Urban consumers' expectations: high and highly individualized

About

Dr. Matthias Winkenbach is the Director of the Massachusetts Institute of Technology (MIT) Megacity Logistics Lab and a Research Scientist at the MIT Center for Transportation & Logistics. His research focuses on designing last-mile logistics systems to supply global urban markets — as well as the challenges companies and policy makers are addressing when dealing with urbanization and the importance of e-commerce through the use of data, analytics, and technology. His lab collaborates with leading industry partners and organizations around the world, e.g., UPS, Walmart, the World Bank and US DOT.

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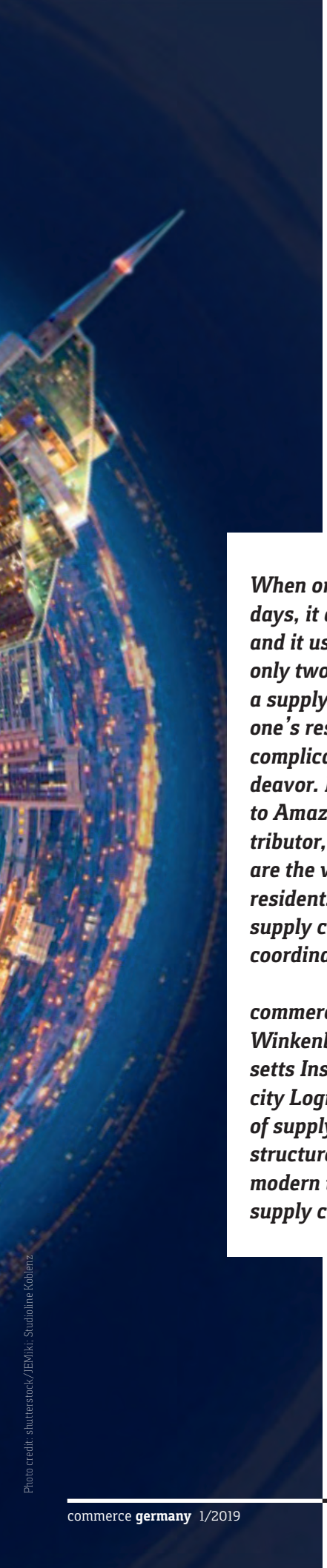

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INTERVIEW WITH
DR. MATTHIAS WINKENBACH

When ordering a lamp on Amazon these days, it appears only a mouse click away, and it usually shows up on your doorstep only two days later. Behind the magic is a supply chain that, depending on where one's residence is located, can be a rather complicated and energy-intensive endeavor. From supplier and manufacturer to Amazon's fulfillment center and distributor, through to the doorstep. These are the various levels of delivery, and for residents in the so-called megacities the supply chain's logistics need regulatory coordination.

commerce germany spoke to Dr. Matthias Winkenbach, Director of the Massachusetts Institute of Technology (MIT) Megacity Logistics Lab, about the coordination of supply chains in megacities, how to structure them to be energy efficient, and modern technical solutions regarding the supply chain of the future.

Despite a steep increase in the cost of living in many urban, metropolitan areas, why are people still flocking to live in megacities?

That is a good question. I believe that cities around the world are hotspots of economic growth, technological innovation, cultural activity and societal change. Especially in many of the emerging markets, moving to the city is the key to social advancement, higher education and opportunity. The benefits and expected long-term gains from living in cities often outperform the short-term costs.

How can megacities organize the "last mile" efficiently?

Well, the so-called last mile is the most complex, costly and difficult-to-optimize part of any global supply chain. It is associated with a lot of uncertainties — from traffic conditions, to weather, to customer availability. Those make it increasingly difficult to efficiently plan and operate the last mile.

And what can municipal governments do to ease the process?

I think that municipal governments anywhere can help alleviate these complications. They can also mitigate the negative externalities of urban freight movements by working closely with industry and providing a policy framework. As well as an urban transport infrastructure that helps streamline the last-mile delivery process. Examples include the creation of dedicated freight lanes or corridors, smart curbside management and the provision of real-time data on traffic or the availability of parking spaces in congested urban centers.

How can GPS-data derived from smartphones help build models for urban delivery operations?

Mobile-phone data and other sources of movement and activity data can be very valuable sources of information to accurately model urban last-mile delivery operations. For example, we are using such data to create highly detailed speed profiles of the movement of commercial vehicle fleets, within an urban road network. That allows us to

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What is a megacity?

