

# SMART, LEAN ECOSYSTEMS MEET OUR SPEAKERS

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**Antoine van Agtmael** (Key Note Speaker), Senior Adviser, Garten Rothkopf and founder, CIO and CEO, Emerging Markets Management, LLC; co-author of The Smartest Places on Earth

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**Charlie Chung**, Senior Marketing Manager, UPS Supply Chain Solutions

For decades, American manufacturers have complained about low-cost competition from Asia, but in recent years, Antoine van Agtmael, keynote speaker at the 2016 DCMME Fall Conference, has noticed a significant shift. He has heard Asian manufacturers bemoan America's competitive advantage and they weren't just concerned about rising labor costs in Asia and cheap energy sources in the U.S.

"The dirty little secret was they couldn't keep up with American and old-economy innovation," said van Agtmael, a longtime emerging markets investor and co-author of *The Smartest Places on Earth*. "They just couldn't keep up with the R&D. The R&D here was so good."

Anyone doubting his words just had to see the type of innovation highlighted at the conference, as speakers such as Mats Johansson of EON Reality and Rho Cauley Bruner of Northrup Grumman discussed their companies' products and the ecosystems that support their research and development efforts.

"As a person who likes to build things, getting to work on advanced aircraft design and manufacturing is pretty much as good as it gets," said Bruner, a Krannert graduate who is the Vehicle Management Systems (VMS) Integrated Product Team (IPT) Lead at Northrup Grumman.

She has spent much of her career working on the Global Hawk, an unmanned surveillance aircraft developed for the U.S. Air Force, and attributes its success largely to the innovation and flexibility of the development team.

Johansson, whose company won the 2015 Innovator of the Year award at the Business Innovation and Growth (BIG) summit, discussed his company's use of virtual and augmented reality to enhance education and training. "With VR and AR, you can remember

longer, learn faster and ultimately make better decisions," he said. The new magazine *Smart Manufacturing* has featured some of the innovation that's helping American manufacturers compete on a global scale. Brett Brune, editor of the Michigan-based magazine, reviewed developments such as the use of Miralon yarn – pure carbon nanotube (CNT) fibers – in aerospace and other applications, and the potential of bioprinting for creating human skin.

Such innovation is driving what van Agtmael described as a new paradigm.

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***"The era of cheap is over, the era of smart has begun."***

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He and his co-author, Fred Bakker, whose book is subtitled "Why Rustbelts are the Emerging Hotspots of Global Innovation," spent a couple of years exploring how five regions in the U.S. and five in Europe have transformed themselves into "brainbelts."

An important aspect of creating a "brainbelt" in a particular region, van Agtmael said, is having a great university performing world-class research, as well as a multi-disciplinary approach to solving problems. The conference offered a glimpse of Purdue's manufacturing-related research and development, some of which is directly benefiting local companies.

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***"Part of our mission at Purdue is to be a bridge between industry, faculty and students,"*** said Dr. Ananth Iyer, DCMME Center Director.

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He highlighted three companies that Purdue students have assisted through the Indiana Next Generation Manufacturing Competitiveness Center (IN-MaC): Zojila, Premier Auto Detailing and American Axle Manufacturing. Dr. Karthik Ramani, Director of C Design Lab and Donald W. Feddersen Professor of Mechanical Engineering,

discussed innovation related to human-computer interaction, including the development of Ziro, a toy-building kit that enables children to create robots and control them remotely using a "smart glove." The product was invented at Purdue with funding from the National Science Foundation. The motorized modules developed for Ziro can potentially be applied to the manufacturing sector. "You would find a lot of machines doing different things," Ramani said. Iyer stressed the benefits of adopting smart technologies such as augmented reality, assistive robots, 3D printing, and video analytics. A student project that extracted data from video captured at a local manufacturing facility underscored the potential benefits of video analytics. "Productivity improvements through deployment of these technologies can actually enable globally competitive manufacturing locally," Iyer said.

It's important for smart technology to extend all the way to the supply chain, said Charlie Chung, senior marketing manager at UPS Supply Chain Solutions. He addressed how smart operations can help manufacturers optimize their supply chain to meet customer demand.

Chung described important aspects of smart operations, such as having smart products, using technology to gain real-time data on inventory throughout the supply chain, and collaborating with third-party providers who offer scale and expertise.

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***"You need to have flexibility and inherent in that flexibility is working with partners, whether it's in your own industry or whether it's educational institutions or other service providers."***

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-Melvin Durai, freelance writer

# CONFERENCE KEYNOTE

## Antoine van Agtmael



**M**r. Antoine Van Agtmael, the co-author of *The Smartest Places on Earth: Why Rustbelts Are the Emerging Hotspots of Global Innovation*, shared with us about the concept of brainbelts which means new clusters in the United States and Europe where complex and multidisciplinary challenges, world class research, and openness to sharing brainpower are combined. The era of 'Smart Manufacturing' has begun, and manufacturing is reinvented due to emerging technology including IoT and big data. Rustbelt cities refer to former industrial cities that currently are transforming

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HYEJIN KIM



themselves into brainbelts which are the centers of global innovation. He described examples of brainbelt cities: Albany in NY (semi-conductors), Research Triangle Park in NC (bioscience, new materials), Portland in OR (bioscience), and Eindhoven in Netherlands (semi-conductors, new materials). Brainbelts cities are producing smart products that the new era demands. Antoine recommended the policy that can foster brainbelts: creating work-study programs, building and supporting innovation districts, and rewarding the sharing of smart ideas. Brainbelts can be the way to effectively bring innovation for the new manufacturing age.

