LOGISTICS TREND RADAR

Delivering insight today.
Creating value tomorrow!

Version 2014

Powered by DHL Trend Research

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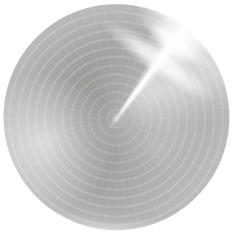

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PREFACE

Dear Reader,

Why do we look into trends? Researching trends and deriving from this implications for business is no longer a niche task. DHL Trend Research is now an established and key source of inspiration, not only within DHL but also for our wider innovation community, partners and customers worldwide.

The first edition of the Logistics Trend Radar was published in 2013, representing the starting point of a new research series by DHL.

It provided an inspiring benchmark for strategy and innovation; it was warmly received by the global logistics community and has triggered a number of successful pilot solutions inside and outside DHL.

In the course of last year, DHL Trend Research published various in-depth trend reports, each providing a 'deep dive' into a specific logistics trend. The recent reports are on the trends of Big Data, Low Cost Sensor Technology and Augmented Reality.

These reports include an introduction to the trend topic, and an in-depth analysis of its impact on the logistics value chain, as well as a unique selection of use cases. As such, these reports are fueling numerous roundtable discussions among industry experts.

In this second edition of the Logistics Trend Radar, jointly developed with the experts from Detecon Consulting, we are honored to share the latest trends with you, and we are excited to invite you to review the new version with extended content and refreshed design. As a dynamic, living tool, the Logistics Trend Radar will hopefully once again assist and inspire you to derive innovative solutions in the world of logistics.

Please join us on our journey to deliver insight today for creating value tomorrow!

Yours sincerely,

Matthias Heutger

Dr. Markus Kückelhaus

LOOKING BACK: HOT TOPICS IN LOGISTICS INNOVATION THROUGH 2013

Looking back at how the global economy has evolved and considering many fruitful discussions, it's now a good time to review the 2013 trend predictions for the logistics industry. Which drivers became prevalent? What trends have substantiated? Here are the trends that took center stage.

SPEEDING UP? NO, IT'S ABOUT WELL-ORCHESTRATED MOVES

In the ongoing quest of the logistics industry to maximize speed and efficiency, a second driver emerged to increasingly impact operations: Flexibility to deliver the right answer to the right customer question. In 2013, decision-makers and opinion leaders agreed that the concept of a **Logistics Supergrid** and related topics such as Logistics-as-a-Service, Supply Chain on Demand, and Logistics Marketplaces had the potential to become business operating models of the future. The real-time adaptability of a Logistics Supergrid would enable flexible collaboration, modular service orchestration, and maximum efficiency at the same time. The admittedly transformational approach would keep logistics companies busy for several years to come, as they would have to step up efforts on standardized service modularization and information management, enabling an orchestrated ad-hoc coupling and de-coupling of logistics partners.

DATA IS THE NEW OIL – REFINE IT

Speaking of information management, it turned out that the mastery of complex and extensive data sources was becoming a differentiating factor in the logistics industry. In 2013, market leaders were seen to build out advanced data manipulation capabilities such as predictive analytics and real-time event processing, and they started extracting insights from unstructured information. Big data had begun to make inroads into logistics services, turning large-scale data volumes into a unique asset capable of boosting efficiency in areas of the business. In the logistics industry, from predictive network and capacity planning, through risk evaluation, resilience planning, and real-time route optimization, up to crowd-sourced pickup and delivery operations, big data was no longer just hype; "big data is the new logistics tool".[1]

[1] Big data boosts logistics: Using data is an untapped logistics asset says a new report from DHL, Cold Chain News, Issue 188, February 2014, Page 3.

LIVING UP TO CUSTOMER EXPECTATIONS

The continued success of electronic commerce gave rise in 2013 to increased customer expectations in terms of faster (up to same-day) and individually tailored delivery. This undisputable trend forced providers to explore alternatives to established delivery models. **Crowd Sourcing** approaches, such as DHL MyWays which was piloted in Sweden last year, seemed likely to soon become a complementary delivery channel in many global markets. While the progress in crowd-based delivery models drew little public attention, except as a means of speeding up delivery times, another development did create a lot of media noise: **Unmanned Aerial Vehicles (UAVs)**. One example is the DHL Parcelcopter which was first tested in a use case delivering pharmaceutical goods to employees at the Post Tower in Bonn, Germany. Many other pilot initiatives are to be anticipated, including deliveries to remote areas.

STOP MOVING GOODS – START PRINTING

The impact of **3D Printing** for the logistics industry was (and continues to be) a hotly debated topic. In 2013, there were at least two different tendencies to consider. For established industries such as the Automotive and Life Sciences industries, there were predictions that 3D printing would start to become a supplementary way to manufacture parts (e.g., in prototyping, testing and maintenance). This was likely to add new complexity to the supporting logistics as it would be necessary to smoothly integrate and orchestrate the logistics flows of traditionally manufactured parts and of parts produced by 3D printing. For all industries, new business models were expected to emerge (e.g., 3D-Fabs). This would create windows of opportunity for logistics providers to extend their value chain by integrating new 3D-production capabilities into their end-to-end logistics services.

