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GREENING THE SUPPLY CHAIN

A new Singapore partnership aims to advance supply chain data analytics and cut emissions in the global logistics industry

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IN A GLOBALISED economy, it's hard to imagine a part of life that the logistics industry doesn't touch. With the global value of the industry estimated at around US$4 trillion in 2013, and the knock-on effects for business supply chains worldwide financially far higher, the industry forms a critical cornerstone of economic activity without which life as we know it would cease to function.

As some commentators have noted, the impetus for industry change is not just subject to popular opinion or political pressure. Increasing instances of environmental disruption, which many fear is in part driven by climate change (see *ENVISION* Issue 4), has been upsetting supply chains.

With a death toll of around 500 people and economic losses in the vicinity of US$43 billion, the significant 2011 floods in Thailand disrupted operations for many major global players including Apple, Dell, Intel, and Toyota. Supply chains were heavily affected by flooding, factories shuttered, and in the instance of Toyota alone, the company slashed annual profits forecast in 2011 by 54 per cent as a result of this single environmental incident.

Such environmental worries are hardly isolated to Thailand: from fragile rail lines at sea-level on the eastern seaboard of the US to the ever precarious logistics hub of Rotterdam that owes its continuing existence in part to levees, there is growing awareness of susceptibility in the international supply chain.

Ranked as the number one logistics hubs by the *World Bank Logistics Performance Index 2012*, Singapore is home to 20 of the world's top 25 third party logistics companies. Potential environmental interruptions to these activities would therefore have significant implications.

As is the case with solving many major global challenges, what has emerged in this critical trading hub is an unconventional partnership between non-traditional players to begin addressing the emissions footprints of the logistics industry internationally.

Teaming up to tackle emissions

To enhance environmental sustainability of global logistics supply chains, the aviation and maritime industries are taking their own steps that complement the global measures led by the International Civil Aviation Organisation and the International Maritime Organization to promote sustainable practices for air and sea freight.

In May of 2013, logistics heavyweight DHL teamed up with Singapore Management University (SMU) to create the Green Transformation Lab (GTL), an applied research collaboration to develop sustainable supply chain solutions.

Through this collaboration, DHL is investing approximately S$2 million over two years to solve real world supply chain problems with the help of SMU's interdisciplinary expertise in operations management and information systems. Stephan Schablinski, Director of Sustainable Supply Chain Solutions at DHL, serves as GTL's Director, and Tan Kar Way from SMU's School of Information Systems is the centre's Academic Director.

Working with academics, logistics industry professionals and students trained in some of the most cutting-edge data analytics technology available, the Green Transformation Lab team is responsible for several major deliverables:

1. To improve the visual analytics in the DHL Carbon Dashboard 2.0, an end-to-end supply chain analysis and management tool
2. Regional research into Extended Producer Responsibility
3. Research into innovative business models that create a strong value proposition in the area of Corporate Social Responsibility, while leveraging core logistics competencies

Business value based carbon decision making tools

At the cutting edge of the environmental data analytics space, the evolution of the Carbon Dashboard 2.0 as GTL's first deliverable holds promise worldwide for the logistics industry. Building off an existing Carbon Dashboard, the Carbon Dashboard 2.0 will help advance analytic capabilities and visualisation tools available to those making major logistics decisions.

"We integrate cost, carbon and time factors into one tool for decision makers," says Mr Schablinski. "This we believe has been the missing link in getting traction on logistics emissions. These factors must be viewed and understood in unison when making decisions."

The new dashboard allows quick analysis and drills down into emissions sources, transport modes, freight density, country and regional information, trade lane and cost data sets, all of which can be supplied from a diversity of sources.

"Effectively, this solution, in its advanced version, will couple three components together," he says. "There is a so-called middleware tier that transforms data from a wide range of logistics sources, a back-end tier that is used to make emissions calculations with this clean data based on relevant protocols, and a front end visualisation tier that helps decision makers manipulate and digest the complex information from their supply chains."

An existing DHL carbon dashboard was given a facelift and some powerful new features to make it both easier to use and more effective. "This is about making carbon emissions transparent throughout the entire supply chain from where it picks up to where it drops off," says Mr Schablinski.

"The improved version uses the visual front end to help demonstrate where fuel is used and how emissions are generated," he says. "Testbedding and tweaking are now underway to perfect the analytical capacity and visualisation features."

Perfecting the technology, gleaning value from data

Building off DHL's industry expertise, SMU helps evolve the technology. "SMU School of Information Systems upgraded the first

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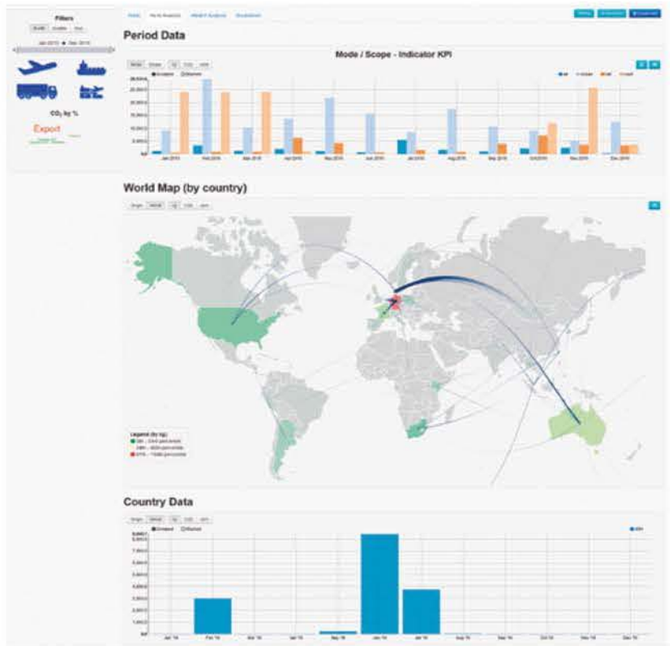