-Hyejin Kim, Center GA

## speaker bio

*Antoine van Agtmael (Key Note Speaker), Senior Adviser, Garten Rothkopf and founder, CIO and CEO, Emerging Markets Management, LLC; co-author of The Smartest Places on Earth*

Mr. Antoine Willem van Agtmael serves as the President, Chief Executive Officer, and Chief Investment Officer of Emerging Markets Investors Corporation. Mr. van Agtmael serves as the Chairman, Chief Investment Officer, and Portfolio Manager at Ashmore EMM, L.L.C. Mr. van Agtmael founded Ashmore EMM, L.L.C. and is responsible for country allocation and overall maintenance of investment standards. He joined Garten Rothkopf as a senior adviser in 2012. Mr. van Agtmael was a Founding Partner at Strategic Investment Partners, Inc. Mr. van Agtmael served as the Chairman of the Board, Chief Investment Officer and Portfolio Manager of The Emerging Markets Strategic Fund. He served as the President and Chief Investment Officer at Africa Emerging Markets and Chairman and Chief Investment Officer at SEI Institutional International Trust - Emerging Markets Equity Fund. Before founding EMM in 1987, Mr. van Agtmael served as the Deputy Director of the Capital Markets Department at International Finance Corporation, as the Division Chief in the treasury operations at The World Bank, the Managing Director at Thai Investment and Securities Company Ltd., and as a Vice President and International Lending Officer at Bankers Trust Company. While at IFC, he coined the term "emerging markets" in 1981 and created the IFC Emerging Markets Database. He serves as a Member of Advisory Board of Zaitoun Ventures. He serves as a Director at Ashmore EMM, L.L.C., Strategic Investment Partners, National Public Radio, Inc., Emerging Markets Investors Corporation, and Emerging Markets Management Company (Ireland) Limited. He was also a founding director of the Strategic Investment GroupSM. He serves as a Director

of The Emerging Markets Strategic Fund, Africa Emerging Markets Fund, and Emerging Markets New Economy Fund, PLC. He serves as a Member of Advisory Board at Eurasia Group, Ltd. He serves as a Trustee at The Brookings Institution. He is a Board Member of the International Human Rights Law Group. He is a Member on the National Advisory Council for the Graduate School of Education and Human Development at George Washington University. Mr. van Agtmael serves on the Board of Trustees of The Lab School of Washington. He is Co-Chairman of its International Advisory Council, a Trustee of the NPR and a Trustee of the Smithsonian's Freer Sackler Gallery. He is a Member of the Board of Trustees of the Washington Opera. He served as a Member of the Board of Directors at India Growth Fund, Inc. In addition, he serves on the Advisory Council of The Paul H. Nitze School of Advanced International Studies at Johns Hopkins University. He was an Adjunct Professor at Georgetown University Law Center and taught at the International Management Institute in Geneva, Harvard University Institute of Politics and Thammasat University, Bangkok. Mr. van Agtmael is the author of The Emerging Markets Century, Emerging Securities Markets and co-editor of The World's Emerging Stock Markets and has spoken at numerous conferences and meetings worldwide. He is on the President's Council on International Activities at Yale University and the Advisory Council of Johns Hopkins University's Paul H. Nitze School of Advanced International Studies (SAIS). He is a member of the Council on Foreign Relations. Mr. van Agtmael holds an M.B.A. from the New York University, an M.A. degree in Russian and Eastern European Studies from the Yale University, and a B.A. degree in Economics from The Netherlands School of Economics at Erasmus University.



Hyejin Kim is a second-year MBA student at Krannert School of Management. Originally from South Korea, she has seven years of experience in global procurement, new product development, and marketing. Hyejin has skills in strategic planning and analytical problem solving across technology, manufacturing, and consumer goods industries. Throughout her career, she led strategic sourcing initiatives across multiple business units and implemented end-to-end new product development processes in three continents (Asia Pacific, North America, and South America). In summer 2016, she developed a global market strategy for Spensa Technologies and also led a process improvement project in procurement at TVS Motors in India. Hyejin serves as Vice President of External Affairs on Operations Club, and is actively involved in Krannert Graduate Marketing Association and Graduate Women in Business clubs.

# SMART MANUFACTURING MAGAZINE

## Brett Brune



**D**uring the fall conference, Brett Brune, editor in chief of Smart Manufacturing magazine, presented an overview of a number of topics on the cutting edge of smart manufacturing as outlined in the most recent copy of Smart Manufacturing magazine. His first topic was smart yarns. Almost everyone is familiar with traditional yarns, but smart yarns are the result of MIT scientists combining the basic ingredients of modern technology, a metal semiconductor and an insulator, into a drawn fiber. Smart yarns were used in the JUNO satellite that recently reached Jupiter.

