



TAUBER INSTITUTE
FOR GLOBAL OPERATIONS
UNIVERSITY OF MICHIGAN

Dell's Pollution Ink and Sustainability Improvement



L to R: Juan Alfaro and Charles Moore

Founded in 1984 and headquartered in Round Rock, Texas, Dell Inc. is an American multinational technology company that develops, sells, repairs, and supports computers, related products, and services.

One of the largest technology companies in the world, Dell has 157,000 employees and reported \$90.6 billion in revenue for the 2019 fiscal year. The third largest personal computer (PC) vendor in the world, Dell is the largest shipper of PC monitors worldwide.

In addition to PCs and monitors, Dell sells servers, data storage devices, network switches, software, computer peripherals, smartphones, high definition televisions (HDTVs), cameras, printers, MP3 players, IT services, and electronics built by other manufacturers. Dell also provides the essential infrastructure for organizations to build their digital future, transform IT, and protect their information.

A key part of Dell's brand strategy is its commitment to sustainability initiatives. From ocean plastic to closed loop gold, Dell has built a portfolio of innovations to help address the challenges involved in moving toward a sustainable future. Pollution Ink, a relatively new initiative, uses harmful PM2.5 black carbon harvested from fossil fuel emissions as pigment for ink.

Dell brought in a student team from the Tauber Institute for Global Operations at the University of Michigan to develop strategies to scale Pollution Ink production in India, which had peaked at 400,000 boxes annually. The team consisted of **Charles Moore**, a member of the Engineering Global Leadership Honors (EGL) Program which leads to BSE in Materials Science and Engineering and MSE in Industrial and Operations Engineering degrees, and **Juan Alfaro**, working on a Masters of Business Administration degree. Because scaling has proven to be a challenge on more than one sustainability project, the Tauber team was also asked to provide recommendations for improving scalability generally.

"Charlie and Juan approached the two aspects of the project simultaneously," said Adam Bushong, global commodity manager at Dell. "Namely, they interviewed dozens of executives and team members involved in sustainability, supply chain, procurement, and marketing, gaining background information on how to address the process requirement for upscaling innovative ideas. At the same time they were in contact with both the Dell India team and the current Pollution Ink supplier to discuss how to advance the ink beyond India."

"We received fresh new thinking that resulted in an expanded product offering, and a new innovation development process for sustainability. This was outstanding work, creativity, and leadership by both Juan and Charles!"

Oliver Campbell

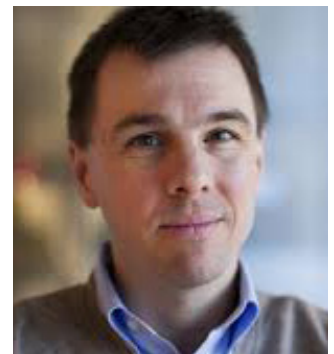
Alfaro said "The project's scope was partitioned into two main objectives, and the team focused on tackling each problem individually. However, the team also used different feedback loops to connect the separate objectives in a cohesive manner."

Bushong explained, "After the rounds of interviews, Juan and Charlie began putting together a very inventive way to address new materials through the concept of an innovation incubator.

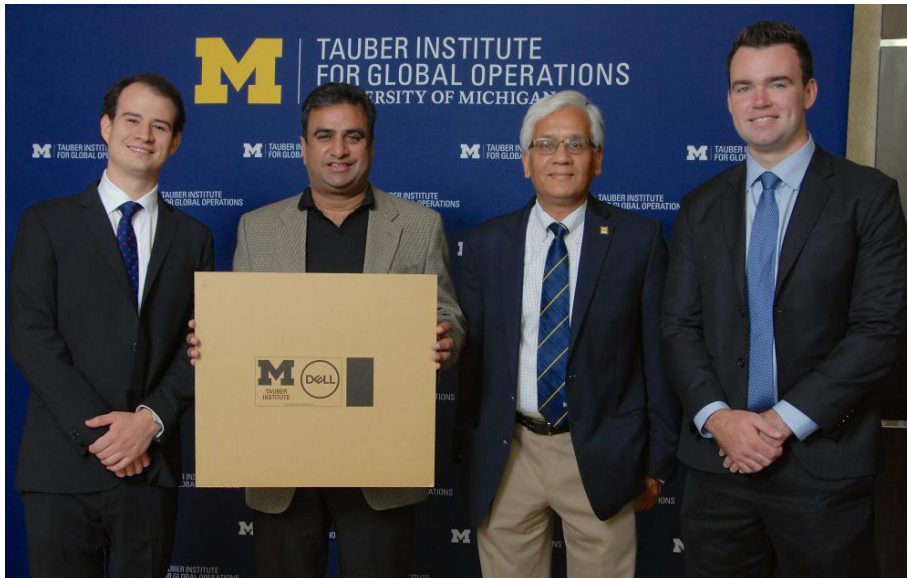
"Probably the most unique aspect of the project was that the development of the innovation incubator will be applicable across any new material proposed by Dell team members. It is not restricted to packaging or Pollution Ink, but rather can be used by any team or individual in Dell to make suggestions for new sustainable solutions. In fact, the incubator model



Ravi Anupindi
Ross School of Business



Steven Skerlos
College of Engineering



L to R: Charles Moore, Piyush Bhargava, Ravi Anupindi, and Juan Alfaro

will be used in evaluating and scaling solutions to support our new initiative, 2030 Progress Made Real.”