LOGISTICS AUTOMATION – THANKS, XBOX AND IPHONE[2]

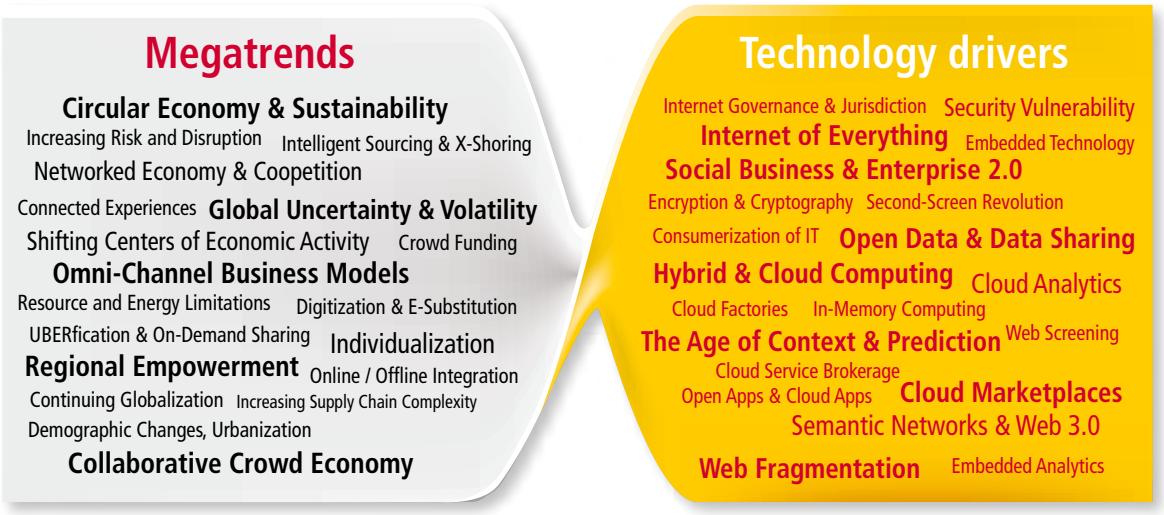
Technological advancement in consumer electronics during 2013 positively impacted the feasibility of new logistics use cases. In intra-logistics, **Augmented Reality** promised to become a tangible technology with higher impact than previously predicted, often guiding and accelerating precise hands-free activities.

As more and more wearable consumer devices arrived on the market, such as glasses, watches, and even intelligent fabrics, Augmented Reality applications in logistics became more likely to achieve a faster-than-expected return on investment. In 2013, the cost of advanced logistics automation was being driven down by the mass production of a wide range of **Low-cost Sensor** devices for consumer electronics. It was predicted that soon logistics providers would be using 3D-sensors for freight volume and object contour scanning, as successfully piloted by DHL Freight over the course of that year. Logistics providers were also predicted to start using low-cost sensor technology to control automated loading and unloading of trailers and for volume-based sorting and pricing. Additional capabilities such as motion, gesture, face, and voice recognition, as well as location and environmental monitoring, would one day be added into many logistics processes, creating substantial opportunity for process automation.

[2] Xbox is a registered trademark of Microsoft Corp.; iPhone is a registered trademark of Apple Inc.

RIGHT HERE, RIGHT NOW: MEGATRENDS AND TECHNOLOGIES DRIVING LOGISTICS INNOVATION

What do the insights from last year tell us about the future? The evolution of the economy worldwide and its perceived impact on the logistics market during 2013 has helped the research team to extrapolate new and even more precise predictions for this second edition of the Logistics Trend Radar. The following sections provide a freshly calibrated view for 2014 on the megatrends and drivers that will influence the development of business models and technology usage in the logistics industry.



MAJOR MEGATRENDS

As well as the most discussed megatrends and drivers of recent years – such as demographic changes, urbanization, consumerization, and individualization – more and more new drivers are beginning to impact logistics companies, particularly how they define strategy and operate business.

Regional empowerment

With ongoing globalization, companies are continuing to expand their global footprint. But unlike the players in the first wave of globalization, new entrants to the global marketplace focus more and more on empowering underdeveloped regions. Some of them, have developed dedicated roadmaps for each region, following the philosophy that in a globally connected world nobody cares if a company is a small business. 'The death of distance' means connectivity and low-cost transmission goods can be achieved without gatekeepers; products sold by many small traders can be moved around the world efficiently. But for small businesses and individual consumers to join this global trade, it is also essential to develop innovative payment and settlement services, along with transparent legal rules and administrative procedures. All this would be possible with a logistics supergrid spanning the entire globe and integrating smoothly and flexibly all parties along the door-to-door delivery chain.

To become a key enabler of this concept – in effect, a global empowerment culture – each logistics provider will have to overcome several challenges in some areas, such as country and currency borders, political incertitude, governmental restrictions, channel fragmentation, and poor logistics infrastructure. A supergrid logistics business model would enable ad-hoc set-up, configuration, and orchestration of smart business networks as necessary.

And to close the gaps in, for example, remote areas or places with high population density and congested roads, this model could be enhanced with innovative pickup and delivery concepts such as unmanned aerial vehicles (UAVs) and crowd-sourced services.

Global uncertainty and volatility, supply chain complexity, and new sourcing strategies

Globally distributed supply chains mean more facilities, infrastructure, suppliers, and product variations, numerous and fragmented sales channels, and increasing regulatory and transportation security requirements. The complex webs of interactive relationships in a global economy inevitably generate long-lasting catastrophic disruptions.