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MATT FOUST

## speaker bio

Smart yarns will continue to be used as functional and integrated parts of electronics and technology. Brett also discussed bioprinting. As 3D printing begins to become common, its uses are becoming more applicable and useful to everyday life. Bioprinting is an extension of traditional 3D printing. It is the actual 3D printing of human body parts. Bioprinting is helping scientists understand how human cells work. As an example Brett showed a picture of a bioprinted ear- an actual replica of Van Gogh's ear. Lastly, Brett touched on the concept of the fourth industrial revolution and the hurdles encountered in additive manufacturing. Those on the cutting edge of technology now believe we have entered a fourth industrial revolution. Brett defined the fourth industrial revolution as the fusion of technologies like gene sequencing, nanotechnology,

renewables, and quantum computing – and their interaction across physical, digital, and biological domains. Although the technology is exciting and transformative, Brett also mentioned that we as humans do not appear ready for this fourth industrial revolution. Similarly, additive manufacturing has advanced so far that we can manufacture almost any shape, but we cannot design it, software-wise. These hurdles we face as technology grows disproportionately fast in some areas are complex and unforeseen. As manufacturing continues to advance, we will need fresh ideas and new talent to address the ever-challenging and ever-changing environment.

-Matt Foust, Center GA

*Brett Brune, Editor in Chief  
Smart Manufacturing Magazine*

BRETT BRUNE is Editor in Chief of Smart Manufacturing magazine. He previously edited and wrote on staff at the Los Angeles Times, the Washington Post and The New York Times. He also produced and wrote a multimedia report for The Global Fund in Russia (broadcast on NBC's "Nightly News"), conducted research for a book by the Dalai Lama, and critiqued magazines for The New York Times.



Matt is originally from northwest Indiana. He graduated from Purdue in 2010 with a degree in Chemical Engineering. Shortly after graduating, he moved to Houston to work for Halliburton. He spent over 5 years with Halliburton in the cementing product service line at the Fresno, TX facility. In this time, he progressed from an associate technical professional, a trainee, to a senior technical professional where he managed an engineering team of 3 as well as overseeing all technical aspects of the cementing field camp reaching \$1.2 million/month in revenue. Matt began the MBA program at Purdue's Krannert School of Management in August of 2016. Outside of work and school, his main hobby is powerlifting, and he also owns two rescue dogs.

# NORTHROP GRUMMAN

## Rho Cauley Bruner



**R**ho's discussion revolved around Autonomous Systems and its applications specifically in connection to Northrop Grumman.

Autonomous Systems- Autonomous systems- aircrafts that are truly robotic versus those that are remotely controlled by a human pilot. These are designed for all environments- the sea, land, air and space. Autonomous systems operate in areas where manned vehicles cannot, allow for prolonged missions, and help reduce risk to both national security and human lives.

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VIREN TULSIAN



The Future of Autonomy in Aerospace-  
These systems can now factor in: The roughness of the air, the time that the refueling aircraft can spend on a station trying to complete the procedure and the threat to the human flight crew from whatever dangers are present.

Autonomous aircrafts in a day – not too far off –will be safely integrated into the fabric of our security and our economy. Ultimately, they will not be confined to military uses. Already, they are shaking off their identifiers as novelties and curiosities. Every year they grow more reliable, capable, versatile, and affordable.

-Viren Tulsian, Center GA

## speaker bio

*Rho Cauley Bruner, Vehicle Management Systems Integrated Product Team Lead  
Northrop Grumman*

Rho Cauley Bruner is the Vehicle Management Systems (VMS) Integrated Product Team (IPT) Lead on the U.S. Navy MQ-4C Triton program. In this role, Cauley has responsibility for the management of VMS Products on the Triton Program including the flight control system, flight critical software, and avionics systems. Cauley began her career at Northrop Grumman in 2002 as a VMS Hardware Engineer and since then has held roles of increasing responsibility. Prior to her role on the Triton program, Cauley was the Deputy Chief Engineer for the Euro Hawk program, where she provided technical oversight of the design, integration and test of the German Full Scale Demonstrator System. Cauley was a key member of the team that successfully executed first flight from Palmdale to Edwards Air Force Base, envelope expansion testing, and ultimately deployment to Manching Air Base in Germany. In addition, Cauley served as Airworthiness Manager during the Manching flight test phase. This role involved interfacing with the German Airworthiness Authority, providing technical and airworthiness oversight of maintenance and flight test activities, and the development and implementation of unique local operating procedures. Cauley has also held multiple other roles on the Global Hawk Program, in both engineering and the program office, including product integration, fielding of production systems, and the development and test of new software and hardware capabilities. She has also worked on the development of new system architectures, and performed design, test and integration of major subsystems for multiple Independent Research and Development (IRAD) projects.



Viren Tulsian is a second year MBA student at Purdue University's Krannert School of Management with concentrations in operations and supply chain management. Viren is the president of the Krannert Operations Club. This summer, Viren worked as a Pathways Operation Manager Intern at Amazon. Here Viren studied the Operational practices at the Fulfilment Center and developed an Integer Programming model to solve for optimum scheduling of truck departures. Prior to joining Purdue, Viren worked for 4 years as a Supply Chain Manager in the Automobile Industry, at Tata Motors Ltd. In this role he worked with suppliers to resolve quality concerns with products, this gave him familiarity to advanced problem solving techniques. In addition, he was also part of new product development, using APQP methodology for development of new products.

