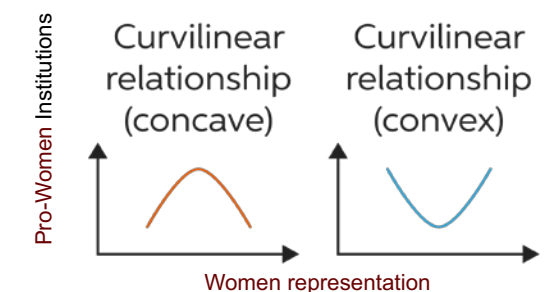
Evolution of Pro-women Institutions in the Municipalities of the State of Grande do Sul (Brazil), 2013 and 2018



The Transition between “Standing for” and “Acting for”



Curvilinear Relationship: Threshold Effects



Luddy and O'Neill Case Competition

November 2022

Held at the Luddy School of Informatics, Computing, and Engineering



Spotlight: Case competitions

GT-IDEA hosts three case competitions throughout the year across our three schools (the Kelley School of Business, O'Neill School of Public and Environmental Affairs, and the Luddy School of Informatics, Computing, and Engineering).

Case competitions are designed to simulate real business problems.

Students work on interdisciplinary teams with students from all three schools.



Organizational Change Management

KELLEY
ROUNDTABLE

September 7, 2022

Presented by:



Nicole Nelson, formerly OCM, Strategy, and Communications Manager, Grant Thornton

Monday, August 22 appeared to be like any other beginning of the week. I logged on to my computer around 8 a.m. I reviewed the To-Do lists I created on Friday up all the things I didn't get done the week before. I reviewed the weekly reports I provide my client and attach it to an email. I logged into my government virtual desktop to scan emails and flag any for follow up. I opened up the website my team is developing. I checked in with my project team. I reviewed my weekly calendar again and accepted invitations. Around 10 a.m. and important all hands meeting came in from Grant Thornton for two o'clock—the exact time I had a client touchpoint to review the weekly report I just sent. I miss that important all hands meeting. Everything changed. The day to day was upended. I was going to need to adapt.

I've been working in change for over 15 years. My first job out of St. Olaf College was in Florida, working for the improved Pregnancy Outcome program where I was an appendage to hard-working nurses who visited low-income mothers. I wrote new baby names on birth certificates—who knew my creative writing undergrad degree would go to such great purpose? I then moved to Texas where I was a creative arts director for a nonprofit. Following that, I taught English for three years at a Japanese school. I helped form a high school in Virginia for kids who fall through the cracks and taught English there. I was a technical writer, an editor, and a change consultant in a few other consulting firms.

I came to working and change by way of writing, marketing, and working in project leadership roles. I like to solve big problems and I like working with collaborative teams that solve problems. Who here wants to be a business leader? I'm assuming everybody in this room. You're going to have to care about change—not just at the organizational level but at the individual level. If you remember nothing from this discussion in the future, remember this: organizations don't change—the people in them do.

Has anyone here already managed projects? Several of you have already done that. Do you want to make the world a better place? All of you I would assume. The world is a turbulent place. OCM practitioners call this VUCA (volatility,

uncertainty, complexity, and ambiguity). You will have to lead your team, your product, and your organization through change at some point in the near future. You will need to adapt to survive.

Depending on what data you believe, 70 to 89% of all attempts at transformation and change fail. Isn't that astounding? It seems like a really high percentage. Effective change management can increase your chances of business success by six times. Change provides opportunities. Identifying those opportunities is important. So as a leader, you'll need to manage the change process, or you'll be too caught up in the VUCA to take advantage.

Organizational change management is a systematic approach for managing the effect of new business processes, new policy, IT implementations, changes in organizational structure, or culture and mission changes in an organization. It's a mouthful. At its most basic, it's the management of the process of getting from here—current state to a future state.

Depending on what data you believe, **70 TO 89 PERCENT** of all attempts at transformation and change fail.

It's important to know what organizational change management is not. It is not IT change management. That sort of change management is IT Service Management (ITSM)— a process that makes it easier for the organization to roll out change requests to your IT infrastructure. You'll also hear organizational change management defined as managing the people side of change. I think that's a little bit of a simplification as organizational change management plays a large, integrated role in the transformation formula of an organization.

There are multiple OCM frameworks out there. Prosci ADKAR—which stands for Awareness, Desire, Knowledge, Ability, Reinforcement—is the most common one used in government. Others include Kotter's eight step, Mackenzie's 7-S, and Lewin's three-stage model. I would be remiss if I didn't speak to the human response to change, which is akin to experiencing a death. Elisabeth Kubler-Ross's change curve shows the five stages of grief—denial, anger, bargaining, depression, and acceptance.

Models are great and all of them have some validity and some shortfalls.

All of these change management model developers wrote books and sold a lot of work for consulting firms. You need knowledge of these models, but you are going to need to customize your approach for the culture you're working with. It is never one size fits all. The best organizations create change infrastructures for the organization. All well-run business functions, finance, HR, PMO have standard business practices, processes and templates. Change should be no different. This helps the organization to have familiarity with what comes next and standard language to talk about change.

I've been doing change work for a long time. I've supported leadership at the top middle management and those most affected people on the frontlines of change. Working as a partner with the government is interesting. Working in change work in government is really interesting work. My husband often tells me my expectations for government change are unrealistic. That I want them to be a speedboat when they are a supertanker—they take several miles to make a turn. This is a struggle for me as I'm impatient person by nature. There's a reason why things change slowly in government. There are a lot of people that keep that supertanker running. Government agency missions are foremost at the top of the priority list. The internal workings of a supertanker are busy keeping it moving forward and operational.

Working in the change space has provided me with some interesting projects. I've had the privilege of working in all three branches of governments. I supported the US Department of Veterans Affairs, the Administrative Office of the U.S. Courts, the Department of Labor, United States House of Representatives, the Marine Corps, the State Department, and the city of San Diego. It is not without its challenges.

Multiple offices, multiple budgets. There's rarely a functional office in government that supports change in organizations, which means that each project and program manager probably handles change a little differently. This doesn't help those experiencing multiple changes throughout the organization. Not having an OCM functional office also makes communication difficult, and the prioritization of changes difficult in large agencies. How do you keep track of all those change efforts with all these different office budgets?

Leading change with technology. I'm sure you're well aware. I get the flash. I love automation. I know it's shiny and expensive. There are entire

contract vehicles built around acquiring new technology in government. I love new technology, but its introduction is often best appreciated in a house that is orderly. To lead with it feels a little cold and sometimes disconnected. Leading with technology often reveals a lack of current business process—documentation, the need for employee upskilling, and how poor the knowledge management in any given agency or organization is.

The lack of leadership sponsorship. Often no one wants to own the transformation effort at the leadership level. Remember the failure rate that I talked about—70 to 89 percent? Often, the change effort is dispersed to an office or department. This can be largely ineffective. You can't ask your own people to change and adapt if no one is willing to lead and adapt that change at the top.



Poor communication. Communication about change does not need to wait until you know the answers. Tell your people what you know and that you will communicate when you know more, or they will fill the void with rumors. And it's much harder to go back with the facts and fix that. There's a lack of engagement with effective stakeholders. I can't tell you the number of times I've been in an early change meeting where I asked the leadership has anyone listened to the frontline affected by this change? Do they even know what's occurring? Where's their representative? The people most affected by change should have a seat at the table.

Silos. It's a very common word in government. Change has ripple effects in an organization. What happens in one Bureau department or office often has ramifications in the other. Often the department or office or bureau hoards information or knowledge it's important to share often and broadly. There is complex bureaucracy. I'll share an example. Our client was embarking on a major



financial system implementation, taking 96 different versions of a single software, and installing the latest cloud version so that every financial team in the United States could be on the same version and receive the same updates and training. And more importantly, do their financial business in a standardized way. Some important background on this complex bureaucracy: our client was not headquarters. They are a centralized support team who handle congressional reporting finances, enterprise communications, technology, security, and Enterprise Project Management. The support team is staffed with business professionals who have strong respect for the rights of those that they support to handle their own business. There is a hierarchy of authority. Suggested movement from our client to transform out to the field is usually not required, but highly encouraged.

The financial system implementation was required, because there were cybersecurity reasons to support it. The project was rolled out in waves across the country. Our team gathered lessons learned from each wave. Those eager for change requested to be in the first wave. Those that were more resistant were in the last weeks of implementation. There are smart people in both groups. We had to work with multiple other contracting firms—CGI, Deloitte, and multiple small firms. This can pose challenges, but we did a great job of being one team and staying in our lanes, collaborating when we needed to do so.

Our team's role was to help people through the change. We're also responsible for branding and communications for the project and ongoing program, developing a community website for information and developing feedback loops to the financial community. Many of our required tasks had never been done before in this organization. I liked those challenges.

One of the things we wanted to do was to increase transparency around the change. We wanted to create a Knowledge Library for the project that was open to all and anonymous. This was important we needed to create digital versions of the financial guides. We wanted people to look at them. We didn't want change to feel like an exclusive club only open to those in implementation. This required policy changes. Cutting through

a lot of red tape and a lot of back and forth with it. At one point a senior leader who was a good friend of mine, stopped me in the hallway after meeting and asked, "is this worth it? All of this angst about this anonymous site. You're never going to be able to do this. It's never been done." My response was, "watch me." You have to be willing to fight the good fight in change. It's really important because you have the inside track on knowing what's best for the people.

The opportunity to create a true financial community in this change together outweighs the risks. One of the most important things you need to help people through change is good leadership. It is the single most important success factor of change management. Someone who sticks with the project from beginning to end and checks in throughout the process, celebrates milestones, and accomplishments of the people. In essence, they show up. On this huge project, we were lucky to have leadership and sponsorship and support and a great government project manager. Some challenges were sustaining the communications and project interest to large groups of stakeholders over a long period of time, keeping those who are operational already in the system as part of the feedback loop and engaged.

What to do with all those blank US Treasury paper checks and the printers. Can you imagine if those had fallen into the wrong hands? Simple shredding was not an option. Successful disposal was the challenge the financial system implementation was successful. The two-year project saved hundreds of millions of dollars for the American taxpayer. One reason for the savings is that it costs approximately 17 cents to spend an electronic transfer fund versus \$1.25 To send a paper check. The project team is how that business function operated. When you automate and remove manual day to day processes, you change business behavior, and you enable better business outcomes. Our efforts move these business functions completely digital—no paper and from paper to text to electronic funds transfer. These changes sound simple, but they change the daily habits of thousands of people who do the work, and the customer experience of millions. Remember change is about people—as people change, they drive organizational effectiveness.

Looping back to my first story. That meeting I missed on August 22? It was announced the 1200 person Grant Thornton public sector had been sold to Lighthouse. Imagine if the kind of school of business was being acquired by Purdue? You your faculty and all of your classmates have to move to West Lafayette within the next 30 to 60 days.