Companies doing business on an international scale must assume that disasters will occur, even if the probability of their occurrence is low. In a connected world, causality is not linear but net-like; even small risks can have unpredictable impact on the supply chain in remote areas and can cause long-lasting disruption. Global uncertainty and increasing volatility require flexible asset management, reduction of fixed costs, greater scalability, increased network elasticity, capacities, and capabilities, and development of smart business networks.

Because of this, most global enterprises aim to bring sourcing and production facilities closer to customers; for example, they may switch from the low-cost production capabilities of outsourcing and offshoring back to more individual strategies such as intelligent sourcing and X-shoring. This changes what's required of logistics network organization and supply management – more raw goods must be transported over long distances and finished products may have to be distributed via different channels or delivered individually to end consumers.

Circular economy and sustainability: from supply chains to supply circles

To address the challenges of climate change, higher global energy demands, material resource scarcity, and varying government regulations over the next decade, enterprises will be forced to develop a strategy integrating both business profitability and sustainability. As well as helping to reduce negative global environmental and economic impact, organizations can profit to an unprecedented degree by using the concept of a circular economy and by starting to think in circles instead of chains.

In their book *Resource Revolution*[3], Stefan Heck and Matt Rogers describe the conscious optimization and utilization of resources and assets as the "biggest business opportunity in a century". For the logistics industry, there is huge unexploited potential as, according to the World Economic Forum, only about 40 % of available load capacity is being effectively used today. The key enablers of circular logistics are local, regional, and global supergrids, bundled logistics flows, synchromodality, and network orchestration.

[3] Stefan Heck and Matt Rogers: Resource Revolution: How to Capture the Biggest Business Opportunity in a Century, New Harvest, April 2014

Omni-channel business models

E-commerce has already changed the shopping habits of people around the world and brought with it new challenges for logistics providers. These include higher volumes but smaller orders to be picked, packed, placed, and delivered as well as larger quantities of returns, exchanges, and damaged goods. Logistics companies have been able to profit from this trend by expanding their business models and taking on new responsibility for services such as packaging, distribution, tracking, fulfillment, setting-up online shops, multichannel management, inventory tracking, and technical support.

Especially for small retailers, e-commerce offers an easy way to get access to the global marketplace, and even simultaneously through multiple channels. The crisis of brick-and-mortar retail will transform the appearance of city centers and suburban shopping malls. In future, there will be a split between the physical presentation of goods in traditional or digitalized stores in cities or outlet centers, and their storage and delivery. New, lean stores will not hold large quantities of stock of every product in every size and every color, but will focus more and more on providing customers with experiences such as look and feel, touch and smell, and – last but not least – the thrill and emotion of shopping without the annoying side effect of carrying bags home.

The brick-and-mortar store will become just one of multiple commercial channels available to retail companies. It may not be the most profitable one but will be on an equal basis with outlets, e-commerce sites, social and mobile sites, catalogs, and other seasonal/single-use channels such as pop-up stores and flash sales. This will change the entire logistics portfolio serving the retail industry: Traditional distribution will be replaced by different networks serving the different channels. The challenge will be to fulfill these requirements with minimum effort and investment in new assets, and just by intelligently using standard networks and orchestrating established assets.

Changing competitive landscape

Besides the traditional global companies and regional and local specialists, new players have entered the logistics and courier, express & parcel markets over the last few years. Most of them were 'career changers' with logistics services as a secondary business; some were crowd sourced. For first-and-last mile and customer-to-customer delivery, their dynamic, flexible services have established a real alternative to traditional business. For example, they enable taxis or private individuals to transport parcels on their daily routes (MyTaxi, mitpackgelegenheit.de).

Typically, all these new market players seek out gaps between established services and customer expectation, or they make intelligent use of untapped capacity. Additionally, global retail providers like Amazon and eBay are working on concepts for vertical integration and intending to establish their own end-to-end global logistics networks. For traditional providers, this means more competition, but it also offers an opportunity – they can use the capabilities and capacities of the new professional and non-professional service providers to crowd-source parts of their business cost efficiently and flexibly.

Crowd business models

Shareconomy which can be defined in essence as the societal shift from ownership to asset-sharing has been one of the most groundbreaking trends in the last few years, generating a huge variety of new business models using the crowd.

This movement has impacted a wide variety of industries from hospitality to the automotive industry with car-sharing platforms such as Drivenow or car2go, making established companies rethink the way they do business. The trend of sharing has not only reached businesses, but also private consumers. Collaborative consumption within peer groups is exploding which can be seen with successful startups such as Airbnb which rents private living space to travelers.

In logistics, crowd sourcing has led to a great number of innovative last-mile delivery solutions. DHL has explored this trend and developed the MyWays solution which allows parcel recipients to have their parcel delivered to their doorstep when they want via the services of residents in their neighborhood.

Additionally, by observing crowd funding platforms, companies can identify pioneering ideas and participate in their development and application at an early stage.