# UPS SUPPLY CHAIN SOLUTIONS

## Charlie Chung



**M**r. Chung gave a presentation on Smart operations.

At the very basic level, smart operations refers to the need for flexibility by design in supply chains. He explained how in the progress towards Smart operations, manufacturers can be classified into 'Thrivers' and 'Survivors'. He answered the question of what makes Thrivers thrive by talking about how technology provides resiliency by connecting products and assets, aiding supply chain decision making, and connecting the buy and sell sides of the value chain. Charlie further discussed how collaboration creates

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HUMPHREY KANYOKE

a smart lean ecosystem requiring internal alignment as well as the use of third party service providers who can bring scale and expertise to the manufacturer.

Three components of an optimized supply chain system include namely- network optimization, inventory optimization and transportation optimization, which are all interrelated. Additionally, Mr. Chung discussed 3D printing and how the first mover winners will be established in the next 12-24 months. He disclosed that UPS, in collaboration with SAP and Fast Radius, is already offering 3D services to manufacturers in the form of a distributed on-demand 3D manufacturing network.

-Humphrey Kanyoke,  
Center GA

## speaker bio

*Charlie Chung, Senior Marketing Manager, UPS Supply Chain Solutions*

Charlie Chung manages Industrial Assemblies and Machinery for the Industrial Manufacturing market segment at UPS. Chung provides in-depth industry analysis and strategic planning that is implemented with UPS's business development and district marketing teams. Chung began his career at UPS in 2010 with the Global Logistics and Distribution business unit. At the time, he was a distribution marketing manager who was responsible for the Industrial Manufacturing and Automotive market segment. In 2012, his focus shifted to managing global marketing for UPS's High Tech Distribution and Aerospace team where he planned and executed the High Tech Customer Forum. This event gave UPS customers a platform to discuss the industry's logistics needs and challenges, and resulted in the Contract Logistics Aerospace Strategy. Prior to joining UPS, Charlie spent 17 years at Chrysler Corporation. Chung earned his bachelor's of science in Economics at the University of Pennsylvania, Wharton School of Business, and his MBA from the University of Michigan.



Humphrey is from Ghana, West Africa. He has a BA (Sociology) from the University of Ghana, with a 2009 graduation date. In the past year, he has worked as the Business Development Manager for Peach Health, a tech Start-Up based in the U. S but with operations in Ghana that develops electronic medical records and other applications and platforms for hospitals, pharmacies, medical laboratories and patients. Humphrey developed the current country roll-out strategy being used by Peach in Ghana, built a client base of hospitals and clinics, developed the marketing strategy being used currently, built partnerships with various government agencies and interest groups key to the company's operations, and built the Peach brand from scratch. Prior to that, Humphrey managed various projects for a health research organization, the Kintampo Health Research Center, in Kintamp, Ghana from 2009-2014.

# EON Reality, Inc.

## Mats Johansson



**M**ats presented on the growing use of virtual reality and augmented reality in today's world, specifically in the field of knowledge transfer. He also provided a glimpse into how VR/AR is going to play a role in tomorrow's world.

#### Need-

EON reality has been able to leverage its technology in the field of knowledge transfer. The main driver for the growth of VR/AR in this field is "The Quantity Problem"- We need to teach more with less- less time and less money! There is a Global shortage of 18m teachers over the next decade, India needs

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VIREN TULSIAN



another 1.2m teachers and America needs 2.3m teachers. Peter Smith UN: "We have to invent new learning solutions or we are as good as writing off this generation." On top of the quantity problem, VR/AR also helps to solve, the "THE QUALITY PROBLEM"- Facts are no longer necessary to learn (Google). The challenge is in teaching students to ask the right questions.

"THE ATTENTION PROBLEM"- Boredom is #1 cause for truancy. We need a learning system that is scalable and wildly entertaining.

Capability- Skill development through VR AR goes beyond just these issues. It teaches students- to Explore, Dissect, Plan & Configure, Construct, Predict, Decide, and Collaborate.

Applications- Sports training- EON Sidekiq is the world's leading VR sports training software, Industry planning, designing, training- VR AR

has been used in solving designing question in Auto. Planning a manufacturing facilities layout is also possible before actual commissioning. GE has used this for training in maintenance. Healthcare training- Instead of training students on a live subject VR/AR can be used to eliminate risk- Interactive teaching with the virtual model significantly improved student performance of the pupillary and extraocular motility examinations by both self and independent assessment.

Scale- Eon reality is achieving scalability through setting up of VR AR schools- IDC's (Interactive Digital Centers). These schools educate professions on VR AR subject matter, who then create new Apps and Knowledge modules.