When you decided what school you wanted to go to what you wanted to look at, there were certain attributes that you look for, right? That's no different than a company—the reputation of the faculty, culture, opportunities, history, location. I have been with Grant Thornton for eight years. This team is about people. What do you think that people in public sector were thinking when the announcement passed? Can you imagine? Betrayal. Uncertainty. The basic news that people were told in that first meeting was that they were going to move across their salary. No details—there's legal reasons why they can't share much more. It has to be examined in the acquisition.

I'm going to read you some of the messages that came through my chat. While the meeting was going on these were flooding in:

What do I tell my clients? They're going to see this in the news. (And it was on the news).

What will my title be now? I just got promoted, and I worked so hard for that promotion. Titles are not equivalent at Guidehouse.

I'm pregnant, and due in December. Will I have maternity leave that looks the same?

It's the first day of public school in the Metro DC area. I was called by my child's teacher. My child is not having a good day. I can't think about this now. I've got to figure this out with my child.

I worked so hard to build my personal brand within the firm. Now I have to start over.

I just found out my son has a heart condition. What will my medical benefits be?

I don't want to lose our Grant Thornton public sector community and culture. How can we stick together?

I just graduated from Indiana University and was hired by Grant Thornton public sector. What does this mean for me? I haven't even started my first engagement.

This is large, complex organizational change and complex individual change. I share these

individual examples because as business leaders, you will need to lead people and understand that explaining the WIIFM (what's in it for me) will be as important as the benefits to the organization.

Leading people through change

Be authentic. People don't trust what they don't understand and this creates resistance. I'm often asked how I will manage change resistance and my answer is always the same. I will engage more and seek to understand. Leaders who seek to hide their own feelings and reactions to change aren't doing themselves any favor. It will erode trust. Leaders can enhance relationships in a change effort by sharing their own challenges and experiences. Be careful that you don't dismiss people's feelings through your own sharing in an "I've done this, you can all do this" way. Everybody comes to change at a different pace. People don't move in whole groups forward.

Be inspirational. If you're an authentic leader, you're more likely to draw people in and begin to construct a cycle of openness and sharing. This will help successful change transformation. *Be inspirational.* It's not an easy thing to do, but it's so important. People are craving this in the workforce right now. I'm not just reading this in change, I'm reading this in other areas. One of the important most important elements of change is people who share a vision of the future. Great leaders paint a compelling picture of what the future will be, why it's important, and how it will be positive. People need to feel a sense of optimism about where their organization is going and how they fit into that vision. They need to be able to see themselves in it.

Tie change to business objectives and strategy. This seems elementary, but sitting at some of some of the early change meetings. I can tell you that leadership—they don't know. I've often asked why are you doing this, does this support your business strategy, your objectives? They don't often know. The are silent.

Be visible as a leader. I know if you're in a remote environment, cameras can get so annoying all day. But it's so important to be on when you're a leader and leading through change. Successful change starts at the top. And successful change leadership

requires acts of visible and committed involvement of its senior leaders. People are heavily influenced through modeling. So the actions of leaders are critical to reinforcing the message of change. People tune in to their leaders' reactions.

Engage people from the start. In the same way that you will ensure the involvement of yourself and other senior leaders, be sure you're also creating opportunities to engage from mid managers, frontline leaders, and those affected most by the change. People are more likely to accept the change when they feel a sense of ownership. Listen and seek input continuously. Develop working groups and employee groups to represent that office or departments. They can provide feedback and act as liaisons. Providing choice supports people's need for control.

Be clear and communicate your expectations. Any change requires shifts in behaviors and people need to understand the difference between what they are doing now and what you expect them to do tomorrow. The day to day is super important to people. Confirm plans and communicate regularly—provide both push-and-pull communication and self-service information. People do not want to be spoon-fed information about change. They want to go to a place and be able to retrieve it when they're ready to absorb it. Overcommunicate your messaging and provide all kinds of mechanisms through which people can obtain information online, in person, in written form, though videos or podcasts—because people learn in different ways.

Be proactive about communications. People need different levels of information at different times. Be intentional and proactive about finding the right communication at the right time. In the beginning of change, provide information that's contextual—the why and the conditions driving the change and personal what's in it for the people. As the change continues, provide details logistics and procedures. Give people information about how they can continue to engage to be changed champions, super users, change agents. We know that adults learn best from their peers and from hands on experience. Think about how those enthusiastic about the change or even those most in the know can help others.

Create the environment for success. Celebrate milestones, everyone always forgets the celebrations. It's so important when you're going through change. One of the reasons people resist change is because they're concerned about their performance, which tends to take a dip during a change transformation. But then there's a big steep incline and it goes up if you're implementing a new software system, give people the opportunity to participate in labs. They just get to play around with it.

If you're changing your organizational structure, be sure people know who they will be reporting to and what will be expected of them. Arrange open office hours where people can get acquainted well before go-live day.

Be measured and evaluate. Learning and reflection are critical to success, but gathering lessons learned is often skipped in the rush to move forward. Please store these lessons learned in a place where leader change efforts can see the lessons. Set up evaluation processes to measure baseline pre-change and post-change. Measurement can help you demonstrate the results and learn we'll need to continuously improve. Don't just measure the outcomes of the change, but the success of the change management process itself, so you can study and improve your organization's approach.

Be reinforcing. Leading people through transformational change takes endurance. It is often a marathon. At the same time, you're communicating a sense of urgency because you need people to do all the things. Celebrate success, small and big steps. Remember, as a leader, you need to engage people's hearts and minds. It's one thing to share all the facts, but the why and the benefits need to continue to be communicated throughout the change.

Be evolving. You will need to build change capacity in your people and your organization. You'll often hear that people are oversaturated with change, or that they've reached their change capacity. To counter that you'll need to build their adaptability and their change capabilities. You'll need to increase learning and the desire to improve. In my experience, a learning culture is a culture that accepts change much more easily.

Legislative Tax Affairs

KELLEY
ROUNDTABLE

October 5, 2022

Presented by:



Joey Connor, Grant Thornton Partner, Manager of the WNTO Tax Legislative Group



Brandon Joseph, Partner - International Tax Services at Grant Thornton LLP (US)

My name is Joey Connor. I'm a manager in Grant Thornton's Washington National Tax Office. I live in DC, and I've been working on the Hill for a decade now. What I do is tax legislative affairs. It's tax specific but has a nice interplay between politics, law, and tax. I'll give an overview of how we interact with the Hill, how we interact with our clients, and how we provide value during change.

How we provide value

What I'm going to dive into here is how we're talking to companies right now. The important thing is to know your client first and foremost, because we have clients who have their own government relations team, and they have multiple individuals who are on the Hill. We can provide a different set of value for that sort of client as compared to someone else not on the Hill. In that case, maybe it's a small partnership that is based on the West Coast and they don't have a DC presence at all, and they're really trying to get their head around what's happening right now.

What we do is we draw from the past, we draw from the present, and then we look towards the future to figure out how to provide value to our clients. Let's take the midterms, which are coming up in less than five weeks. They're going to have a major impact on tax legislation.

Traditionally, the president's party is going to lose seats in the midterm. That's a normal trend. Another factor is how the President is pulling his approval rating. President Joe Biden is currently high 30s to mid 40s, depending on your poll. That means he'll lose 36 seats in the midterm if he's at a sub 50 approval rating. Does that mean that Democrats are going to lose 36 seats in the upcoming midterms in the house? No. But things change day by day. Today there was two or three polls released in the Georgia Senate race, and they were off by about seven points. You can drill down to a specific race. But even the pollsters have disagreements in terms of leads. What we can do is look back on the data and from the data estimate the Democrats are going to lose seats in the House. Then we ask, "What does that mean for our client's taxes?"

With the Senate, we're in a 50/50 division, where Vice President Kamala Harris is the tiebreaking

vote when necessary. The 50/50 Senate really comes into play for reconciliation bills, such as the Inflation Reduction Act. The Affordable Care Act was a reconciliation bill too. With filibusters, you need 60 votes in the Senate to break the filibuster. There is a special procedure called reconciliation, which bypasses the filibuster procedure where all you need is a majority vote. You only need 50 votes from the Senate for reconciliation. That's why we look at the Senate more. We're looking at both now because you need both chambers in order to pass legislation.

Things can take a long time, or they can happen immediately. While they were voting on the Inflation Reduction Act, there were changes being made on the floor. A handwritten amendment was on the floor 45 minutes before the vote happened. That amendment is in the law now. That's an example of trying to find change last minute and succeeding. My job is speaking with people on the

Clients aren't worried about the macro-economic considerations. They are concerned with the economic considerations that specifically affect them.

Hill to help them understand what they care about, especially on that day. This is some nuance on how we provide value to our clients, and how we help them make decisions that are best for their business. Take the midterm elections we have coming up in four and a half weeks. The National Republican Senate Committee has announced that they're pulling funding for ads in Arizona. So not an outright concession, but an acknowledgement of where allocating funds is useful. Not as

much Republican airtime being in Arizona, whereas Nevada is more of a state our Republicans believe they can take. Again, you're looking at the polls, and they vary. In Georgia there was a poll that came out today, that was an 11-point favorite for the Democrats. And there was another poll that came out two days ago that was two points. You must explain what's going on to your clients and right-size their expectations since there's a lot of uncertainty involved. That's a lay of the land, which is the baseline for how we talk to clients about the political landscape.

That's a broad perspective on how we really provide value for our clients. Clients aren't worried about the macro-economic considerations. They are concerned with the



economic considerations that specifically affect them. Probably the biggest part of my day to day is taking the energy tax credit lists and figuring out how this matters to our clients, because the 15 percent minimum tax is for the biggest 150 to 200 companies in America, and we have several clients who are likely to be impacted by this. However the vast majority of people we talk to daily are not going to be impacted by this tax because it's just too high of a revenue threshold for them to be impacted.

Building trust with clients

Networking is a huge thing. Being able to have a real conversation and say, this is off the record, but this is what's likely going to happen. That's how we get a lot of our information. Interestingly, we haven't been seeing a lot of companies change their attitudes towards buybacks. It's what we've been hearing from multiple clients. They say, "Okay, this is something we're going to pay for now. We still want to return that value to shareholders." So again, even if it's a big proposal, in terms of conversation, that doesn't necessarily mean that it's going to be impactful for a client. So, we have a lot of questions from clients. And unfortunately, the answer is, here's what we know, and there's a lot we don't know. Knowing how to manage the conversation

without having a solution is important. There's a bunch of information that I think is useful, but you must know your client, you must know who you're talking to.

Working with the Hill

We hear on a conference call about section 174 amortization of R&D, which is the full expense of your R&D costs during the year in which you have them. This provision expired at the end of 2021. The expectation this entire year, all we've been hearing from the Hill is "Hey, we're going to solve this. We're going to retroactively extend say, we're going to pass the bill most likely in the lame duck session post the midterm elections so likely late November, early December." However, over the last two weeks, that conversation has completely changed. We now have a group of at least 10 Democrats in the House and several Democratic senators who are saying we're not going to retroactively extend section 174 unless Republicans also retroactively extend the enhanced Child Tax Credit, which you've probably heard about. But it's just increasing the amount of tax credits for individuals and families making less than a certain amount of money.