TECHNOLOGY DRIVERS FOR LOGISTICS INNOVATION

From Internet of Things to Internet of Everything

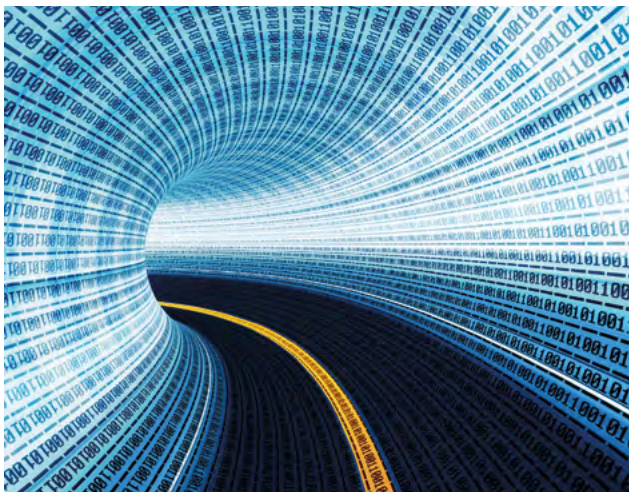
The Internet of Things has reached a new stage of maturity and become the 'Internet of Everything'. It is now more than just sensors communicating with and being steered by a central hub; the things are starting to talk directly with each other and become more intelligent and autonomous.

They are building swarms and organizing themselves, dynamically responding to changes in their environment. Being integrated with existing infrastructure (such as electricity grids, health centers, etc.), they are enabling new connected-living experiences such as connected homes, cars, media, etc. In logistics and transportation, this offers a wide range of new applications, from tagged goods that already 'know' their entire lifecycle and can autonomously steer their way, to fridges generating supply orders for groceries when their content falls below a specified level. These capabilities are embedded in traditional infrastructure, and the separation between online and offline is vanishing. The web itself has become part of the infrastructure, with the same importance as the supply of electricity and water.

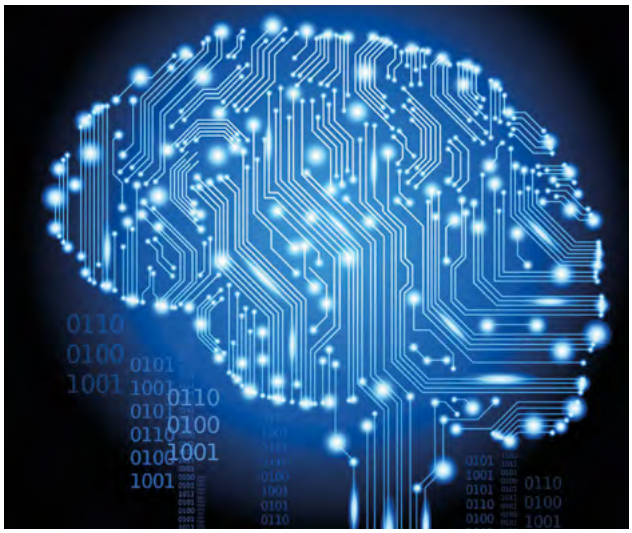
Open data, the age of context and Web 3.0

Open data published by governments and private institutions, and a company's own data shared with partners, provide additional scope for big data applications, and enable entirely new developments in analytics and operations. According to the McKinsey Global Institute, data sharing and using open data in transportation can enable additional value of $720-$920 billion per annum.[4]

More and more open data is being published and integrated with traditional and new data sources into innovative big data-based analytics. This is likely to have highest impact on improving the efficiency of freight operations, enhancing capacity and asset utilization, and adjusting and synchronizing transport schedules in the context of, for example, synchromodal and other smart logistics networks. It will become increasingly important to identify open-data and data-sharing use cases, and integrate paths for their adoption into corporate data. Logistics companies can become frontrunners by creating industry-specific open-data ecosystems and by considering how to monetize the value of their own data as it becomes liquid and sharable.



The semantic web or Web 3.0 was proclaimed by the World Wide Web Consortium (W3C) as a next evolutionary stage of the internet. While Web 2.0 connects people, Web 3.0 connects information by interpreting the context of the activity.



For example, during a search request, it provides users with so-called 'miracles of little data' – data extracted on a personal basis from all the big data available in the digital world, as an individual response to an individual question. The 'semantification' of company data and open data yields great opportunities to enhance business value by enabling anticipatory and predictive operations, and much more.

Web fragmentation and internet jurisdiction

The ubiquity of the internet and global connectivity have brought the people of the world closer together than any other development. However, today we are facing a new challenge. As the internet becomes a commodity, we are hearing more from experts and politicians who red-flag increasing web fragmentation and who insist on global web governance and internet jurisdiction.

For the logistics industry, unpredictable cyber-attacks on supply chains and logistics infrastructure are likely to be disruptive and even devastating. The damage caused by cyber-attacks isn't merely virtual; it can also be physical – air or rail traffic control, GPS systems, track-and-trace systems, and real-time control applications can be strongly affected. Logistics companies, along with the global web community, have started to face up to this challenge by establishing regulations in terms of web security, privacy protection, and cryptography.

[4] McKinsey Global Institute: Open data: Unlocking innovation and performance with liquid information, October 2013

Second-screen revolution and holistic human-machine experience

Social networks have become indispensable for both business and society, bringing the world closer together. Today, digital natives are beyond being 'always on'; now they tend to be 'on' via several channels in parallel. The latest technologies have been designed to enable cross-usage, delivering integrated, and interactive experiences. In public, we are surrounded by screens providing information and enabling interactive co-creation, since these screens are able to react to our individual interests and condition to deliver exactly the content we need. Electroluminescent films and other new technologies make it possible to transform almost every surface into a display.

Today, abstract concepts, ideas, and data become more and more sensual and seamlessly integrated into the physical world. Augmented reality allows more than merely hands-free operation. Physical processes can be visualized and simulated in a near-real-life virtual environment allowing the actors to haptically experience their role in the process and bring it to perfection before implementing it in real life.