-Viren Tulsian, Center GA

## speaker bio

*Mats Johansson, CEO  
EON Reality, Inc.*

As Co-Founder, President, and CEO Of EON Reality, Mats Johansson has developed partnerships and business with many leading companies worldwide such as Microsoft, HP, Nvidia, Atlas-Copco, Suzuki, Lexus, Boeing, Cornell University and Imperial College to mention a few, he also played a key role in the company's rapid growth. Mats has over 20 years of experience in 3D Interactive Simulation technologies and is widely recognized as a leading innovator in his respective field. Mats specializes in strategic issues surrounding the development and transition of EON's applications particularly in the aerospace/defense, Education, Energy and Manufacturing sector. He has been regarded as a subject matter expert and has been the program manager/consultant for many different projects such as Volvo Car engineering analysis, as well as Oil and Gas simulation projects in the North Sea. Mats earned a Masters Degree in Mechanical Engineering from Chalmers University and an MBA in International Business Administration from Gothenburg School of Business.



Viren Tulsian is a second year MBA student at Purdue University's Krannert School of Management with concentrations in operations and supply chain management. Viren is the president of the Krannert Operations Club. This summer, Viren worked as a Pathways Operation Manager Intern at Amazon. Here Viren studied the Operational practices at the Fulfilment Center and developed an Integer Programming model to solve for optimum scheduling of truck departures. Prior to joining Purdue, Viren worked for 4 years as a Supply Chain Manager in the Automobile Industry, at Tata Motors Ltd. In this role he worked with suppliers to resolve quality concerns with products, this gave him familiarity to advanced problem solving techniques. In addition, he was also part of new product development, using APQP methodology for development of new products.

# WABASH NATIONAL

## Bob Nida



**B**ob discussed the process of Value Creation and how to utilize it in Building a Smart Lean Ecosystem, with a focus on the Wabash Heartland Innovation Network (WHIN).

Some of the key aspects of Value Creation involve:

- 1) Turnaround Efforts- This represents a conscious decision by leadership to take action to correct "a failure of both leadership and management.
- 2) Complexity Theory- Optimal system behavior occurs at the edge of chaos, where the competing goals of adaptability and efficiency are balanced.

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MATTHEW JUNG

3) Building Smart Lean Ecosystems & WHIN- Wabash Heartland Innovation Network (WHIN) is developed to build upon regional strengths by identifying opportunities and resources. It is a new strategic plan aims to help shape the long-term success of the 10-county Wabash Heartland Region.

4) Resources- The idea for WHIN is to utilize the key resources that are available in the region- High quality education, diverse employment clusters, numerous natural resources and an internationally renowned Tier 1 public research university in Purdue University.

5) Strategy- The broad strategy involves-

1. Catalyze the growth of industrial clusters for which the region has a unique comparative advantage,
2. Advance systemic workforce development/ talent initiatives aligned

with industry cluster needs,

3. Leverage the region's long-standing research strength, and
4. Foster a high-value quality of place.

The next phase of WHIN's work will consist of prioritizing which initiatives and actions will be pursued and developing a comprehensive implementation plan and timeline.

-Matt Jung, Center GA

## speaker bio

*Bob Nida, VP Organizational Devt., Wabash National*

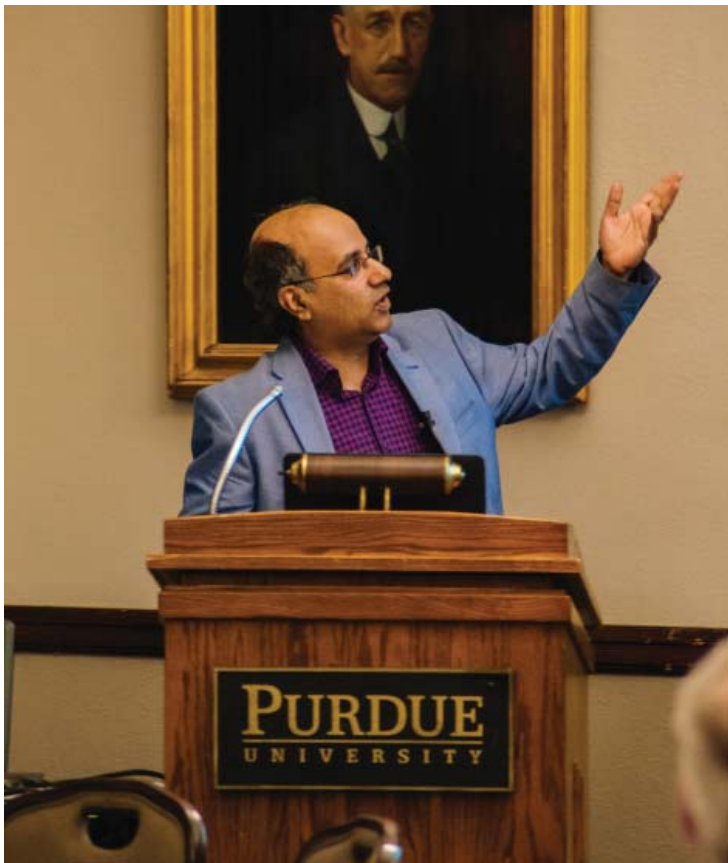
Mr. Robert L. Nida, also known as Bob has been Vice President of Organizational Development at Wabash National Corp. since February 27, 2014. Mr. Nida has been Vice President of Business Development at Wabash National, Inc since February 2008. He served as vice president and general manager, retail at Wabash National since 2008. He is employed at Wabash National Trailer Centers He served as corporate senior vice president at Accuride Corporation in Evansville, Ind. He was Senior Vice President of Accuride Wheels, Gunite & Brillion Iron Works at Accuride Corp. since August 10, 2005. He served as Senior Vice President Gunite & Brillion Iron Works at Accuride Corp. from December 2006 to December 2007. He served as Vice President- Technology at Accuride Corp. since July 2002. He has a Black Belt in Six Sigma, holds certifications as a Quality Systems Auditor for QS9000 and TS16949. Bob graduated from Regent University's School of Global Leadership and Entrepreneurship with a Ph.D. in Organizational Leadership in May 2009. Mr. Nida holds a B.A. in Sociology from Bridgewater College and a Masters in Total Quality Management from Friends University.