Areas like the New York City Metropolitan Area with a population over 10 million are megacities. The closest German equivalent would be the Rhine-Ruhr Metropolitan Area, with over 10 million inhabitants. In 2018 the world had a total of 37 megacities. By 2050, 70% of the world's population will be living in cities with their very individualized demands and needs. Since 2010, only 10% of the earth's surface is considered remote, which is defined as a location 48 hours of travel from a major city. People flock to large urban areas for upward mobility, access and, ultimately, prosperity. With the emergence of the age of the individual — or, more precisely, of consumer-driven market demand — the importance of having successful and efficient supply-chain management solutions is critical and is now also seen as a key growth enabler. While growth needs to be guaranteed, the sustainable handling of supply chain management is also more and more in focus. The author John Manners-Bell writes on the World Economic Forum's website, "The 'triple advantage' approach to supply-chain management is critical to ensure long-term sustainability, though striking a balance between each of these core 'pillars' — economic viability, environmental accountability and social responsibility — is challenging."

characterize accurately which kind of vehicle will travel for how long and far between two consecutive stops. Which depends on the time of day, weather conditions and other factors that impact delivery efficiency. Similarly, such data can help our models "learn" from the local knowledge of drivers and delivery agents on the ground. For instance, we can identify commonly taken shortcuts around traffic obstacles, or frequently used parking locations to load or unload the vehicle. This helps us plan better delivery operations in the future, but also to inform more effective regulations and more targeted infrastructure investments of cities.

What special challenges do you see from urban transport systems in developing countries? The greatest urban population increase is set to happen in the world's poorest regions, particularly in regard to sustainable development.

Cities in developing countries and the so-called emerging markets pose very particular challenges to efficient urban mobility in general and urban freight distribution in particular. The populations of these cities often exhibit particularly high rates of vastly unplanned growth, giving rise to exponential increases in urban density and congestion. The demand for urban transportation services

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rapidly outgrows the capacity of road networks and other transportation systems. This is further amplified by increasing levels of individual wealth, consumption and mobility needs in these cities. At the same time, issues with public safety, the lack of well-structured address systems and well-maintained physical infrastructure introduce additional uncertainties and constraints to last-mile planning and operations.

Since universal "freight generation profiles" exist to measure urban activities constantly from one city to another — retail, construction, waste, etc. — shouldn't it be less complicated to find universal answers or systems applicable to metropolitan areas?

No, I don't think so, and let me explain why. While intercity freight demands are highly aggregate measures, that are relatively stable and easy to forecast, one of the key challenges of urban logistics is the fragmentation of loads. Especially in light of growing e-commerce and a trend towards

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We need complex solutions to ensure that our cities remain worth living in: with lower CO_2 consumption, less noise and space for everyone who appreciates the pulsating city life.

on-demand consumerism, urban freight shipments get smaller and smaller, and deliveries are becoming increasingly fragmented and individualized. Urban consumers expect individual delivery time windows, ever faster delivery lead times and increasing levels of flexibility to decide when, where and how to receive a shipment. Being able to anticipate the dynamics of such a highly fragmented transportation problem in light of various external sources of uncertainty, such as traffic or weather, is extremely challenging. And every city, and even every neighborhood, is different — there are no one-size-fits-all solutions to urban logistics anymore.

Given increasing individualization in consumption habits, how can sustainable, energy-efficient urban delivery operation systems be developed? What could they look like in detail?

I see two main directions of research and development that may enable us to mitigate the effects of increasing customization and fragmentation of urban deliveries while making the last mile more sustainable on the long run. First, innovative unattended delivery models enabled by low-cost sensors and IoT technology can help decouple the delivery process from customer availability and other customer-specific constraints, while providing superior levels of convenience to the recipient. Second, data analytics can help to educate the consumer to order in a more sustainable way, putting less of a burden on last-mile delivery systems. For instance, anticipating recurring orders of commodity goods and incentivizing the customer to place these orders earlier — thereby giving logistics operators more time to consolidate and plan for efficiency — could help to counteract the common notion of making everything available to consumers instantly and on-demand.

The MIT Megacity Logistics Lab

The MIT Megacity Logistics Lab (MegacityLab) — a part of the MIT Center for Transportation and Logistics — claims to combine original academic contributions with solving relevant real-world problems. The research focuses on the following four areas.

Distribution Network Design
In this research area the MegacityLab develops interactive, data-driven optimization and simulation models that help designing better last-mile distribution networks and delivery models to serve demand in congested urban centers more efficiently.

Urban Freight Infrastructure
Dr. Winkenbach and his team combine data analytics, mathematical modeling, and industry best practices to guide freight infrastructure investments and policy design to make cities more livable and last-mile logistics operations more sustainable.

Logistics Big Data Analytics
The MegacityLab develops analytical methods and tools to navigate and analyze the vast amounts of data generated by logistics operations every day in order to derive intelligible and actionable insights that help improve last-mile performance.

Last-mile Technology Innovation
The researchers conduct inter-disciplinary research to identify potentially disruptive technology innovations, assess their impact on last-mile distribution, and support their adoption in the marketplace.

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