All data and information can be perceived with all senses, embedded in the correct context of the situation. And people involved in the operational process can respond with all senses – voice, gesture and even eye movement.

Physical processes and information flows no longer run on parallel tracks but interact with and navigate each other through the entire logistics lifecycle. This makes the world of logistics more flexible, responsive, precise, and efficient.

CHANGES IN THE LOGISTICS TREND RADAR

As a living tool reflecting a vibrant, dynamically changing world, the Logistics Trend Radar needs to be continuously challenged and reviewed.

Throughout the year, the DHL Trend Research team has continuously conducted trend scouting at mega-, macro- and micro-level. The team has been cooperating with research partners such as MIT and various Fraunhofer Institutes as well as a wide range of global technology partners.

The DHL Innovation Center attracting over 10,000 visitors per year served as an engagement platform for Trend Tours, and provides the DHL Trend Research team with valuable feedback from global customers and partners across industries on the latest trend developments. Through several trend workshops with business units, customers and partners, the new DHL Logistics Trend Radar received its new look! Below is a key summary of the changes with more details to be found in the following in-depth chapters.

New BUSINESS TRENDS

Anticipatory logistics: Empowered by big data predictive algorithms, logistics providers can significantly boost process efficiency and service quality by speeding up delivery time and enhancing customer intimacy, as well as optimizing capacity and network utilization.

De-stressing the supply chain: Complex supply chains and vulnerable customer demands require the right mix of transportation modes and services. Tactical 'slow-downs' of the entire supply chain or parts of it on a day-by-day basis contribute to optimally balancing the supply chain as well as reducing costs in storage and warehousing.

Omni-channel logistics: The next generation of retail concepts such as cross-, multi-, and omni-channel commerce, requires logistics networks tailored to the needs of each single channel. This includes cost efficient, high-quality services achieved through the intelligent use of standard logistics networks and assets.

New TECHNOLOGY TRENDS

Localization and location intelligence: These types of intelligence offer critical insight to enterprises, enabling better operational and strategic decision making. They also support automatic process improvement and applications automation.

Wearable technology: Beyond the hype, wearable devices (together with responsive environments and contextual apps) will in the long run significantly change the ways we work and manage our lives. Therefore enterprises need to develop strategies for adoption of wearable devices at an early stage.

Crypto-currencies and crypto-payment: Started by an underground community in the 1990s, crypto-currencies and crypto-payment have evolved to become a significant trend with strong potential as a serious alternative to the established financial infrastructures of governments, banks, and credit card companies.

