



SciTech Northwest 2016:

Washington State is a Leader in Clean Tech Commercialization

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INTRODUCTION

Washington State technology thought leaders heralded the next technology innovations at the intersection of clean energy, biotechnology and data science. Held on November 9, the day after the 2016 United States Presidential election, SciTech Northwest 2016 featured guest speakers, including venture capitalist Matt McIlwain, Managing Director for [Madrona Venture Group](#) in Seattle, who emphasized the need to focus on continued technological innovation and commercialization while incorporating human elements to achieve success.

COMMERCIALIZATION STRATEGIES

Guest speakers invited by the forum host, [Technology Alliance](#), shed light on different aspects of the commercialization process and challenges in the conference's three target industries—cyber and data analytics, clean energy and biotechnology. In summary, Seattle and Washington State are positioned to lead because of their technology clusters, innovative productizing partnerships and foundational research in energy security. But leaders must incorporate ethics, morals and privacy into the development and commercialization process.

Cluster of Technologies Makes Seattle a Leader

The future is the intersection of computer science, data science and biological science, and Seattle's "culture of experimentation" makes it ripe to take the lead, according to McIlwain. "On the East Coast, the question is, 'Why did you fail?' A better question [for innovation] is, 'What did you learn?'" Seattleites ask the latter question.

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The past 10 years saw the trends in technology mature to take the lead, said McIlwain. First, cloud-based infrastructure became a service. Second, tech companies delivered software as a service. Third, technology interaction moved from click-based to touch-based methods. McIlwain said the

future will see three new trends. “Server-less computing” or “event-driven computing” as the base layer will lead to different pricing models. Second, hardware and applications will move from on-premise deployment to software service to intelligent applications. Third, interaction will evolve to include multiple senses—voice, eye movement, gestures, sounds and emotions.

Seattle can be the fulcrum for developing the future because of its cluster of technologies. McIlwain said Seattle is the cloud compute service capital of the world, with Amazon, Microsoft and Google in the lead. Other Puget Sound companies provide an artificial intelligence or machine learning cluster. As an example, Microsoft has added thousands of machine learning specialists to its payroll. And Amazon requires technologists to understand machine learning. Finally, augmented reality and virtual reality, including gaming, lay the foundation for multi-sense compute interaction.

In closing, McIlwain said while there are environmental factors that businesses cannot control, including campaign results, entrepreneurs can control the phases of bringing a product dream to fruition. Product marketing (focusing on strategy and operations), scaling to \$5 to \$10 million in revenues (focusing on team and execution) and maximizing value (developing the brand) were the three phases that spelled success.

Productizing Validated Research is the Primary Goal

Rosemarie Truman, Director of Innovation Impact at [Pacific Northwest National Laboratory](#) (PNNL) and a commercialization expert, discussed the dangers facing the United States in falling behind in innovation and PNNL’s revolutionary approach in partnering with entrepreneurs to bring to market PNNL’s innovations. A study Truman had previously conducted for the Ewing Marion Kauffman Foundation revealed that the United States would lose every lead in innovation metrics between 2014 and 2024. As a result there is a declining number of companies and jobs. To combat that and be successful at maximizing the potential of inventions, the United States needs three things: 1) more startups, 2) the right environment for carrying the product idea forward and 3) the right people with the right entrepreneurial capabilities. To address those key issues, Truman explained PNNL’s deployment and engagement solution as a Challenge-Accelerator model: groups of entrepreneurs compete to create a start-up company around a PNNL invention. Truman said 28 percent of C-Suite executives in the start-up applicants were women.

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A recent transplant from the east coast, Truman said larger companies were attracted to this Research / Development / Commercialization (RDC) path because PNNL had already done the research, and a company could put their efforts and funds toward developing the product and taking it to market. To assist entrepreneurs in attaining commercialization success, PNNL is looking

for judges, mentors and advisors who, in her words, can take an invention and start-up from cradle (start-up) to grave (commercialization).