Republicans will say 174 has always been a bipartisan exercise. We've done this with

both parties. Democrats will say you have a ton of business proposals that you want, and we want proposals for the lowest income individuals. So, you need to give us something. Again, getting another level deeper, which we try to have, most of our clients have seen these news stories or at least have heard a little bit about them. It's understanding what level of this is posturing, and what level of this is real, which is difficult.

Planning in uncertainty

How do you plan in an uncertain environment? It's trying to figure out what do we do from a tax perspective. Often, this is bringing in our accounting methods group to look at the existing facts. We're not looking at new legislation, we're trying to figure out what pieces and what levers we can pull to ensure that the client is in the best economic position that they can be in. But really, it's just understanding your client's fact pattern. It's understanding what they're going to be looking for and whether inflation is a big thing that they're worried about. It's having the conversation and bringing ideas to them beforehand and letting them say, "Sounds good, let's move forward." That's when you have long term considerations.

Blockchain & Digital Assets

LUDDY
ROUNDTABLE

October 19, 2022

Presented by:



Markus Veith, Grant Thornton
Partner, Digital Asset Practice
Lead

I am Markus Veith, and I lead Grant Thornton's blockchain and digital asset practice. I came to it through my background in banking and big audit financial services. I had no knowledge of crypto—not that anybody else knew either. But since I became a GT partner, we've built our own blockchain platform, which not every firm has. I'd like to talk about the rise and fall of Bitcoin, and what caused it. A couple of the big players faced their demise in the recent crash, brought down partially by some outside factors. When you look at what's happening now with some of these companies, and the use of these assets into one-plus-one plus platforms, people believe it is like a bank—an insured asset. But it is not insured. A provider may say they can hold your crypto for you, but you do not have the keys. If that provider falls into bankruptcy, you lose your assets. If you work with a hosted wallet service where you keep the keys that control the asset, then you still have your asset if the company goes bankrupt. The keys determine who can control the asset if the company does go bankrupt.

A brief history of Bitcoin

Bitcoin is a decentralized digital currency that runs on the Bitcoin blockchain. It can be used for peer-to-peer payment processing, and message sending. We test the existence and ownership of crypto assets by checking the blockchain. It was created in 2008 by an individual who calls himself Satoshi Nakamoto. Nobody really knows if Satoshi is a real person, if they are a group of people, or whether it is just a made-up name. But Bitcoin has been the first and most successful application of blockchain technology.

The first few years it existed, from 2008 to about 2017, the price remained flat. It was a couple of cents and \$1, then it was a couple of dollars, then a couple hundred dollars. We used to have our financial services practice office down on Wall Street, right next to the New York Bitcoin Exchange Office. They had a Bitcoin ATM. I remember thinking, "I don't know what this Bitcoin is about, and it's only a couple of cents." It's like thinking, "maybe I should buy a couple of 100 or a couple of 1000 Bitcoin and, if you lose it, you lose it." You may have heard about the famous pizza deal. The first transaction with Bitcoin was buying two pies of pizza, paid for with 20,000 to 30,000 Bitcoin. That was the most expensive food delivery in history.

I'm focusing on Bitcoin because every other coin moves much the same way. There are altcoins out there that became popular. Elon Musk says "oh, I'm big on Dogecoin," and then you have a spike. But typically, the market moves along in lockstep over the longer term. In 2018, we had the first boom, and everybody said "I need to invest in Bitcoin because the price keeps going up and up." There are certain people who predict that Bitcoin will hit 100,000 by the end of the year. Famous crypto billionaires lead some of those companies.

Since Bitcoin is not backed on a device like gold, you can't record a currency. It's not as if you'll go to the bank of Bitcoin or a Bitcoin organization and say "hey, here's my Bitcoin, I'd like my cash back." That's not happening. The price will go up. People are going to buy to see the price rise.

You can also see intermediaries, and—like everything in financial services—there are people who try to take advantage of the marketplace, manipulate it, and make money out of it. That's partially what happened. In December 2018, when the price was at its highest, Bitcoin crashed. This was the first crypto winter. There was one night where the price was about 8,000 and within an hour or two we crashed down to 3,000, only to recover quickly up to the 5,000s. I saw it as a buying opportunity. I executed the buy order on my app. Turns out the app was glitchy, so when I pressed buy, the button action didn't take. I kept pressing buy, buy, buy and nothing happened. Then I checked my email, and I was totally surprised. I froze because it said I had 10 buy orders. It was a small amount. But I was thinking, oh, I spent that much money on crypto. With the helpdesk in crypto it's hard to get anybody on the phone. I found out it wasn't executed properly. Only one trade was executed.

In hindsight, it would have been great if I had 10 buys. It shows how volatile this is. If you have a company and Bitcoin is on your books, then the way it is accounted for is simple. The principal rule is you must treat this intangible asset as a record of the cost of virtual impairment. There are exceptions for certain private companies and investors and funds where you must value it. But that's the current guidance the Financial Accounting Standards Board (FASB) has come out with. It was only about a week ago when they

said they'd pick it up with a fair value project. But companies will be allowed to record their assets at a fair value. Recognizing gains and losses is like trading securities. Most of those assets are fungible. But for the time being, any public company that has Bitcoin—like MicroStrategy, Tesla, Square Coinbase or the other public crypto companies—must treat their crypto inventory as an intangible asset.

The Rise and Fall of Terra Luna

In early May, the Luna coin fell to 35 cents. And while the Luna companion token crashed from \$80 to a few cents, when it was as high as \$119. Some of the most famous crypto investors are lunatics. There's no clear answer to what happened. A lot of people thought there was a deliberate attack of the founder behind the coin. He was viewed as an arrogant person. He tweeted this and that. Some people suspect there was a deliberate attempt to destroy the point of the network: when it goes low, you have panic sales. That's what happened. People tried to dump their coins, which accelerated its downfall and it never recovered. In order to not just have the algorithmic support, they also set up a reserve fund of about 3 billion Bitcoin. So that's linked from Terra Luna to Bitcoin to the wider crypto system. When selling accelerated, it dumped Bitcoin in the market. When you suddenly have a big supply, the price falls, which was the first reason for the big crash in 2022. I believe this happened in one day.

Then the Three Arrows failure happened. The Three Arrows was a hedge fund created in 2012 by two relatively young traders. They tried to lock in effects trading work in Hong Kong, Singapore for some large banks, and they obviously got bored, but they wanted to do one thing and take advantage of the knowledge. So, they started a hedge fund, and for whatever reason, a lot of the crypto players, all the crypto companies you can think of, gave them money. The big thing in crypto is making sure the mechanism works for liquidity. There's a lot of lending and borrowing, but you need Bitcoin liquidity. You can't go to a party and say "Hey, can you lend me Bitcoin and I'll give you cash" because cash is scarce in the marketplace. You give another crypto or you don't give anything as collateral. For whatever reason, the three error guys were able to convince a lot of the industry players to give them unsecured loans. As a bank keeper, that's mind boggling. It's going to be a great space for us consultants to help those companies.



Voyager, a publicly traded company on the Toronto Stock Exchange, moved over to their own stock exchange. They had a \$650 million dollar loan, which was unsecured. They went bankrupt. If you had what you had when the bankruptcy happened, started limiting and stopping withdrawals, there's not a lot of play. You're still trying to sort out what is left and how to distribute it to the users. The question is, who gets what first? Do you get your money first, or does it go to the shareholders, or credit? They convinced many infrastructure players to give them unsecured loans.

One company, they were smarter. They had small loans collateralized by Bitcoin, but they called the loans in early. However, when they tried to liquidate collateral, the transfer agent was very slow in handing the Bitcoin over although they controlled it. If you have collateral from a party event, you must make sure you control the collateral because otherwise it's not going to pay you back.

It was a massive number of losses. People were trying to liquidate Bitcoin or other coins. When Terra Luna happened, there was big momentum to get stable regulation. What makes stable coins so important? I'm a proponent of the technology behind it. As we said earlier, defy has promise. But in the short term, what does right in the short term, it doesn't really have a big impact.

70 PERCENT
of crypto trading is
transacted on
stable coins

The long-term benefit of a stable coin is I can transfer funds securely, cheaply and fast around the world. If you must send money to Europe, it's going to take you a couple of days, and it's costing you some money, detracts a handsome fee to transfer. If you have a stable coin, there's a wallet. Someone in the UK has a wallet. I'll send my stable coin to you instantaneously. There's very little fee charge. That's the longer-term benefit of stable coins. Currently 70% of crypto trading is transacted on stable coins, not Bitcoin dollars. Stable coin regulation is desired, but nothing happens. It takes an act of Congress and since our party system is so divided on the issue, nothing really happens.

I think it's going to take an Enron level event to approve regulation. We've all learned that crypto entrepreneurship gains high fines by violating sanctions. You only need an email address to open an account and you trade crypto by exchange. Those days are past. I don't know any exchange where you can open an account with an email address and you start freely trading, but those were the Wild West days back in 2014. We need sensible regulation. Some people think a money market fund should be regulated. It's going to be another hurdle for the USA in the crypto race. Other countries have already set up a regulatory regime. The Bahamas, Bermuda, and Singapore are a few examples. Europe is also moving forward in setting up a solid regulatory regime. We really need regulatory clarity, and I don't know when it's coming. It's been discussed for a long time, and it hasn't happened. Companies that suffered losses from three errors and bankruptcy are looking at some of those regulatory practices. If you believe in the future of the infrastructure of the crypto system, now's the time to buy.

Q&A

Student: I've read recently that in political contributions the use of cryptocurrencies was on the rise. Are there any regulations that you see on the horizon that are looking to change that?

Markus Veith: I'm not aware of any but we wrote a thought leadership article two months ago about crypto donations for nonprofit organizations. If you donate appreciated stock, you get a tax benefit, and it adds value. According to some studies,



people who donate crypto on average give three or four times as much as somebody who gives cash.

Student: I'm thinking more about the transparency problems and wondering if there are any regulations looking to target that before our politicians are completely bought.

Markus Veith: That's the tricky part with crypto. I saw this on the blockchain. You can see the transaction latency; we just don't know who's behind it. Once you have to leave the system, you have to go to the exchange or find somebody who's willing to take and offer cash. If you go to the exchange and all these changes require an identity check, sooner or later, you can trace

it. Some authorities traced the identity of certain hackers trying to liquidate crypto from ransom attacks. So, it is possible only when you leave the system.

The other point I want to make is about NFTs. If it's very hyped, prices go up for the artwork. And then it comes crashing down. We have spoken to many media and TV companies that realized the NFT's not there to hide artwork. These companies are using it to tie in users and create a whole experience to retain the user, keep them engaged.