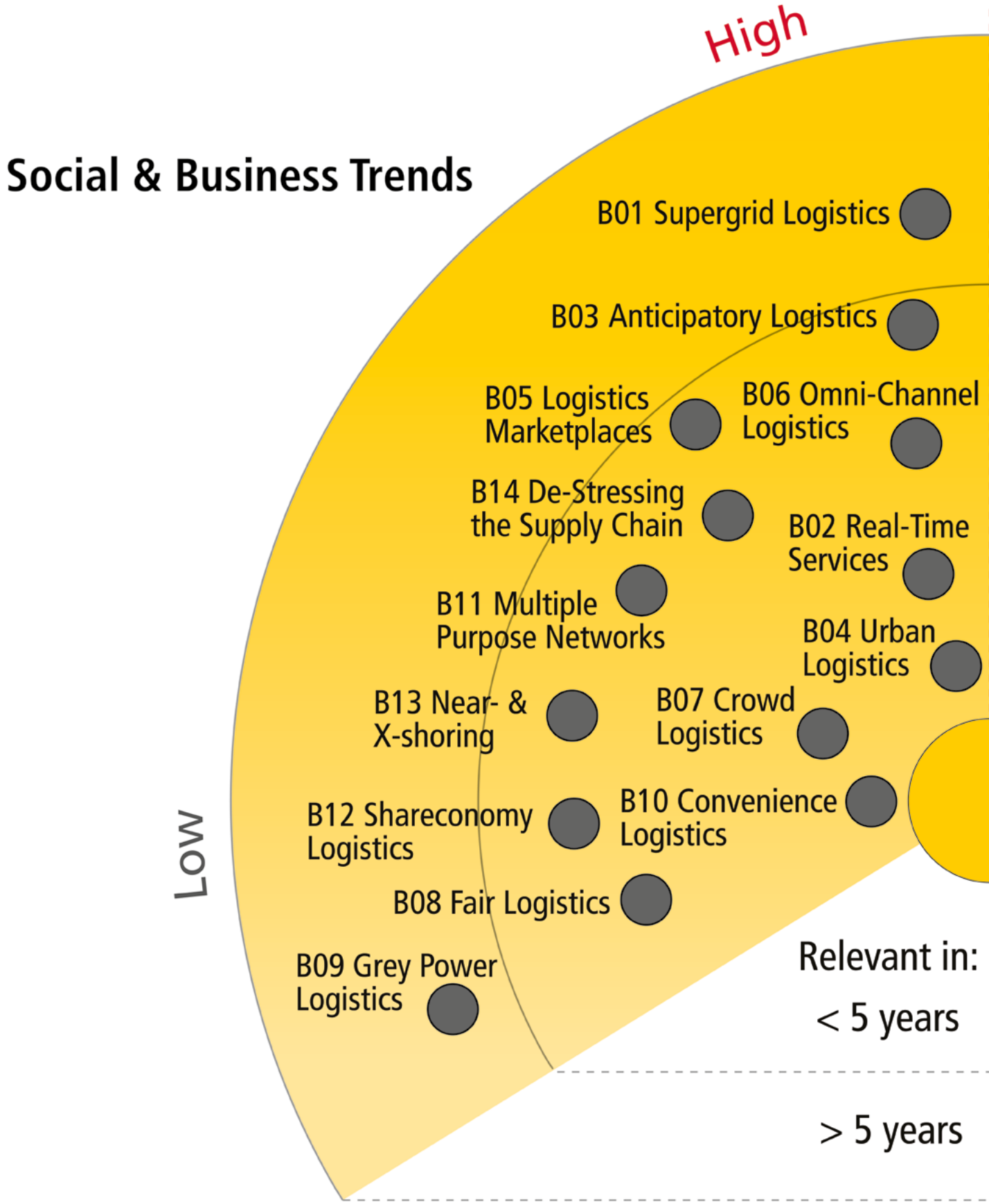
PHASE-OUTS

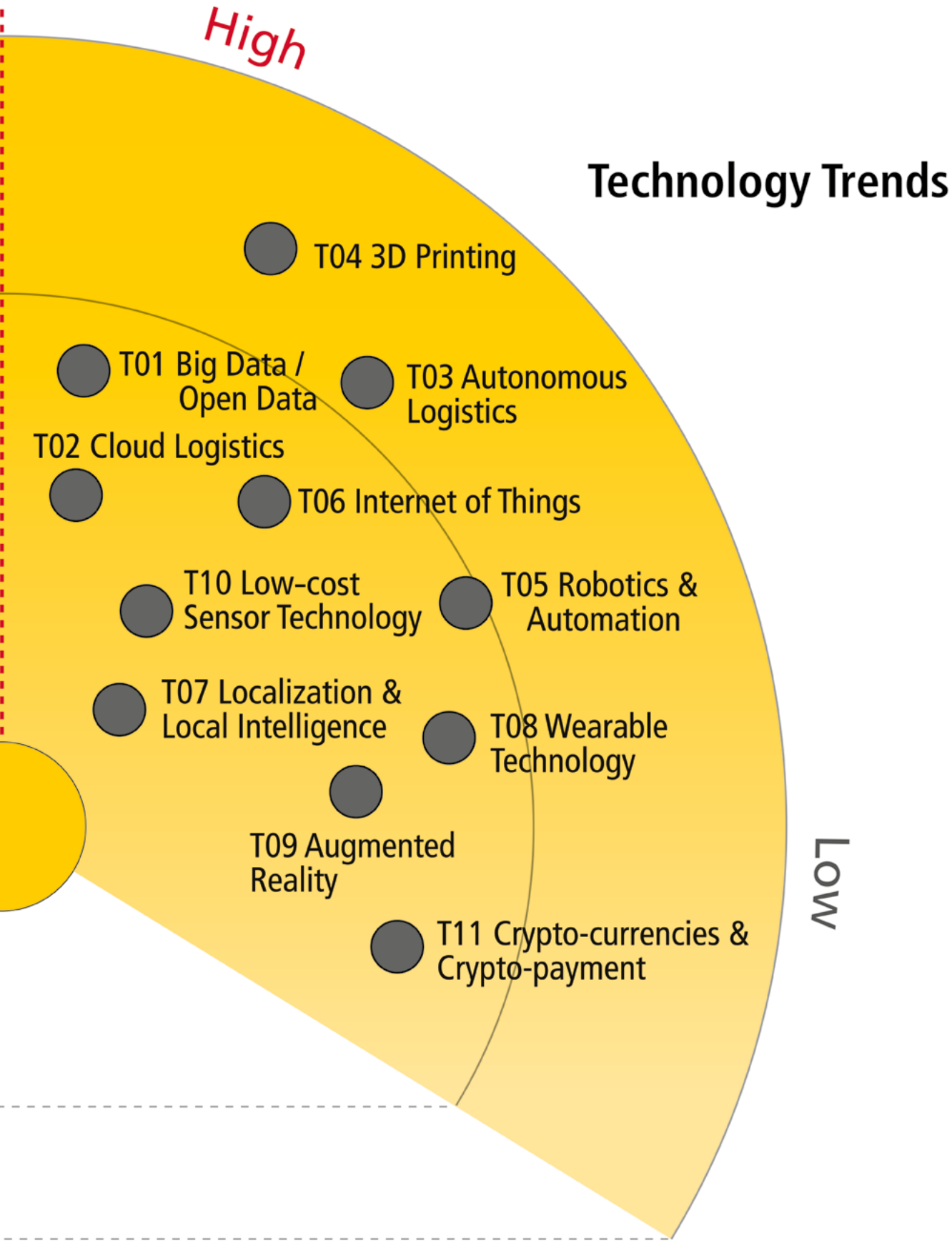
'Logsumer' is considered to be a topic impacting several areas of the logistics business. In this edition of the Logistics Trend Radar, it has therefore been phased-out as a singular trend. The effects of the consumer-driven culture will be continuously tracked in the radar by specific trends such as convenience logistics, shareconomy, crowd logistics, and omni-channel logistics.

Next-generation telematics, as indicated in the first edition of the Logistics Trend Radar, has already reached commodity status. The next stage of enhancement of location- and localization-related innovation is being followed up in the new trend localization and location intelligence.