Securing the Energy Sector is a Key to Our Infrastructure

The United States Computer Emergency Readiness Team (US-CERT) reported that in fiscal year 2015 there were 295 industrial control system (ICS) intrusion reports and acknowledged that many more intrusions went unreported or undetected. [1] Cybersecurity and physical systems expert Dr. Adam Hahn from the [Energy Systems Innovation Center](#) (ESIC) at [Washington State University](#) (WSU) said the energy industry had two current needs: security of the infrastructure and systems and privacy of the system. An example of what can go wrong with an intrusion into an electrical grid was the attack on the Ukraine's power grid. [2] Hahn said a virus was present in the control systems for three to six months before becoming active and taking down the grid, leaving more than 200,000 customers without power. Within minutes of the power outage, Hahn said Ukraine personnel were able to flip manual switches to restart the power. But he noted that U.S. power companies do not always have manual overrides.

To accomplish the two-pronged goal of security and privacy, Hahn and his team were developing smart energy grid solutions that offered continuous cybersecurity monitoring throughout the entire energy process, from bulk power creation through transmission and distribution to the customer. Part of that plan was a smart city test bed where he and his team could analyze attack data from net power flows, Intrusion Detection System (IDS) alerts and event logs and determine methods and triggers for the attacks. Hahn said the process would include gathering data from the controls, applying analytics to determine how current traffic flow compares to normal network communications and providing visualizations comparing current to normal trends.

In All Things Tech Remember the Human Element

The key to the next decade of data science is handling data responsibly, said data science policy expert Dr. Bill Howe, Associate Director of the [eScience Institute](#) at the [University of Washington](#) (UW). While physical sciences were happy with current data handling policies and practices, the social sciences, "not so much," he said. They were concerned about curation of data and privacy. "Now, we ask what **can** be done with noisy, heterogeneous data sets. In the next decade, we will ask what **should** we do with noisy, heterogeneous data sets." Answering the latter question depended upon past experience and societal constraints, Howe said.

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In balancing transparency versus accountability in making decisions using algorithms and big data, Howe said there are two options. One is to include humans in the decision-making loop. For example, the European Union General Data Protection Regulation guarantees human intervention in any automated decision-making process. [3] Another option is to build protections into the algorithms themselves. “If decisions are made by algorithms, then we lose both [transparency and accountability],” said Howe. The discipline of data science must include discussions and policies regarding privacy, fairness, transparency, reproducibility and ethics, said Howe.

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Howe noted that concern over big data and privacy has reached the White House. During the Barack Obama administration two executive branch reports in May 2014 and May 2016 underscored the importance of privacy in regards to handling big data. [4, 5] Moreover, Howe said, mathematician and social activist Cathy O’Neil wrote in her recent book that big data has three critical problems today—opacity, large scale and the damage big data and algorithms can inflict on others. Her book, “Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy,” was included in the National Book Awards longlist for nonfiction. [6, 7]

Howe discussed two cases supporting O’Neil’s thesis. The popular media had reported on websites and prediction algorithms where “background signals in data of institutional racism included by the algorithms,” he said, “amplified, operationalized and legitimized” that racism. In one case, a web site quoted varying prices and deals based upon user addresses, leading to inequality in pricing due to people of different races living in specific geographic groupings. [8] In another case, an algorithm predicted which African-American and white defendants would be repeat offenders, but the algorithm was wrong in almost half the cases. The article, published in *ProPublica*, said 44.9% of African American defendants were “labeled higher risk, but **didn’t** re-offend,” while 47.7% of white defendants were “labeled lower risk, but **did** re-offend.” [9]

CONCLUSION

Even if some elected officials are vague about their understanding of climate change and how the United States will lead the planet to resolve the issue, Washington research institutions have committed to building a better future. Commercializing vetted technology is promising, but start-ups must balance the need for efficiency and technological improvements with security, transparency, accountability, privacy and basic human rights.

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