Student: I know FTX does tokenize stocks, how are they able to keep the price similarity between stocks on the blockchain and stocks in traditional markets?

Markus Veith: I think it's just a different form of ownership. If you hold stock in mutual funds, the fund will mirror the performance of the underlying stock. Same with the decrease in Bitcoin trust. If you have an indirect investment in Bitcoin, you expect that the value of those units mirror the price of Bitcoin. But typically, I would say that the best comparison I can give you is a mutual fund.

Student: Do you think the government sees this as a competitor to fiat currency in a way that would make them reluctant to regulate it?

Markus Veith: Good question. Several countries have created CBDCs Central Bank, which is like a digitized version of the currency, China first and foremost. I don't think there's any immediate intention to create a CBDC and there's a lot of debate constantly in the industry with privately issued standpoint with competitors' CBDCs. A lot of the industry players think they can coexist. Private treasury securities and private label securities coexist. There will be a reasonable use case for privately issued stable point or crypto unless somebody comes out advanced. China restricts it, but I understand from talking to some of my colleagues, that part of the reason why China is banning or limiting the use of crypto is they have strict currency controls. You can only send or transfer a limited amount of currency outside the country. I think Russia has the same thing. A lot of countries are afraid that crypto could lead to shadow economies, where you lose control of a currency. El Salvador adopted Bitcoin as a national currency and are putting their fortunes there now.

Student: I'm sure you're familiar with the moniker Web 3, implying that decentralized web is the next iteration of the internet. Do you see any legitimate value and labeling in that label? Or do you think it's something that people with significant crypto holdings like to say in an effort to create buzz?

Markus Veith: We believe it has value, but yesterday there was an article in the Wall Street Journal about metros multiverse that hasn't worked out the way it was supposed to work out. I think the idea behind Web3 is

good and valid—that you give more power to people to create content and control content.

Student: Do you put value in companies like Decentraland, where you can buy the plots of digital land?

Markus Veith: I have been puzzled about it. And to be honest, I know a lot of companies are buying property.

Student: You can actually go on the Ethereum network and go to the DAP right to the decentralized app, and you can log in and buy. You'd have to go through an NFT marketplace to buy that land. But there are legitimate companies there, there are embassies. Yet, no foreign countries have bought land yet.

Markus Veith: I think it's coming. But is it coming tomorrow? Is it coming in five years? Hard to say. The same thing with crypto. A lot of people thought the last crypto winter brought us deflation and stable coins. And I was just talking to an industry friend of mine who said this crypto winter is going to bring us institutional adoption. Because that's the thing that everybody has been waiting for. The institutional adoption of crypto is so far that the crypto market has been driven by retail users investors and high frequency traders. There's a lot of hope in the blockchain Coinbase partnership. This is the first step. That's what we've been waiting for. It's a watershed moment. We'll have to see. Thank you.

Student: How is the digital asset side relevant to our daily life? How do people benefit?

Markus Veith: How can you benefit from digital assets in the database? Some people only use Bitcoin to make purchases, not fiat currency, not dollars. There are a lot of people who feel that 10-20 years from now, the dollar will be gone. All we do is pay and buy things with Bitcoin. I'm a skeptic. I don't believe it. Bitcoin is volatile, and most cryptocurrencies are super volatile. There are a lot of companies that accept Bitcoin. You can buy a ticket on Delta airlines. I'm not sure if you're going to be able to use volatile cryptocurrencies to make purchases. If you're Starbucks and someone

buys a coffee with Bitcoin, you still have to pay for your coffee beans in dollars. That's why I think stable coins or CBDCs can have more value. Starbucks can say "we accept XYZ stable coin," then you give them the stable coin on your Apple card, it moves to their wallet, they can keep it and invest in it. They can use it to make investments, or they can quickly convert it to dollars and buy more coffee beans. That's the benefit of stable coins. You don't have that mismatch of volatility. A bitcoin is more like an asset class. It's the new gold.

Student: Are there any catalysts for crypto investing you can look for in the short term? Or do you have to play the long-term game?

Markus Veith: When the price crashed from eight to three, I want to get in at three because I figured it may not go back to eight, but it's going to recover because it made it cheaper. It's been hovering around 20,000. I was early on bullish theory. Bitcoin, I always find, is a gimmick. But the theorem has revalue. Either there's a blockchain can build on, where you can have smart contracts, but you need the native token to some extent. So, it was figured Ethereum will grow faster or go higher than the Bitcoin. It did for a while, but now it also came down. It's around 1,300. Again, if you follow the newsletter, it will always break at the 100-day line. It's going to go lower. You must see if you will believe in this asset class long term. If you buy it at 20,000, it goes to 15,000 you'll say "yes, I believe in it." If it goes down to 10 and \$5, you'll say, "oh, shoot, I shouldn't have bought it." It's difficult to say.

That is one of the benefits and downsides of the crash we discussed earlier, you can deposit your crypto and earn on stable coins at 8 percent. Before the interest rate went up, you could have earned 8 percent on a stable coin, which is basically the equivalent of dollar. You must take credit risks. If you sign up to this product and say you're handing over your assets to us, we lend it out as is the guarantee if the counterparty doesn't pay it back, you're the one who takes the loss. It's high return, high risk. You can take advantage of that.

Digital Adoption and Change:

What does it really look like when we go into the workplace?

LUDDY
ROUNDTABLE

November 4, 2022

Presented by:

Christen Miller Bell, Grant Thornton Director, Change & Adoption Leader

The name of the game is industrial psychology. My role is an industrial psychologist. What that means is I solve people problems. I've worked with Microsoft and conducted market research on preferences of Chief People officers. I gave them the research from my journey maps. What that looked like on the y axis was sentiment. The X axis was time. I showed them where people decided that they didn't like software, gave that to them, and it is now what today is being sold as Microsoft Dynamics 365 for HR. It's the coolest engagement I've ever done. Some of the others are working on mergers and acquisitions, integrating people with each other. My weirdest story involves a \$6 billion hedge fund in New York. I sat in front of the founder and CEO and told him that all his people problems were caused because he paid his people too much. So all of these things to say, we have done some fantastic people problem solving.

The last three years I've been focused inward at Grant Thornton. I came off the line since I started a family. I've tiny twins at home, so mama needed to stay at home for them. I've focused all my efforts internally, and now we do change management for our largest service line, which is our audit practice. Auditors by trade are incredibly skeptical. Their job is to hunt and peck through zillions of rows of data and find fraud or find discrepancies and point them out. So you can imagine every time we try to roll out a change to them. I have a unique background in this area. And it solved two problems. I wanted to get off the road and they needed somebody who was particularly good at figuring out change methods for groups like this who are incredibly resistant to change.

What is change management?

I realize that most of you had a part in your cases that focused on the creation of change management. I loved getting to hear some of your ideas for how to implement change in a global expansion scenario, but also picked up that some folks depending on what college you're coming from, know a little bit more about change management than other students. So, I'm going to cover the background of change management to ensure everybody's on the same page. There's a lot of different methods you could use. There's a few that are the most prevalently used in the business world today. There are Kotter's eight steps. McKinsey has one of seven essays that you can incorporate, or my personal favorite is Persite and we heard about that one as well. Persite is what we

follow and teach at Grant Thornton because it is the most scalable and customizable to our clients. Now, this might sound like a whole lot of nonsense to you. So let me simplify this further. Change management boils down to two things: 1) determining people's expectations, and 2) finding a way to either meet them or change them.

There are 2600 people in our audit practice. They do financial audits for our clients, both public and private. To do those audits, they go in, they check a bunch of bank statements, and their work is collected in a repository. Historically, this repository has been a desktop-based tool built in the dark ages. When this tool started, around 2015-2016, they started to realize we need something else. We needed a cloud-based tool. We get a bunch of auditors together. I'm not part of the team at the time. In 2018, they decide to deploy this technology to a couple of pilot offices. It was a disaster. It completely flopped. Half of these teams adopted the technology, they get halfway through their client work and decided it was crap. It means that everybody works nearly double and we didn't charge our clients for that. They couldn't figure it out. And halfway through everybody quit. So, in 2019, I joined the audit practice to lead change management for them. Among other things we went back to the drawing board. We changed some code. We changed some development. We did that first because the user experience wasn't ideal.

Among other things, we're trying to figure out what we can do to increase adoption. We've got a whole bunch of things that we considered. Change champions in every office who are like gurus of this new tool and show people how to use this tool. How do we do that when everybody's working from home? We employed a digital adoption overlay on top of the second version of our tool called Leap. This digital adoption overlay is a digital Bastion platform overlay on top of an application. It adds in app guidance, learning, simulations, analytics, things like that. It's a Vanna White on top of your preexisting tool that shows you where all these resources are. The coolest thing about this is the in-app guidance helps figure out areas of frustration. It finds when and where employees are seeking guidance. If they fail to complete a task, it lets me know. This tool eliminates some of their frustration, which then led to disengagement. For me as the Change Manager, I get to see where people are quitting, and figure out if it is this an area of an audit that just actually takes a long time or is

this an area where people are really having a strong frustration. So we built our tool called Wave. Our NF guidance has this fantastic self-help bar. We partnered with an organization—we didn't build it ourselves. My team went in and we applied Principles of Psychology to this digital adoption overlay. It has been wildly successful. We have a 91% satisfaction rate from our new users. One of the things I'm most proud of from this is we now have more digital adoption overlays on the two other products at Grant Thornton. We're doing it for our corporate intranet, and our client acceptance tool. We're really pumped about it.

AI in the Workplace

It's a wonderful use case for AI in the workplace and how AI is enabling change. We specifically did not tell people what the digital adoption overlay is. We just called it in-app learning and guidance. They think it's part of the original solution. Our users have no idea we slipped it on them. This is a case of something that in academia, they refer to as the odd paradox. Something just becomes part of your world and you have no idea that it's like new or different, it just gets absorbed and you're not really cognizant of what is happening. However, it's widely agreed that AI technology has proven itself to be one of the most transformative door opening inventions in history. But with great power comes great consequence. This transformative nature means that some of the doors open both ways. There is largely a negative perception of intelligence systems in the business world. These people are the ones using their face to unlock their iPhone every day, but they don't know what it is. When you talk to them about robotic process automation, they get glassy eyed because to them they're thinking of the terminator or Dolores from Westworld. People are fearful of technology. Nobody's ever heard talking about how AI has saved the world. When you are rolling out some kind of intelligence system based in the workplace, there's so much more that you have to do from a change perspective because of this fear. So let's say you're working for a company and you've got a really sweet new chatbot. It understands your company's jargon. But this chatbot is going to replace a good bit of your tier one tech support staff. What do you do? One, remove people's fear and two, positively manage the fallout.