Quantum computing is now considered outside of scope, as it is unlikely to be applied in the logistics industry within the 5 to 10 year timescale of the Logistics Trend Radar.

AT A GLANCE: THE LOGISTICS TREND RADAR

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Technology Trends
T04 3D Printing
T01 Big Data / Open Data
T03 Autonomous Logistics
T02 Cloud Logistics
T06 Internet of Things
T10 Low-cost Sensor Technology
T05 Robotics & Automation
T07 Localization & Local Intelligence
T08 Wearable Technology
T09 Augmented Reality
T11 Crypto-currencies & Crypto-payment
Low

OVERVIEW: TRENDS SUMMARY

Logistics Trend Radar: Social & Business Trends

	Social & Business Trend	Impact	Timeframe	Summary
B01	Supergrid Logistics	High	> 5 years	Supergrid logistics will bring up a new generation of logistics companies with primary focus on the orchestration of global supply-chain networks that integrate swarms of production enterprises and logistics providers.
B02	Real-Time Services	High	< 5 years	Real-time services enable flexible and efficient adaption to changing conditions and ad-hoc optimization of supply chains by integrating real-time information into intelligent and interactive analytics frameworks.
B03	Anticipatory Logistics	High	< 5 years	Powered by big data-based predictive algorithms, anticipatory logistics enables logistics providers to significantly boost process efficiency and service quality by speeding up delivery time and enhancing capacity and network utilization.
B04	Urban Logistics	High	< 5 years	Key issues in urban areas are environmental impact and traffic density. Combined with the growing relevance of e-commerce and home delivery, this makes it essential to have logistics solutions tailored to the specific requirements of urban areas.
B05	Logistics Marketplaces	High	< 5 years	In the context of globalization and increasingly digital lifestyles, logistics market-places create opportunities for new services that can overcome geographical and functional segmentation, and significantly enhance cost efficiency and capacity utilization.
B06	Omni-Channel Logistics	High	< 5 years	The next generation of retail, including cross-channel, omni-channel, social, ambient, everywhere and no-line commerce concepts requires logistics networks tailored to the needs of each single channel. This implies high-quality logistics services with minimum investment, by just intelligently using standard logistics networks and assets.
B07	Crowd Logistics	Medium	< 5 years	Social networks and crowd-based concepts offer new business opportunities. By placing greater emphasis on crowd sourcing and crowdfunding, logistics providers can speed up innovation-to-market cycles and create a new sense of community with customers.
B08	Fair Logistics	Low	< 5 years	Logistics will lead the way into a fair and sustainable society by generating social benefits and fostering the circular economy with its products and services. In future, dealing thoughtfully with earth's limited resources will go hand-in-hand with fair and respectful human interaction, and sustainable investment in regional empowerment.
B09	Grey Power Logistics	Low	> 5 years	In five or more years' time, the first wave of digital natives will enter the aged population segment. Grey power logistics – the logistics for an aging society – will offer new services to answer the resulting challenges of this demographic development.
B10	Convenience Logistics	Medium	< 5 years	Customers buying goods online appreciate not just price advantage but convenience. It saves costs, time, and physical effort and provides 24/7 availability. Today's market leaders offer food fresher than conventional supermarkets through continuous cold-chain and direct delivery from the producer's site via a standard parcel network.
B11	Multiple Purpose Networks	Medium	< 5 years	Multiple Purpose Networks refers to the utilization of standard, existing networks to transport and store temperature-sensitive, special, and dangerous goods, enabled by innovative methods of transportation, smart packaging solutions, and real-time supply chain monitoring.
B12	Shareconomy Logistics	Low	< 5 years	A new sharing culture leads to new logistics needs within the digitalized neighborhood. Logistics infrastructure and service sharing with coopetitors open new perspectives for logistics providers, and will create new forms of collaboration across enterprises.
B13	Near- & X-Shoring	Medium	< 5 years	Following on from the offshoring wave of the last decade, changing economic and social conditions will bring up new sourcing strategies such as near-shoring, re-shoring/back-shoring, and even x-shoring.
B14	De-Stressing the Supply Chain	Medium	< 5 years	Complexity of supply chains and vulnerable customer requirements require the right mix of transportation modes and services. De-stressing means that the transportation of a subset of goods may tolerate a tactical 'slow-down' to optimally balance the supply chain and reduce costs in storage and warehousing.