Screen grab from Carbon Dashboard 2.0, which uses advanced analytics and visualisation technologies to demonstrate where fuel is used and how emissions are generated

Stephan Schablinski (right) and Tan Kar Way, Director and Academic Director at DHL-SMU Green Transformation Lab

"THIS IS ABOUT MAKING CARBON EMISSIONS TRANSPARENT THROUGHOUT THE ENTIRE SUPPLY CHAIN FROM WHERE IT PICKS UP TO WHERE IT DROPS OFF"

version of the Carbon Dashboard to Carbon Dashboard 2.0 by building in visualisation and decision-support capabilities," says Ms Tan. "SMU's strength in analytics allows the application to process large amount of shipment data in an efficient manner. From there, a more solid understanding of greenhouse emissions profiles across a company's supply chain activity becomes possible."

At the front line of this environmental application of big data, careful selection of technologies ensures data storage and visualisation capabilities work seamlessly to help meet business needs. Built using open-source technology, Carbon Dashboard 2.0 is also designed to be services-based, which allows easy integration with other supply-chain management tools that GTL will be building in the near future.

Data can be uploaded from databases of transport management systems (eg origin, weight, volume, port of loading, port of discharge and destination) to the Carbon Dashboard 2.0 where large amounts of data can be quickly queried and visualised for decision-makers to evaluate the end-to-end supply chain process. The application has been designed with large scale data analytics in mind.

Industry applications

While carbon calculators are commonplace enough in the industry, this often does not extend outside logistics providers' data, and it can often be presented in myriad data formats. The new Carbon Dashboard 2.0 in its advanced version is designed to provide a complex, integrated and open offering.

"The bigger picture play here is quite clear," says Mr Schablinski. "We need to introduce common standards for industry to use so that we can universally improve the understanding and management of greenhouse gas emissions."

"This dashboard will eventually be more openly available as an online application which we hope will get mass uptake, and help harmonise data sets across players in the global logistics industry, unify language and consolidate a robust approach to dealing with this critical supply chain aspect," he says.

Through the end of 2013, GTL will pilot the new dashboard for selected customers, and from early 2014 onwards, introduce this to companies in different industries like life sciences and technology. Mr Schablinski believes this will help address several pressing needs.

"Companies are asking how to generate this carbon number, what it means, how to report on it, and how to understand the numbers to identify inefficiencies in their supply chains. In an era prone to fuel price spikes, this also has many attractive cost-saving implications," he says.

At this stage, mainly multinational companies based around Asia-Pacific are asking for this solution, though some local companies also interested.

The future of logistics

Eventually, the Carbon Dashboard 2.0 will form just one part of a suite of supply chain analysis tools. Right now, it focuses on what happened after the fact – the consequences of supply chain decisions that have already been made. Expansion of a "what-if" tool will allow changing of different logistic parameters to see what these changes would mean to the supply chain in terms of carbon, cost and transition time. There will be future development of an advance planning tool to better model possible scenarios and their outcomes.

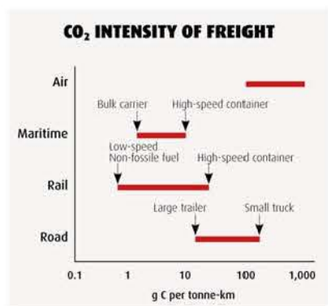
The logistics-focused work goes further however. Through SMU's leadership in analytics for business, consumer and social insights, strong capabilities in applied research on urban logistics and transportation planning have evolved. Prof Lau Hoong Chuin, a senior faculty at the SMU School of Information Systems, illustrated two of his recent research projects in collaboration with other faculty in SMU and companies like DHL. In 2012 for example, they developed analytics for 'Computational Sustainability', which included the development of decision support methods and tools for green transportation from distribution centres to retail outlets that optimise carbon footprint, and service efficiency in a multi-echelon logistics network.

Prof Lau is currently leading a project which is a major part of a multi-year national research initiative on urban logistics, aimed at developing technology for the coordination of freight movements into the city centre. The aim of this initiative is to minimise congestion and localised transport emissions, and correspondingly improve air quality within a city.

The sum of these activities showcases just how competitive and forward-looking the logistics industry in Singapore has become in trying to balance both economic and environmental realities. As they are perfected, these solutions will have a transformative effect on many aspects of supply chains worldwide.

In many respects, the collaboration between DHL and SMU has also demonstrated that unconventional approaches towards problem solving have their merits. While DHL could have easily approached a vendor to help deliver a tool with set specifications, the dynamic relationship between the latest research and technology insight offered by SMU presents a unique value add, allowing greater iteration in the design, development, and test-bedding process. At the same time, DHL's industry experience gives students and academic faculty alike the opportunity to immerse themselves in solving pressing, real-world challenges. By pooling this larger crowd of talent and taking bold new approaches, the GTL could be an early example of collaborative paradigms in the years ahead.

"WE NEED TO INTRODUCE COMMON STANDARDS FOR INDUSTRY TO USE SO THAT WE CAN UNIVERSALLY IMPROVE THE UNDERSTANDING AND MANAGEMENT OF GREENHOUSE GAS EMISSIONS"



Whitelegg, 1993; IPCC, 1996a; OECD, 1997a, ipcc.ch/ipccreports/sres/aviation/126.htm