Use cases in change management

I got a second story for you. I remember working for a very large tech consulting firm in the same kind of capacity and my client was a top 10 U.S. bank. At the time they were looking to improve some of their more tedious processes like accounts payable. This group had 45 teammates, predominantly women. Most of them had just come out of the Great Recession and had been unemployed for over at least a year. They're all in the roles of just AP processors, low level, very task-based low wage but stable jobs. A lot of these women had families. They were scared as crap. So this group, if you mentioned anything to them, about process automation, they blanched. So I came in with a tech team and they're asking us to streamline some of their processes. It was glaringly obvious that this group could really benefit from some robotic process automation. In this case, we needed to change people's expectations to proceed. So first, I focused on their pain. It was obvious that these people were bringing a lot of baggage into the workplace, and we had to get rid of that baggage to move forward. So I took the time to conduct focus groups with these processors to figure out where they were at mentally. They cited tedious repetition in their job. We asked them what they liked about their job, what they didn't like about their job. They'd complain about hunting and pecking and copying and pasting and moving things over. They would talk about how if they made an error, there was no way to really check it. Everything was very manual. They talked about how they get bored, they didn't feel challenged in their jobs. And so, I asked them, "What if I gave you harder tasks to do overwhelmingly?" With that knowledge, I knew that if we educated this team on the things that process automation could do, it might be appealing. I never used the word robotic process automation. The word robotic scared the living daylights out of them. It was just straight up process automation. They could have done enough research to figure out what it was, but removing that word removed the fear for them. We likened it to Excel macro on steroids that to them. And it was okay from there.

The third thing we did was conduct spot surveys to ask people how comfortable they felt. Along the way, we kept asking, kept gauging, and we did it for every single individual person. You have to root out individual people because it can spread like

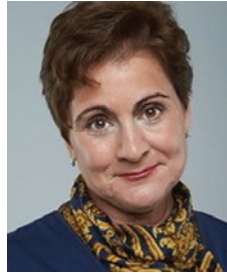
wildfire. It's like a spot on a piece of fruit that's going bad—if you don't cut the spot out, the whole piece of fruit is going to rot. We did it slow. Those who adapted quickly, we rewarded. One of Kotter steps is celebrating small wins. You get a reward for some of these new adaptations. Ultimately, the goal was for some headcount reduction. We've got these processes that can be replaced by automation. It's going to take some people's jobs. How you positively manage that fallout is everything. We coached the client on how to maintain a positive perception of a negative events. This is some high level PR. What we did is convince our client to work with the people that we knew might get their job changed. One group got retooled. These were people who had not been given that opportunity for education in the past. Another group worked heavily with the bank to find other opportunities. They filled other open roles in the bank. The 45 people chose to upskill. They took coding boot camps, and they owned and ran those process automations. Ten left the team and then moved into different roles within the bank. Thirteen stayed, and then 12 ultimately left the company. So of this team of 45 we were able to shrink it within about six months to 23. The big takeaway here is that people didn't complain about it. Their expectations changed. We removed fear of the unknown. Two of them went on and received advanced computer science degrees, and their salaries have grown over 2.4%. Their lives changed completely. The team size shrunk due to natural attrition, but we didn't replace anybody. Two years later, we went from 23 down to 20. So we lost another three people, but they didn't have to be replaced because the process automation was able to take on that work. And what's cool is that overtime kept absorbing more work they started taking on more functions rather than just accounts receivable payable. This is the very best example I have of AI going right. This client understood how scary this was and that to advance themselves in the technological space, they had to take a risk and spend a little money to get some savings in the long run. These are two real scenarios that one might encounter, and two very real scenarios of how you need to either meet or change expectations when you're working with AI.

Formal Relational Contracts

RESEARCH
WEBINAR

November 5, 2022

Presented by:



Deanna Malatesta
Associate Professor at the
O'Neill School

Organizations of all sizes and types, including large companies such as Grant Thornton, let you enter contracts with other organizations all the time, including universities. Organizations understand their need for strategic relationships, whether these arrangements are B2B or public-private partnerships. They often involve complex contractual arrangements. A key objective in contract negotiations is how to protect the party that you're representing. Protecting your party is done in various ways, by clarifying responsibilities and by specifying penalties if obligations are not met, and the resulting contract documents at the end of the day are many pages involving lawyers, financial consultants, and lengthy negotiations. For businesses it is often not a choice, but a responsibility to shareholders to go through all of it. Public organizations do this as well.

The parties often agonize over every conceivable scenario before then trying to put everything in black and white. But by their nature, these negotiations embody an adversarial mindset. It's contractual, it's a transaction, with both parties trying to gain the upper hand. The result is a variety of contractual clauses, like termination for convenience clauses, where one party has total discretion in ending the contract after a specified period, and often even sometimes with government contracts, for no reason at all. What happens is these clauses often foster a negative relationship and behavior. Until recently, there wasn't a feasible or an acceptable remedy that's been proposed, but this has changed with the introduction of what's called a formal relational contract. As the title suggests, you may have an idea that it combines a formal contract and a relational contract. That's true, but it's also much more than that.

What are formal relational contracts?

A formal relational contract specifies a mutual goal and establishes governance structures to keep everyone's expectations and interests aligned over the long term. They're designed from the outset to foster trust and collaboration, and they're also legally enforceable. They are a construct all its own. They are not just a formal contract, nor a relational contract, and they are intended to address the shortcomings of relational governance. They are also theoretically grounded and have garnered a good amount of empirical support. These two parts of the formal

relational contract are the big picture. There are a lot of organizations now that are using this approach like AstraZeneca, the Canadian government, Dell, and Intel. There are something like 40 contracts in use at this point.

Types of Contracts

There are two main types of contracts in the literature. Here we talk about formal transactional contracts and relational contracts.

Formal transactional contracts

These are agreements that are legally binding and enforceable. They have two functions: control and coordination. Often, they're characterized by either a degree of flexibility or rigidity. It takes a good amount of time to negotiate these to specify the agreements and then to monitor behavior as the contracts go forward. Dispute resolution often comes into play. These contracts are inevitably incomplete, because we can never specify everything that we want to have happen. They're also very often subject to interpretation problems. Sometimes this is expressed, but often there are issues with the contract that we must solve as they come up, primarily in misunderstandings in communication.

Relational contracts

Relational contracts, on the other hand, are not anything new. Very often buyers and sellers form close bonds and have nothing more than a handshake deal. It is a sort of supplement or complement to the actual formal contract that wasn't specified up front but was just acted upon where the parties would kind of fill in the gaps with trust, which is kind of embedded already in the relationship and their concerns about their own reputation. The parties are concerned with their own reputation and perhaps renewing the contract or getting a contract with another buyer or seller, and they want to keep their reputation intact so that they can do that. The problem is that, on their own, we still call them contracts, but they're not enforceable, nor are they practical. It's always difficult to tell what's on someone's mind, or the degree to which trust is embedded in the contract. So really, we've got two problems. What we think of in the literature is 1) the incomplete contract problem with formal contracts that we can never specify everything we want to do, and 2) the enforceability problem with relational contracts. This is exactly what formal relational contracts are intended to solve.



Adoption of formal relational contracts

The reason why these contracts have not caught on is because, until recently, they haven't had the buy-in of some prominent scholars. In terms of the theoretical underpinnings for formal relational contracts, there are many. It starts with the idea of bounded rationality, which means we all have cognitive limitations. Because we can't specify everything, we tend to fill in what we think things mean or what we think the parties intended, by which we interpret and put forward in our own self-interest. Our interpretation of the contract ambiguities or what's missing are very much associated with our own self-serving biases.

What occurs here is one's reference point affects his or her evaluation of an outcome, and how a party reacts to events and others' behavior. The reference points connected to one's feeling of entitlement determine the behavior of contracting parties. We judge outcomes, including what we might even get at the end of a negotiation, in part by what we perceive is fair, and sometimes this isn't in the contract. Oftentimes it could be in contradiction to the actual words and the underlying ideas. If you're familiar with the idea of a psychological contract, this idea of fairness matters beyond the words, so the theoretical parts are related to that as well. The circumstances that we experience when we're negotiating, devising the contract, and when it's executed, are bound to change as the contract goes forward. Combining this simple fact of the changing

state of the world with the assumptions of incompleteness gives us the foundation of the key logic for these formal relational contracts. Bottom line is, contract gaps are inevitable, and changes in the perception regarding fairness and entitlements are also inevitable. All of this has implications for people's behavior, including how often these contracts are modified, and how often disputes arise, which is quite often.

Equity theory

Equity theory says that people are motivated by their perceptions of fairness. For example, they'll perform an employment contract based on what they get in the end. We know that flexible contracts have more nuance than rigid contracts. But we also know structured communication has a small positive effect on the performance of flexible contracts. Structured communication is one of the practices involved in formulating these formal relational contracts that we like to implement. Having structured communication helps in situations where the evidence shows us that parties who bargain over losses tend to make fewer concessions and find fewer integrative solutions, more often failing to reach an agreement. People often reject offers they perceive as unfair even if they're made better off. So, we help both sides to work together to find solutions.

The five-step approach

There are key principles called the five-step approach. These principles come into play when parties go through the whole process,

adopt these key principles, and insert them into the contract. These have been enforced lately in court, especially in a Canadian context, but also in district courts in the United States. We know that the contracting parties can benefit by explicitly including social norms in the contract. These principles are more than ad hoc principles chosen by the parties. In fact, they think that the best way to describe them is they're activated rather than chosen. What the parties come up with fills in the gap as needed. The contract laws of most jurisdictions now include some version of what's considered the good faith doctrine, and courts have applied this when interpreting contracts, sometimes by including implied terms, even though there is no universally agreed upon meeting of good faith. The guiding principles that the parties go through in formulating these contracts can be thought of as laying out the party's understanding of what to do as the relationship and circumstances change. It's been labeled "the vested way process," consisting of five steps to forming this formal relational contract. It's not more costly than the traditional approach, but there is in fact much more cost one upfront, since they're going through a long process of laying a foundation to create a formal vision. These are very effective, although relational contracts are seen as being somewhat touchy-feely and not enforceable. But now the combined theoretical evidence underpins acceptance. Now, the process has been tweaked over and over with many companies adopting it.

Mental Health Analytics: An AI Perspective

RESEARCH WEBINAR

November 5, 2022

Presented by:



Sagar Samtani
Assistant
Professor at the
Kelley School of
Business

What I've noticed is when folks get into the cybersecurity field, in their first year they look like baby Yoda: cute, bright eyed, bushy tailed. Three years into the job, they look like 900-year-old Yoda. I don't know how many of you can relate to this, but it's part of the reason why I'm an academic and not on the front lines of a company, because I want to keep what little hair I have left on my head.