Matt Jung is a second year MBA student at Purdue University's Krannert School of Management with concentrations in finance and strategic management. Originally from Hawaii, Matt earned a degree in biology with a minor in biochemistry from Brigham Young University Hawaii. Upon graduation he worked for a private government contracting firm in Honolulu. Prior to coming to Purdue, he worked for 3 years building and overseeing the supply chain department of Pelatron, Inc. As supply chain manager his responsibilities included staffing, training, and streamlining company process to effectively manage all asset and project based material. Over the summer, Matt interned with Y. Hata & Co. Ltd, a large wholesale food distributor in the state of Hawaii. Joining the finance department, he worked closely with the CFO on updating an activity based costing software. His duties included meeting with various department heads to determine costs associated with the company's various activities. He also led a team that identified losses between unresolved credit memos and returned merchandise.

# PURDUE UNIVERSITY, MECHANICAL ENGINEERING

## Karthik Ramani



**K**arthik Ramani is a professor in the School of Mechanical Engineering at Purdue University and director of Purdue's C Design Lab. During the recent DCMME Fall Conference, Professor Ramani spoke about a few some of the research he has been a part of while at Purdue, and even brought a few of their "projects" for all in attendance to enjoy and experience, RevoMaker and Ziro. Quoting directly from the C Design Lab website (<https://engineering.purdue.edu/cdesign/wp/>), RevoMaker enables "multi-functional and functionally embedded 3D printing using a rotational cuboidal platform". So what does that

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TAYLOR HAWS



mean? Essentially it means that it uses 3D printing to create functional items using a rotating platform. To give everyone in attendance an idea of the capabilities RevoMaker has, Professor Ramani and his team brought in a custom made computer mouse that had been built specific to someone's hand. The second product that Professor Ramani brought was Ziro, a robotic toy kit in which the car is controlled by a glove a person can wear. While just a toy car was brought to control, the underlying technology can potentially be used for any number of items. By moving the hand in certain ways, the car could proceed forward, backward, stop, and change directions. It was clear from both the lecture and the "show and tell" that Professor Ramani and his team are testing the boundaries of both mechanical and computer engineering, and finding ways to link the two together. It was amazing to hear his experience, see his passion, and get to experience first-hand the benefits we all can experience from the research Professor Ramani is conducting.

-Taylor Haws, Center GA

## speaker bio

*Karthik Ramani, Director, C Design Lab, Donald W Feddersen Professor of Mechanical Engineering, Purdue University*

Karthik Ramani is a Professor in the School of Mechanical Engineering at Purdue University. He earned his B.Tech from the Indian Institute of Technology, Madras, in 1985, an MS from Ohio State University, in 1987, and a Ph.D. from Stanford University in 1991, all in Mechanical Engineering. He has worked as a summer intern in Delco Products, Advanced Composites, and as a summer faculty intern in Dow Plastics, Advanced Materials. He was awarded the Dupont Young Faculty Award, the National Science Foundation (NSF) Research Initiation Award, the NSF CAREER Award, the Ralph Teetor Educational Award from the Society of Automotive Engineers, Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers, and the Ruth and Joel Spira Award for Outstanding contributions to the Mechanical Engineering Curriculum. In 2002, he was recognized by Purdue University through a University Faculty Scholars Award and won the NSF partnership for innovation award. In 2005 he won the Discovery in Mechanical Engineering Award for his work in shape search. In 2006 he won the innovation of the year award (finalist) from the State of Indiana. He developed many successful new courses - Computer-Aided Design and Prototyping, Product and Process Design and co-developed an Intellectual Property course. In 2007 he won the only Research Excellence Award throughout the College of Engineering at Purdue University. He also serves as the chief scientist at Imaginestics, a knowledge-based software company that has launched the world's first on-line search engine for the global supply chain. He serves in the editorial board of Elsevier Journal of Computer-Aided Design. In 2008 he was a visiting Professor at Stanford University (computer sciences) as well as a research fellow