Alfaro said, “The team focused on strategies involving additional parties to address the lack of organization and communication that was inhibiting project scaling. The innovation funnel framework creates different phases that are owned by key stakeholders and designed to incentivize collaboration and alignment.”

Consolidating the findings with industry best practices and relevant literature, the Tauber team produced a framework to manage sustainability initiatives across the company. “Running Pollution Ink through this framework, the team identified several key issues with the current supplier and identified an appropriate alternative,” said Alfaro.

Bushong said, “In terms of the Pollution Ink aspect, they were able to determine that the current supplier in India has a business model that was incapable of expanding to other regions within the Dell business model. Using both Dell and University of Michigan resources, they then began looking for new suppliers in the Pollution Ink business.

“They not only found a supplier that could scale within the Dell framework, but then researched the new company’s business model and set up the beginnings of a pilot within our supply chain.

“Aside from having to identify a new supplier, they then had to convince them that their product could be used in flexo printing and then to incorporate the supplier into the packaging supply base in order to conduct a pilot. Previously, the new supplier only worked with ink in the garment industry, so new formulations needed to be developed and tested.”

The team conducted two pilots in Taipei with the supplier and developed a roadmap to drastically increase scale and impact by determining the feasibility of the ink. In the first pilot, the darkness and color scheme did not fully match regular ink, requiring increased viscosity in the ink. In the second pilot, increased viscosity produced positive results across the board.

Testing was then moved to a production facility in China. “After the third trial, we are happy to say that the ink performs the same as our standard flexo ink,” said Bushong.

“In doing this, the Tauber team laid the groundwork for the potential for this technology to expand to the entirety of the packaging operations of Dell and other large companies.”

Juan Alfaro

“After successfully developing the solution to pass the third round of testing in China, the Pollution Ink supplier has had its material evaluated in order to provide suppliers with MSDS and ROHS compliance documentation. The supplier is currently building up inventory to support a limited launch for China production in January 2020. After a three to four-month period, assuming continued success, we will expand the Pollution Ink for packaging across more lines of business.”

Through the scheduled implementation of the recommended framework, Dell will have the tools necessary to meet its ambitious 2030 corporate responsibility goals and provide solutions tailored to an increasingly sustainability-centric customer base. To complement and test this framework, the Tauber team also outlined a plan to print over 40 million boxes using Pollution Ink by 2021, saving 17,000 kilograms of PM2.5 from entering the ecosystem and preventing the emission of 45 tons of carbon dioxide (CO2) annually.

“This project was the first time that the Pollution Ink technology was incorporated into a supply chain,” said Alfaro. “In doing this, the Tauber team laid the groundwork for the potential for this technology to expand to the entirety of the packaging operations of Dell and other large companies. This is unique because a lot of sustainable initiatives are simply one-off projects that have no feasible means for expansion.

"Dell provided amazing support and feedback on sustainability initiatives. People in the company are very passionate about sustainability, but our ability to look at things holistically and gain buy-in from key stakeholders enabled us to provide a framework that takes the bigger picture in mind and delivers results."

Bushong said, "Charlie and Juan's ability to take a huge roadblock, such as the initial Pollution Ink supplier having a business model that does not scale, and then revamping their project to include finding and developing a new supplier was most impressive. They showed grit, imagination, and business acumen that is rarely seen in interns. These are two really smart, driven individuals."

Dell Technology Team

Student Team

Juan Alfaro – Masters of Business Administration

Charles Moore – EGL (BSE Materials Science Engineering & MSE Industrial & Operations Engineering)

Project Sponsors

David Lear – VP Corporate Sustainability

Erika Chan – Senior Consultant: Sustainability

Oliver Campbell – Director Packaging Engineering

Adam Bushong – Global Commodity Manager

Piyush Bhargava – VP Supply Chain

Faculty Advisors

Ravi Anupindi – Ross School of Business

Steven Skerlos – College of Engineering

About Tauber Team Projects

The 2019 Tauber Team Projects resulted in \$390.3 million in savings according to sponsoring company calculations, an average of \$30 million per project over three years.

Each two- to three-person Tauber Team consists of graduate engineering and graduate business students. Along with receiving high-level corporate support from the sponsoring company, each team is advised by a College of Engineering and a Ross School of Business faculty member and overseen by a Tauber Institute Co-Director. The projects begin on-site in May and continue for 14 weeks. Students present the results of their projects and compete for over \$40,000 in scholarships at the U-M Tauber Institute's annual **Spotlight!** Event held each September in Ann Arbor, Michigan. **Spotlight!** provides outstanding opportunities for students and corporate partners to establish relationships while exploring innovations in operations and manufacturing.



To learn more about the Tauber Institute for Global Operations, visit tauber.umich.edu or contact us at 734-647-1333.