There are mental health concerns that have started to come up within the cybersecurity workforce and the IT workforce as well. Depression, anxiety, and chronic stress consistently come up among cyber professionals. This can lead to overuse of alcohol, or a culture of ignoring your symptoms. There's a lot of stigmas associated with mental health. Earlier this year my associate and I had written a couple of blogs through CompTIA, one of the world's leading nonprofit trade associations for information technology. The blogs addressed the mental health crisis amongst IT professionals and strategies for IT business leaders to manage their employees' mental health. For IT professionals doing this work, there are a lot of different stressors that are associated with the job, especially when starting a new job. It can be very stressful when someone is onboarding and needs to be kept up to date on new technologies. The thought is to use your resources, create onboarding guides, and so on. Another stressor is the culture of slow to be praised, quick to be blamed. Earlier this year at the Kelley School of Business, we had workshops related to the concept of Mental Health First

Aid, where we can determine what people are thinking and feeling, then address the issues accordingly and bring in the appropriate intervention strategies.

However, that does require a level of mental health literacy. IT leaders need to have a good sense of what good mental health looks like. For IT leaders, professionals, and managers to be aware about what types of response packages to deliver to their employees they need to be able to recognize and manage mental health issues that are coming up. The four components of mental health literacy are 1) ability, 2) knowledge, 3) beliefs, and 4) attitudes. Ability refers to the ability to identify or recognize mental health symptoms. Knowledge and beliefs are risk factors, self-help intervention services, which services to send people to and so on. Lastly, attitudes relate to the recognition of help seeking behaviors once the behavior is identified. If we think about the way mental health symptoms are being addressed and the limitations with that, AI can start to play a very valuable role.

There's a lot of different survey instruments that have been put together by the public health community, that ask people through survey mechanisms, how are you feeling? What does your anxiety look like, how does your depression show up? There are two major issues that come up with the surveying tool. One is that the survey is periodic, not ongoing. Surveys aren't an ongoing measurement as to what people are feeling on a second by second, minute by minute, day by day, week by week basis. It's a more sporadic format. Secondly, surveys are subjective by nature: stigma and biases are very real here. But how can we monitor mental health on a continuous objective basis?

An area I've been working in is sent sensor signal analysis, where we can analyze the data that's automatically generated from mobile devices such as wearables, and other devices generating data at a very high velocity. It's harder to fool a sensor than it is to fool a survey. Where AI can really play a role here is in the quantity, velocity, variety, and veracity of big data. How do you synthesize insights out of these data

characteristics to come up with measurable outcomes for an application such as mental health? If we look at sensor signal data, they're high velocity which means they're more objective. Not purely objective, but they're more objective than what you'd see in surveys. And they're increasing in ubiquity across many different applications. You can collect multiple dimensions of human behavior, such as physical, social, and sleep just through sensor signal data just through your smartphone. It's amazing how much data you can collect.

You need a method to be able to synthesize these data characteristics and to be able to produce results out of them. One of our objectives is identifying individuals with potential depressive symptoms, and pinpointing the behaviors that are associated with depression, based off sensor signal data. The value in this is identifying those behaviors objectively and recommend specific interventions, instead of putting the onus on the manager or the professor or whoever the leader is to detect what those behaviors are in there and of individuals that they may be managing. The goal is to analyze the sensor signal data to do that automatically.

We developed a deep learning-based approach called the agreement self-attentive model that encodes and aggregates multiple sets of data, multiple sets of sensor signal data from different sources. Then we extract the consistency in feature patterns to identify which sensors are most associated with depressive behaviors. Indiana University is one of the few universities that I'm aware of that has a very good mental health set of services here on campus, but they're often understaffed and overworked. What we're working on now is embedding an algorithm that we've developed into the IU mobile app to automatically tell the mental health services on campus, this student might be at risk for a depressive episode, then make specific recommendations to the student about actions that they could take. Those are conversations that we're having here at Indiana University. The synergy that results from these analytics really helps synergize and enhance existing mental health services.

Toward Automatically Evaluating Security and Privacy Risks and Providing Cyber Threat Intelligence

RESEARCH WEBINAR

November 5, 2022

Presented by:



Xiaojing Liao, Assistant
Professor of Computer Science,
Luddy School of Informatics,
Computer, and Engineering

Cybersecurity and privacy are issues that affect society. Humans are a central part of this issue. The center of my research is under the umbrella of human-centered security analysis, which is the intersection of human-centered AI and system security analysis. Specifically, I want to understand the human factors in system security and interpreting the way AI systems security.

I focus on four factors. One factor is learning how developers understand and comply with privacy goals, and how they recognize and assess when security is breached. The second involves how miscreants weaponize vulnerabilities. Third, how to access vulnerabilities to better understand tactics, techniques, and procedures. Fourth, what is the reachability of security issues?

Natural language processing technique is a bridge of the computer system and humans. It is at the intersection of computer science, artificial intelligence, and linguistics. The goal is for a computer to process human language. There are some well-defined natural language tasks which are key for some downstream tasks like cybersecurity.

Named entity recognition means the computer recognizes names, products, locations, etc. This is a common natural language processing task. Sentiment analysis is another task. These actions can help assess threats for various organizations. In security companies, personnel can check trending security events and often recognize artifacts of documents. We can model tasks by using named entity recognition to gather information such as attack location to help detect threats. Another example is using a chatbot to communicate with miscreants to gather attack information. This is a more proactive technique.

My project showcases semantic-supported security and privacy analysis, which combines security analysis with natural language processing. We can use natural language processing techniques to simulate human intelligence. This helps to empower security and privacy analysis. When considering compliance, it's important to highlight privacy, or security, objectives. For example, take the Facebook-Cambridge data scandal in which 50 million Facebook profiles were harvested in a data breach. This type of breach is referred to as

"cross-library data harvesting" or XLDH. This sort of cross-network breach is prevalent. In fact, over 19 thousand Google Play apps, totaling nine million downloads, integrated cross-library data harvesting through distribution channels involving pre-installed libraries, application monetization, and colluding in free app functionalities.

We built a tool to assist in detecting XLDH with a goal of automatically recognizing privacy objectives from mobile SDK terms of use as well as supporting privacy compliance check of XLDH. However, identifying the privacy code itself is not trivial. Company-specific privacy data and context-sensitive sophisticated conditions becomes pivotal. For example, Google allowing a developer to identify a device id separately to prevent gathering data or device information. We tried to better understand and model the privacy goals and establish alignment techniques involving natural language processing.

What's the impact of XLDH? It's reported that 42 malicious libraries that conducted cross-library data harvesting were integrated into 19 thousand Google Play apps. Wide media coverage exploited these instances in publications like Forbes, ZDNet, and Naked Security. Malicious SDK vendors were sued by victim library vendors, like Facebook and Twitter.

Semantic-supported security analysis technologies offer an opportunity to identify security objectives for automatic vulnerabilities detection, inferring security objectives from documentation. So first, we identify the security code rather than the privacy code from the developer's perspective. We check it against the original code to identify data misuse. We then compare it to some traditional API use detectors, which did not include the semantic analysis. This type of semantic approach outperformed traditional types of program analysis. It has a wide range of uses.

We can use inference techniques to help understand privacy goals. Consider payment systems, which often have well-defined payment procedures and security properties. In recent years, we have seen some new payment services, or syndicate services. These are often third-party transactions and often lack sophisticated security systems.

GT-IDEA Faculty Scholars

Indiana University Faculty

Kelley School of Business
Luddy School of Informatics, Computing, and Engineering
O'Neill School of Public and Environmental Affairs

Matthew Baggetta

Associate Professor
O'Neill GT-IDEA Scholar

Matthew Baggetta is an expert on civil society and voluntary associations. His research interests include civil society and civic engagement, membership-based organizations, and social movements. Baggetta's work focuses on the impacts of voluntary associations on their members and the broader impacts of associations and movements on society. Baggetta has conducted studies of Sierra Club chapters, local community choirs, campus-based student groups, and large, urban associations. He has developed a new systematic social observation data collection tool for studying civic activity and is applying it in the Observing Civic Engagement Project. He currently serves on the board of directors of the Melos Institute, a think-tank focused on membership-based organizations and contributes to Mobilizing Ideas, an interdisciplinary blog focused on social movements. Baggetta's publication outlets include the *American Sociological Review*, *American Journal of Sociology*, *Social Forces*, *Perspectives on Politics*, *Nonprofit and Voluntary Sector Quarterly*, and *Sociological Methods and Research*. Baggetta joined IU and the O'Neill faculty in 2010 following a year as a Harvard College Fellow.

Mallory Barnes

Assistant Professor
O'Neill GT-IDEA Scholar

Dr. Mallory L. Barnes is an expert in quantitative analysis and integration of ecological data across spatial and temporal scales. She joined O'Neill as an assistant professor in 2019. She earned her Ph.D. in watershed management and ecohydrology from the University of Arizona. Barnes also holds a master's degree from the University of Hawaii at Manoa in natural resources and environmental management. At the undergraduate level, she studied zoology at the University of Wisconsin-Madison. Barnes's research and teaching focuses on environmental informatics, remote sensing, ecohydrology, natural resource management, ecological analytics, and geographic information systems. Her specific research interests include scaling ecohydrological and biophysical processes from leaf to global scales and from daily to decadal timescales to improve predictions of vegetation response to future climate conditions. This work serves to improve our understanding and prediction of environmental changes in response to climate change, ranging from individual plants to entire ecosystems, with significant implications for agriculture, water resources, and biodiversity. Barnes previously worked as a biological sciences technician with the U.S. Department of Agriculture's Southwest Watershed Research Center.

David Crandall

Director of Luddy Artificial Intelligence Center
Professor of Computer Science
Director of Center for Machine Learning
Luddy GT-IDEA Scholar

David Crandall received a Ph.D. in computer science from Cornell University in 2008 and M.S. and B.S. degrees in computer science and engineering from Pennsylvania State University, University Park, in 2001. He worked as a postdoctoral associate at Cornell from 2008-2010, and as a research scientist at Eastman Kodak Company from 2001-2003. Dr. Crandall's main research interest is computer vision, the area of computer science that tries to design algorithms that can "see". He is particularly interested in visual object recognition and scene understanding. He is also interested in other problems that involve analyzing and modeling large amounts of uncertain data, like mining data from the web and from online social networking sites.

April Grudi

Director, Master of Science in Healthcare Management
Assistant Clinical Professor
O'Neill GT-IDEA Scholar

Professor April Grudi joined O'Neill in 2018. Grudi spent the prior decade providing strategic and operational leadership in a variety of roles at Indiana University Health. Most recently, she led a team of trainers who supported both system level and business unit development through the use of a Lean operating model. Grudi also provided support and coaching to senior executives in the fields of leadership development, change management, and new leader onboarding activities.

Dana Habeeb

Assistant Professor of Informatics
Luddy GT-IDEA Scholar

Dana Habeeb is an assistant professor in the Department of Informatics at Indiana University. Trained as an architect and urban designer, Dr. Habeeb brings a design perspective to her research in environmental planning and health. With a focus on designing local interventions, she investigates ways to engage and empower individuals to respond to current and future environmental problems by synthesizing research in climate change, public health, and environmental sensing. Her research explores how climate responsive design can help mitigate climate change and address environmental challenges to improve the health of individuals and communities.