at PARC (formerly Xerox PARC). He is also serving on the Engineering Advisory sub-committee for the National Science Foundation (Industrial Innovation and Partnerships) for 2007-10. His has been supported by National Science Foundation, Los-Alamos National Labs, Zimmer, Bell Helicopter, Sika Corp., Wabash National, Kemlite, Dow Plastics, Alcoa, Proctor and Gamble, St. Vincent's Hospital, U.S. Army, Defense Logistics Agency, National Center for Manufacturing Sciences, Imaginestics, PLM center, General Electric, and National Institute of Health. The newly formed C Design Lab represents its focus in the gelatinous space at the intersection of design, art and science of geometric computing, and engineering. While his research lies at the intersection of mechanical engineering and information science and technology, the areas span design and manufacturing, new kernels for shape understanding using machine learning, geometric computing and human-computer natural user interaction and interfaces with shapes and sketches. A major area of emphasis in his group are computer support for early design, shape searching, sketch-based design, cyber and design learning, sustainable design, and natural user interfaces for shape modeling. He is also currently serving on the NSF Advisory Committee for the SBIR/STTR program of the Industrial Innovation and Partnerships program. In 2006 and 2007, he won the Most Cited Journal Paper award from Computer-Aided Design and the Research Excellence award in the College of Engineering at Purdue University. In 2009, he won the Outstanding Commercialization award from Purdue University and the ASME Best Paper Award from technical committees twice at the IDETC. In 2012 his labs paper won the all conference best paper award from ASME-CIE. He has published over 200 peer-reviewed papers, over 90 Journal publications; over 70 invited presentations, and granted 10 patents.



Taylor Haws is a second year MBA student at Purdue University's Krannert School of Management with concentrations in operations and supply chain. Taylor is originally from Arizona and earned his bachelor's degree in Spanish Linguistics from Arizona State University. After graduating from ASU, Taylor worked for two years at State Farm Insurance before coming to Purdue University. Taylor's most recent role at State Farm was as a Spanish Team Lead in the Express Claims Department. In this role, he directly supported a team of 10-12 Spanish Express associates, as well as 588 other Express associates in nine different locations. Taylor's main duties were to assist in solving complex claim issues as well as provide coaching for associate development. Additionally, Taylor worked directly with the Estimates, Business Process, and Underwriting departments to streamline the duties of the Express claims associates throughout the entire claims system.

# SMART MANUFACTUR



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## Understanding Smart Manufacturing

In the article What is Smart Manufacturing? the author delves into what exactly smart manufacturing is, as defined by the new technology that has allowed it to come into being. Smart manufacturing has enabled us to use continuously collected and flowing data to improve processes thus taking some the human error element out of manufacturing. It's not to say that the smartest piece in the manufacturing puzzle isn't still a human because it most certainly is. It is more a realization that machines can now collect and interpret data themselves (as we have programmed them) so that they almost "think" on their own.

The author points out that some believe we are now in the 4th industrial revolution. This industrial revolution involves big data, predictive analytics, and the artificial intelligence created

using these concepts. In essence, the data tells us what to do. Instead of a maintenance cycle that works based on past failures, think of a maintenance cycle that continuously collects data thus giving us indicators before a failure. Furthermore, the data can let us know what failed as well which increases efficiency. This connection is known as the IIoT – the Industrial Internet of Things. The emergence of cheap connected devices, coupled with the availability and affordability of mass computing power, has been the biggest driver of Smart Manufacturing. Visibility is a big driver in understanding ROI in smart manufacturing. The processes can alert users via messages on their phones; displays on a monitor, or a number of other ways. Communication between machine and humans becomes simple. When the data tells you what to do, decisions normally become easier thus reducing

human error, increasing efficiencies in manufacturing processes, and finally saving money.

Will smart manufacturing eventually become so good that actual human jobs are lost?

What safeguards are in place so we know that sensors on manufacturing processes are not relaying operators the wrong data?

**-Matt Foust, posted October 2016**  
**[view more of Matt's blogs at dcmme.wordpress.com](http://dcmme.wordpress.com)**

## The GoPro Karma

In a recent article on the website, The Verge, the announcement of GoPro's new drone is discussed. GoPro has just released its first ever drone (The Karma) to accompany its newest cameras. The Karma allows for the user to have

# PRINTING IN THE NEWS

## SMART LEAN ECOSYSTEMS



a more connected experience with its camera and the footage that is recorded. With GoPro having its own drone, the user will be able to “stay” on GoPro’s own ecosystem.

**-Matt Jung, posted September 2016**  
**view more of Matt’s blogs at**  
**[dcmme.wordpress.com](http://dcmme.wordpress.com)**

### 3D Printing for the Non-Industrial Consumer?

The article “3D printing and the Future of Manufacturing” (<http://www.industryweek.com/emerging-technologies/3d-printing-and-future-manufacturing-infographic>) is an infographic that breaches the norm of 3D printing discussions. Instead of talking about how 3D printing could influence the industrial manufacturing industry, this article focuses on another potential user- the non-industrial consumer. As stated in the article “Today, almost anyone can become a manufacturer or contribute to the manufacturing process.” “If applied correctly, that point might be the biggest business opportunity presented by the technology to date.” The article displays ten major characteristics of 3D printing, three of which will be discussed today. The range of materials is exploding: 3D printing is no longer

limited to plastics or the recently added metals, but can now be incorporated with ceramics, concrete, food, and other biological substances, among others. This opens the 3D printing market to virtually every business today. New major players: As stated above, almost anyone can become a manufacturer or contribute to the manufacturing process. The consumer possibilities are also endless: 3D printing enables customization at no additional costs, giving a sustainable solution to the “thirst” of personalization. These three main points, along with many other aspects and benefits of 3D printing, create the perfect storm for 3D printing to flourish. As the technology grows and improves, the impact of 3D printing will only continue to grow.