Jonathan Helm

Associate Professor
Kelley GT-IDEA Scholar and Co-Director
Life Sciences Faculty Research Fellows
Center for Business of Life Sciences

Jonathan Helm joined Indiana University in 2012. Formerly, he held operations management and supply chain roles at GE Healthcare and Mayo Clinic. He is a three-year National Science Foundation Fellow. His research aims to improve the delivery of health care at three levels: the system level, the organizational level, and the individual patient level. Specific interests focus on patient flow, readmissions, and disease monitoring and treatment. He won the 2018 Pierskalla Award for Best Healthcare Paper at INFORMS and was a finalist for the 2018 POMS Most Influential Paper award for 2015-16. He was selected to give a Showcase Presentation at the 2014, 2015, and 2018 POMS College of Healthcare Operations Management (CHOM) Conference for implementation of three different research projects in hospitals and nonprofit organizations. He founded an interdisciplinary research group encompassing business, engineering, and surgical faculty at Indiana University, University of Michigan, and University of Pittsburgh and has collaborated closely with Mayo Clinic, National University Hospital (Singapore), and the MESH Healthcare Coalition in Indianapolis.

Diane Henshel

Associate Professor
O'Neill GT-IDEA Scholar

Dr. Diane Henshel is an internationally known systems-based risk assessor working across diverse systems and disciplines. Her research addresses the multidimensional problem of integrating disparate metrics across the many dimensions of multilevel systems. Her main research foci encompasses the fields of environment, health, and cybersecurity, which have begun to overlap in ways that will increasingly impact global security as climate change causes stresses in both natural and anthropogenic (and joint) systems. She is an associate professor at SPEA specializing in risk and resilience assessment, cybersecurity risk modeling, risk communication, and toxicology. She spent a year as the executive director of the Risk Assessment Forum at the EPA. She is also the principal and owner of Henshel EnviroComm, a consulting firm specializing in supporting both government agencies and communities addressing chemical contamination.

John Hill

Clinical Associate Professor
Co-Director Digital Logistics and Transportation Workshop
Kelley GT-IDEA Scholar

John Hill has been a faculty member with the Kelley School of Business in the Department of Operations and Decision Technologies for six years. He was previously an assistant professor of mechanical engineering at Michigan Technological University. His industry background includes positions as engineering manager for R&D at Eaton Corporation and product development engineer for General Motors. John received his bachelor's in mechanical engineering from Michigan Technological University, a master's in Engineering from Purdue

University, and both a PhD in industrial engineering and a MBA from the University of Iowa. He teaches courses in operations management and business analytics for the full-time and online MBA programs. He is co-director of the MBA Supply Chain Academy and has received multiple teaching awards.

Bryce Himebaugh

Clinical Assistant Professor of Engineering
Luddy GT-IDEA Scholar

Bryce Himebaugh's career has centered around embedded systems design and leadership. His work history includes positions at Intel (four-term co-op), Cummins Engine Company, Indiana University, and Analog Computing Solutions. He has held technical leadership positions at Cummins (heavy-duty controls hardware lead), Indiana University (Luddy director of information technology), and Analog Computing Solutions (chief technology officer and co-founder of this startup). He began teaching for IU's Department of Computer Science as clinical assistant professor in 2013 and moved to the Department of Engineering in 2018. He has taught undergraduate and graduate level classes on topics such as computer structures, embedded systems, C programming, operating systems, computer architecture, analog circuits, and cyber-physical systems.

Kari Johnson

Teaching Professor
Kelley GT-IDEA Scholar
Associate Department Chair, Operations and Decision Technologies

Kari Johnson is a teaching professor of operations and decision technologies and an award-winning educator with over twenty years at the Kelley School of Business. For the past seven years, Kari has served as faculty coordinator of an undergraduate business analytics course with over 1,000 students per semester. Kari also co-authored the textbook, *Introductory Business Analytics*, to help students master data-driven decision-making techniques and understand the value of data in today's business environment. In addition to teaching analytics at the undergraduate and graduate level, she also serves as a co-director for the Business Analytics Consulting Workshop at Kelley.

John R. Karaagac

Senior Lecturer
Director, Certificate of Applied Research and Inquiry
O'Neill GT-IDEA Scholar

Dr. John Karaagac is a political scientist with expertise in the American presidency, domestic and foreign policy, political biography, and international and comparative politics. An IU faculty member for more than a decade, Karaagac lectures on public policy and international relations at O'Neill. He has also taught at the University of Richmond and Johns Hopkins University. In the summers, Karaagac teaches international relations theory and American foreign policy at Hopkins' School of Advanced International Studies Summer program where he earned his doctorate with distinction in 1997. Karaagac has written four books on American policy and the intersection between the presidency and foreign politics, including *The Bush Paradox: a Study in Comparative Politics*. He also co-authored a book with IU Emeritus Professor Randall Baker, titled *Why America Isn't Europe*.

Antino Kim

Associate Professor of Information Systems
Kelley GT-IDEA Scholar

Antino Kim is an assistant professor of information systems at the Kelley School of Business. Antino earned his PhD in information systems from the Foster School of Business at the University of Washington, Seattle, and a master's degree in computer science and engineering from the University of Michigan, Ann Arbor. His research interests include misinformation and social media, supply chain of information goods, digital piracy and policy implications, and IT and worker displacement. Antino's papers have appeared in the Journal of Management Information Systems, Management Science, and MIS Quarterly, among other outlets.

Xiaojing Liao

Assistant Professor of Computer Science
Luddy GT-IDEA Scholar

Xiaojing is an Assistant Professor of Computer Science at Indiana University Bloomington. Xiaojing received her Ph.D. in Electrical and Computer Engineering at the Georgia Institute of Technology. Her research interests include data-driven security and privacy, with the specific focus on cyber crime, system security, as well as cyber-physical systems security and privacy.

Alex Barsi Lopes

Clinical Professor of Information Systems
Kelley GT-IDEA Scholar

Alex Barsi Lopes is a clinical professor of information systems at the Kelley School of Business, where he teaches process modeling, systems analysis and design, data warehousing and visualization, big data, applications of artificial intelligence, and technology consulting management. He has served as director of the Technology Consulting Workshop since its creation in 2016 and has been responsible for GLOBASE and AGILE consulting projects in Guatemala, India, and Thailand. His research focuses on online information goods, collaboration technologies, face-to-face and online social networks, and IS educational initiatives, with his work appearing in journals such as *Information Systems Research*, *Journal of Management Information Systems*, and *Communications of the ACM*. Passionate about international education, Dr. Barsi Lopes has taken students to Thailand, China, India, Brazil, Guatemala, Mexico, and Canada. Before joining Kelley, he was the director of the MS-IS Program at the University of Cincinnati.

Deanna Malatesta

Associate Professor
O'Neill GT-IDEA Scholar

Dr. Deanna Malatesta joined the Public Affairs faculty at the O'Neill School of Public and Environmental Affairs in 2007. She received her Master's in Public Administration from Rutgers University-Camden and her doctorate in Public Administration from the University of Georgia. She has published numerous

works on contracting, public management, and governance, including peer-reviewed journal articles, book chapters, and professional reports. She is the recipient of the 2011 William E. Mosher and Frederick C. Mosher Award for the best article by an academician in *Public Administration Review*, the field's flagship journal. Malatesta also has an extensive professional background in regulation and cable television franchising procedures. She has served as a telecommunications consultant for several municipalities in New Jersey and for the City of Philadelphia. She also previously served on the High Performance Governance Team for the City of Indianapolis.

Jorge Mejia

Associate Professor
Kelley GT-IDEA Scholar

Jorge Mejia is an assistant professor at the Kelley School of Business at Indiana University. Prior to joining Kelley, Dr. Mejia was a technology and management consultant, an industry analyst, and an entrepreneur. His research focuses on understanding the antecedents and impacts of social media through the analysis of large amounts of data. His more recent work examines how transparency in organizations affects social justice. He was awarded the INFORMS ISS Gordon B. Davis Young Scholar Award in 2021 in recognition of his work as a junior scholar in the field of information systems. He was also awarded the inaugural INFORMS ISS Bapna-Ghose Social Justice Best Paper Award in 2021 for his work uncovering potential biases in ridesharing. His work has been featured in multiple media outlets, such as NPR, CBS, and FOX.

Stasa Milojevic

Associate Professor of Informatics
Core Faculty of Cognitive Science
Luddy GT-IDEA Scholar

Stasa Milojevic is an associate professor in the Luddy School of Informatics, Computing, and Engineering, the director of the Center for Complex Networks and Systems Research (CNetS), a Grant Thornton Scholar, a core faculty of the Cognitive Science program, and a fellow of the Rob Kling Center for Social Informatics at Indiana University, Bloomington. Her research endeavors to elucidate the dynamics of science as a social and an intellectual (cognitive) endeavor by approaching science as a heterogeneous system comprising of people, ideas, documents, instruments, institutions, and policies situated in a historical context. Specifically, she strives to produce comprehensive, yet straightforward models based on theoretical and empirical findings from a wide range of fields (science, technology, and society (STS), science of science, information science, network science, economics, sociology, philosophy, history, etc.) in order to uncover and explain the fundamental principles that govern contemporary science. She serves on the editorial boards of *Scientometrics* and *BioScience*. She is an associate editor for *Quantitative Science Studies*, the *Frontiers in Research Metrics and Analytics*, and *Journal of Altmetrics*. She received her PhD in Information Studies at University of California, Los Angeles.

Roger Morris

Senior Lecturer
O'Neill GT-IDEA Scholar

Roger Morris joined O'Neill in 2008 and is an expert in database management, IT services and governance, information privacy and network infrastructure. He has been working in the IT field since 1990, serving over 14 years as the information systems manager for the Indiana Prevention Resource Center at Indiana University's School of Public Health. In addition to information technology, Morris studied East Asian languages and culture and is fluent in the Chinese language. He recently served as a Chinese interpreter for a conference hosted by the IU Bloomington School of Public Health. Prior to working at IU, Morris was a network specialist for the Monroe County School Corporation.

Charles Pope

Senior Lecturer
Assistant Chair, Computer Science
Luddy GT-IDEA Scholar

Charles Pope prepared profit and loss statements for the operations director, special accounts division for the largest wholesaler of wireless equipment before working at CompuCom, Dallas, TX, where he held various positions in call center management, including special projects, metrics, and reporting programs for Fortune 500 companies outsourcing help desk operations. He was a major accounts manager for a highly specialized network operations center in Austin, Texas, before moving to Indiana in 2001 to work for a telecommunications aggregator. In late 2003, he began teaching real-world productivity applications to IU students majoring outside of computer science. He has authored materials for one textbook by Hayden-McNeil, and two textbooks from Pearson Education. He currently serves as senior lecturer and assistant chairperson of computer science.