**-Taylor Haws, posted September 2016**  
**view more of Taylor’s blogs at**  
**[dcmme.wordpress.com](http://dcmme.wordpress.com)**



## [CONT'D]

### **Large Grant Awarded to VeHICaL**

In a recent article on the website, Berkeley News, the announcement of a \$4.6 million grant was discussed. With companies wanting to integrate driver-less cars and delivery drones into our society, the need for the safe operation of these machines is paramount. The National Science Foundation has awarded UC Berkeley \$4.6 million over five to a group of researchers called VeHICaL, towards researching and improving the human/machine interface. With this grant VeHICaL hopes to find new and improved ways to the manner in which humans and machines interact. How may humans benefit from the interaction with robots? How can drones hurt/help society? How may people be hesitant to adopt this technology?

***-Matthew Jung, posted September 2016  
view more of Matt's blogs at  
dcmme.wordpress.com***

### **IoT- 101**

"Internet of things" or IoT is one of those buzzwords that everyone keeps talking about but hardly anybody truly understands what it is. We at DCMME decided it was time for us to demystify IoT.

What's IoT?– The IoT is a giant network of connected "things". Simply put, this is the concept of basically connecting any device with an on and off switch to the Internet (and/or to each other). Some common examples of IoT devices include the Amazon Echo, Smart Watch, Nest Learning Thermostat and the Philips Hue-Smart Home Lighting.

Why IoT?– Say for example you bought some meat from your nearby grocery on Sunday. The next day the batch of meat that you bought was recalled by the manufacturer. What if your refrigerator sends you a text that you need to throw out that piece of meat? What if the refrigerator knew when it was running low on supplies and automatically re-ordered more? What if the wearable device you

used in the workplace could tell you when and where you were most active and productive and shared that information with other devices that you used while working? On a broader scale, the IoT can be applied to things like transportation networks: "smart cities".

***-Viren Tulsian, posted September 2016  
view more of Viren's blogs at dcmme.  
wordpress.com***

### **Big Data is Not The Magic Bullet for Smart Manufacturing Improvement**

In the article My New Year Wish – Less Hype for Big Data Analytics, More Buzz for Smart Manufacturing, the author examines how smart manufacturing is utilizing big data, but just not to the extent we all thought. In fact, vast amounts of data are being collected in many new manufacturing processes, but very little of it actually gets used. The value in new smart manufacturing processes isn't all the data, it's the connectivity between systems. That is, no value is found by trying to mine a stream of sensor data





emanating from machines in the plant in the hope of finding some pearl of wisdom. The real value is streamlining business processes from desktops to machines, across department walls, across tiers of manufacturing operations management, and across tiers of suppliers. Interestingly, the author cites an article that states that 70% of the data collected during manufacturing processes goes unused. If this big data was so important, why is so much of being discarded? One has to believe if there was usage to be found, it would be found by experts in these processes. Instead of mindless and useless streams of data, emphasis needs to be placed on manufacturing process improvement enabled by integration standards that connect machines, processes, and systems. Of course some data collection and analyzation is part of this improvement, but gigantic amounts of data are not necessary.

One has to wonder if Big Data is more a buzzword than a useful concept. There is no denying that manufacturing processes can become more efficient through a

more thorough understanding of the process via data collection, but perhaps we've overstated how much data we need. Properly prioritizing the importance of big data usage within innovation is key, and we need to stop looking at the technology itself as the innovation.

Do you think the author has a minority point when it comes to Big Data?

Will there come a time in the near future where we actually begin to collect less data, or will the reasoning of better safe than sorry prevail?

Do you think there is actually any use to all the data that gets discarded?

**-Matt Foust, posted October 2016**  
**view more of Matt's blogs at**  
**[dcmme.wordpress.com](http://dcmme.wordpress.com)**



# Poster competition



**THIS COMPETITION WAS CREATED TO BENEFIT BOTH INDUSTRY VISITORS AS WELL AS STUDENTS**

By accomplishing three primary objectives:

1) Demonstrate to industry visitors the caliber of summer projects that Krannert students can complete during an internship and provide an alternative resource for locating

student candidates interested in operations and supply chain careers. 2) Provide an opportunity for graduate students to promote their talents and refine their presentation skills by marketing themselves to industry visitors. 3) Expose undergraduate and incoming 1st-year MBA students to the variety of companies and employment opportunities which they might encounter when searching for internship employment themselves. Participating

as judges for the competition, our industry conference guests have the opportunity to meet the competitors individually. Judges listen carefully and ask probing questions as the students articulate their internship work experience and accomplishments. We value all of our participants' preparation and willingness to share their experiences with us at the conference.



Professor Karthik Ramani (conference speaker) provided an engaging display during the poster session and break time including robots & Eon Reality equipment for conference attendees to try out.

## CONGRATULATIONS TO OUR WINNERS:

### GRADUATE

1st: Gourav Singhal  
2nd: Akarsh Kosuri  
3rd: Amy Wong

### UNDERGRADUATE

1st: Alekhya Surepeddi





**FALL 2016**

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