Sagar Samtani

Assistant Professor of Information Systems
Kelley GT-IDEA Scholar

Sagar Samtani is an assistant professor of information systems at the Kelley School of Business. Samtani's research focuses on Artificial Intelligence for Cybersecurity applications, including smart vulnerability assessment, dark web analytics, scientific cyberinfrastructure security, and cyber threat intelligence (CTI). His research initiatives have garnered nearly \$1.5M in prestigious funding, including the National Science Foundation (NSF) CISE Research Initiation Initiative (CRII), NSF Cybersecurity Innovation for Cyber Infrastructure (CICI), and others. He has published over two dozen peer-reviewed articles in venues such as *MIS Quarterly*, *Journal of Management Information Systems*, *IEEE Intelligent Systems*, *Computers & Security*, and others. He serves as a program committee member or program chair of leading AI for cybersecurity and CTI conferences and workshops, including IEEE Security and Privacy Deep Learning Workshop, USENIX ScAI Net,

IEEE Intelligence and Security Informatics, and others. Samtani has won several awards for his research and teaching efforts, including the ACM SIGMIS Doctoral Dissertation Award and Nunamaker-Chen Dissertation Award (runner-up). His research has been cited in media outlets such as the Miami Herald, Science Magazine, AAAS, and Fox.

Patrick C Shih

Director of Graduate Studies for Data Science
Assistant Professor of Informatics
Luddy GT-IDEA Scholar

Patrick Shih is an assistant professor of Informatics in the Luddy School of Informatics, Computing, and Engineering at Indiana University Bloomington. He is an ACM Senior Member (top 25% of ACM). He directs the Societal Computing Lab (SoCo Lab) and is the director of graduate studies for Data Science. He is also the co-director of the Animal Informatics MS and PhD track and the BS Cognate, BS Minor, and PhD Minor in Animal-Computer Interaction, as well as a core faculty of the Health Informatics PhD track. His research focuses on how to better support health and well-being, specifically that of underserved and vulnerable populations, through the design, development, and evaluation of sociotechnical systems and community-based mechanisms. He also designs technologies to amplify human and animal capabilities in animal-assisted interventions, improve animal welfare, and cultivate empathy for others. Prior to joining IUB, he was a research associate and lecturer in the College of Information Sciences and Technology at Penn State. He received his Ph.D. in Information and Computer Science from UC Irvine, where he was a Chancellor's Fellow, M.S. in Information Networking from Carnegie Mellon University, and B.S. in Computer Science and Engineering from UCLA. He has also worked at Microsoft Research and IBM Research.

Shellye Suttles

Assistant Professor
O'Neill GT-IDEA Scholar

Dr. Shellye Suttles is an agricultural economist with a focus on food system sustainability, including local and regional food systems, agricultural production, and agriculture's impact on climate change. Her research applies macroeconomic and microeconomic analysis to a variety of sustainable food system topics. Her areas of interest include public policy impacts on sustainability in food and agricultural systems, particularly social, economic, and climate policy. Suttles joined the O'Neill School as an assistant professor in 2020. She also serves as an assistant research scientist with Sustainable Food System Science at IU. Previously, she served as the food policy and program coordinator for the City of Indianapolis's Office of Public Health and Safety and as an economist with the U.S. Department of Agriculture's Economic Research Service. Suttles earned her Ph.D. and M.S. in agricultural economics from Purdue University.

Owen Wu

Associate Professor of Operations Management
Kelley GT-IDEA Scholar

Owen Wu is an associate professor of operations management at the Kelley School of Business. His research focuses on the operations of conventional and renewable energy supply chains and their interfaces with energy markets. He has published articles on a variety of topics related to sustainable energy systems, such as integrating renewable energy resources, upgrading conventional resources, building energy storage facilities, investing in energy efficiency, and managing energy demand. He collaborates with industry practitioners and has advised sustainability projects at Cummins, BorgWarner, Boeing, DTE Energy, 3M, Graham Partners, Delphi, Dow, and UPS. Professor Wu received the Paul Kleindorfer Award in Sustainability in 2017 from the Production and Operations Management Society. His teaching excellence has been recognized multiple times.

Lu (Lucy) Yan

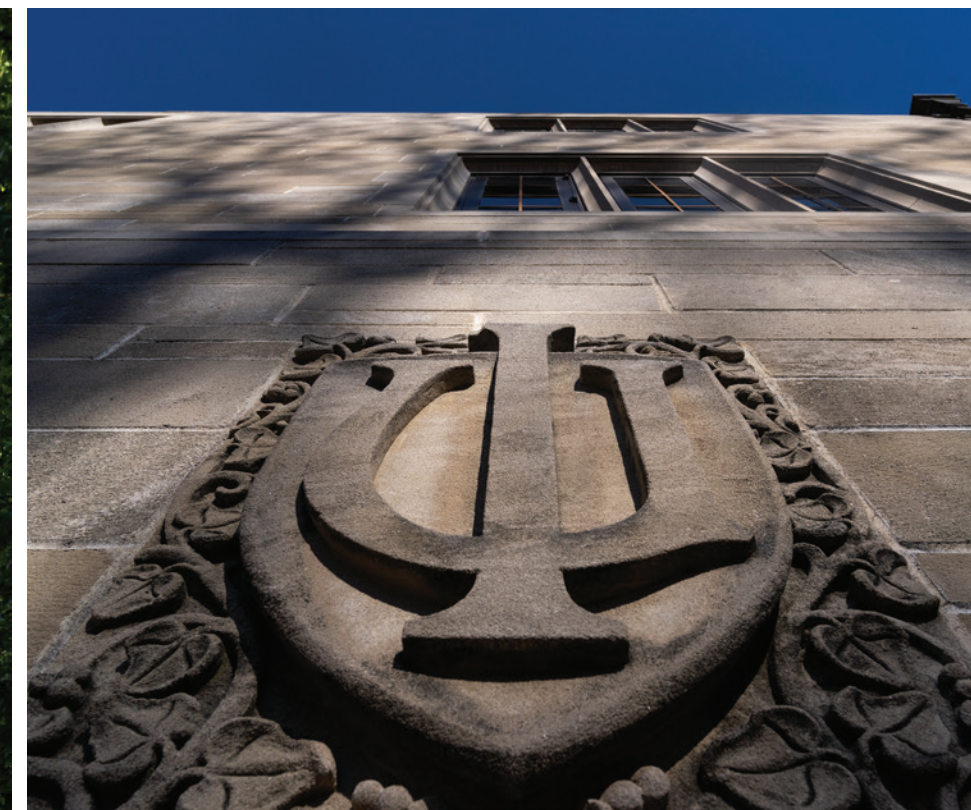
Associate Professor of Information Systems
Kelley GT-IDEA Scholar

Lu (Lucy) Yan is an assistant professor of information systems at the Kelley School of Business. She holds a PhD in business administration from the Foster School of Business, University of Washington. Her research interests include social media, social networking, and patient-centric health care models. Her recent studies investigate the impact brought by social media to health care, especially for patients with social diseases. She has published in *Information Systems Research*, *Production and Operations Management*, *Journal of Operations Management*, and *Journal of Management Information Systems*, among others. She is a member of the editorial review board of IEEE Transactions on Engineering Management.

Eunae Yoo

Assistant Professor
Kelley GT-IDEA Scholar

Eunae Yoo joined the Operations and Decision Technologies department at the Kelley School of Business in 2021. She earned her Ph.D. from Arizona State University, and prior to joining Indiana University, she was an assistant professor at the University of Tennessee. Eunae's research examines how online platforms (e.g., social media platforms, online volunteering platforms) can be leveraged to improve humanitarian and non-profit operations. Her publications have appeared in *Production and Operations Management*, *Journal of Operations Management*, and *Journal of Management Information Systems*. Recently, Eunae's research was awarded the Best Paper Award for the Humanitarian Operations track at POMS 2021 and was a finalist for the Chan Hahn Best Paper Award at AOM 2019. To conduct her research, she has established partnerships with multiple non-profit organizations, including the Canadian Red Cross, Humanitarian OpenStreetMap Team, and Medic Mobile.



What is GT-IDEA?

The Grant Thornton Institute for Data Exploration for Risk Assessment and Management (GT-IDEA) is an interdisciplinary institute that spans Indiana University's Kelley School of Business, O'Neill School of Public and Environmental Affairs, and the Luddy School of Informatics, Computing, and Engineering. With a focus on assessing risk both in terms of service delivery exposure and/or client risk, the mission of GT-IDEA is to leverage disruptive technology and unlock innovation in the market by integrating leading-edge technology with business and policy.



Eric Kinser

KELLEY SCHOOL OF BUSINESS

Eric Kinser is a teaching professor in the Department of Operations and Decision Technologies at the Indiana University Kelley School of Business. At Kelley, Eric has won multiple teaching awards and currently teaches both graduate and undergraduate courses. His course topics include spreadsheet modeling, visualizing data with Excel and Microsoft's Power BI suite, cloud-based analytics, and Visual Basic for Applications. In addition to serving as co-director for the Grant Thornton Institute for Data Exploration for Risk Assessment and Management (GT-IDEA), he is a co-author on the *Your Office* textbook series. Prior to joining Kelley, he worked in the medical field and in higher education as a technology and decision support specialist.



Dan Grundmann

O'NEILL SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS
GT-IDEA SCHOLAR

Senior lecturer Daniel J. Grundmann specializes in the field of human resource management, is a Senior Certified Professional (SHRM-SCP) with the Society for Human Resource Management, and has maintained certification as a Senior Professional in Human Resources (SPHR) since 2000. He worked for the City of Bloomington for 17 years, including 13 as director of Human Resources, where he helped drive the complete revision of the compensation and benefits structure for the City, the development of performance appraisal and job evaluation systems, the implementation of a Human Resource Information System, and employee handbook and policy manual revisions. Grundmann has taught at IU since 2002. He was honored to receive a 2012 Teaching Excellence Award from IU's O'Neill School of Public and Environmental Affairs for his accomplishments as an adjunct faculty member. Also that year, he earned a Society for Human Resource Management Academic Award.



Travis Brown

LUDDY SCHOOL OF INFORMATICS, COMPUTING, AND ENGINEERING

As the senior executive assistant dean, Dr. Brown built and serves as the academic director of the Innovation and Entrepreneurship Program and Cross-Curricular Education, the executive director of the Shoemaker Innovation Center, and the point of contact for strategic discussions related to the commercialization of faculty research. Dr. Brown also holds a special academic appointment as an HCI/d Core faculty member, which entails teaching design strategy and strategic design and serving as a faculty advisor for the HCI/d master's degree students, as well as the co-director of the Grant Thornton Institute for Data Exploration for Risk Assessment and Management. In addition, he is the faculty advisor for the Ideation and Creation Entrepreneurs (ICE), the Shoemaker Scholars, and the Product Management Club. Prior to returning to Indiana University to pursue his doctoral degree, Dr. Brown spent his career within the intersection of business and technology, focusing on performance management, entrepreneurship, corporate innovation, business analytics, software development, and interaction design in corporate and small business settings.