Logistics Trend Radar: Technology Trends

	Technology Trend	Impact	Relevance	Summary
T01	Big Data / Open Data	High	< 5 years	Big data carries huge untapped potential for optimizing capacity utilization, reducing risk, improving customer experience, and creating new business models. Open external data sources will add a new dimension to big data use cases.
T02	Cloud Logistics	High	< 5 years	Beyond the hype, the paradigm of cloud-based services is increasingly tangible for logistics. Logistics-as-a-Service (LaaS), logistics mall, Supply Chain-as-a-Service (SCaaS), and on-demand SCM are some of the future topics of logistics.
T03	Autonomous Logistics	High	> 5 years	Autonomous logistics utilizes innovations such as cellular transport systems, self-steering vehicles, and unmanned aerial vehicles (UAVs) that offer new transport and warehousing solutions, enhancing the efficiency of established assets and providing infrastructure alternatives in remote areas.
T04	3D Printing	High	> 5 years	3D Printing is a disruptive technology that will change tomorrow's logistics by adding a new diversity of manufacturing strategies. Innovative logistics providers can become thought leaders in orchestrating complex networks that include traditional and 3D manufacturers.
T05	Robotics & Automation	High	< 5 years	Robotics and automation technologies support zero-defect logistics processes and enable new levels of productivity. The new generation of robots and automated solutions with significantly improved performance and enhanced sensing capabilities offers a serious alternative to manual handling.
T06	Internet of Things	High	< 5 years	The Internet of Things empowers smart objects to be active participants in self-steering, event-driven logistics processes. Logistics is one of the major industries which will benefit from the intelligent conjunction of information and material flows.
T07	Localization & Local Intelligence	Medium	< 5 years	By integrating location and spatial information with traditional analytics data, localization and location intelligence (LI) help to increase process efficiency, and provide enterprises with powerful insights into asset utilization.
T08	Wearable Technology	Low	< 5 years	Beyond the hype, wearable devices (together with responsive environments and contextual apps) will in the long run significantly change the ways we work and manage our lives and will impact all industries. Enterprises need to develop a strategy for adopting wearable devices at an early stage.
T09	Augmented Reality	Low	< 5 years	By adding virtual layers of contextual information at the right time and in the right place, augmented reality will provide new perspectives in logistics planning, process execution, and visual analytics.
T10	Low-cost Sensor Technology	Medium	< 5 years	Established consumer sensor technologies enable new applications within the logistics industry. With access to low-cost sensors, logistics is likely to increase the use of sensors, creating smart infrastructures for monitoring, inspecting, and controlling industrial and logistical processes.
T11	Crypto-currencies & Crypto-payment	Medium	< 5 years	Started by an underground community of cyberpunks in the 1990s, crypto-currencies and crypto-payment quickly evolved to become a significant technology trend with strong potential as a serious alternative to the established financial infrastructures of governments, banks, and credit card companies.

IN-DEPTH: SOCIAL & BUSINESS TRENDS

B01 Supergrid Logistics

Topic

Supergrid logistics will bring up a new generation of logistics companies with primary focus on the orchestration of global supply chain networks that integrate swarms of production enterprises and logistics providers. Global logistics supergrids will open up new business opportunities for different logistics branches – 4PL providers, companies with special expertise in complex or special services, and even small local logistics providers.

Description

Supergrid logistics rests upon a well-structured, modularly configurable logistics service portfolio. Per service module, internally operated or external services can be selected, orchestrated, and executed 'on demand'. Based on Logistics-as-a-Service (LaaS) methods, smart business networks can be created and individual intermodal, multimodal, and synchromodal solutions can be executed quickly and cost efficiently. LaaS introduces a new generation of business models affecting the entire logistics market.

- **Supergrid drives new market segmentation:** The logistics provider market will split into new actor categories such as service specialists, users, configurators, orchestrators of complex logistics solutions, and service mall owners. Logistics malls will establish a new degree of market transparency and give small local companies access to the global market. Global players will focus primary on cross-border integration, premium services, and orchestration of regional and local service providers (cooperative competition) to a global supergrid. The big players in the logistics industry can secure cutting-edge positioning by re-envisioning their strategy and business operating models, based on the concept of service-oriented logistics (SOL).
- **Supergrid enables cost-efficient premium services:** Services with constantly growing complexity and high development costs (such as risk management and security, customs clearance, and compliance) will be developed by only a few specialists. Premium e-services (e-billing, e-compliance, e-clearance) will become the new differentiators.
- **Supergrid adds business value:** Logistics services will be sold not only to customers but also to service partners and even competitors. Cooperation will impact infrastructure development, support capacity, and resources utilization (e.g., by sharing fleet) to secure corridors, reduce costs, save energy, and be more sustainable. Cooperative competition will drive economic growth by supporting states investing in infrastructure (rail, bridges, and hubs).

Benefits:

For the logistics provider

- New business opportunities for global players to enhance their networks and for small companies to participate in the global market
- Reduction of infrastructure and service development costs, rapid time-to-value, scalability of services, elasticity of infrastructure

For the provider's customer

- More flexibility, fast and cost-efficient configuration of individual solutions and scenarios, and cost reduction

Concerns:

For the logistics provider

- Limited experience: There are currently only a few cross-company supergrid pilots
- Pilots and use cases for LaaS or logistics mall-based business models for global 4PL providers are still not in place
- Several companies offer single, most standard, cloud-based logistics services under the label LaaS

Project Logical

LOGICAL
transnational logistics improvement through cloud computing and innovative cooperative business models

- Interoperability enhancement of logistics businesses of different sizes
- Competitiveness improvement of central European logistics hubs, based on a modern logistics cloud infrastructure
- Universal standard for cloud computing in logistics
- Fully operational transnational 'LOGICAL Cloud'

B02 Real-Time Services

Topic

Real-time services enable flexible and efficient adaption to changing conditions and ad-hoc optimization of supply chains by integrating real-time information into intelligent and interactive analytics frameworks. This offers enhanced levels of visibility and transparency throughout the entire supply chain, enables additional business capabilities, increases operational efficiency, and boosts customer intimacy.

Description

Real-time services provide data in cycles timed to seconds that can be received, analyzed, and integrated into operational activities at any time and in any location.

- **Real-time tracking services:** Independent of the location, continuous data transfer of the shipment or smart package solution provides information (track events) about position, condition (e.g., temperature, humidity), and integrity (e.g., electronic seal with flexible access authorization). Up-to-date real-time tracking solutions are fully integrated with personal or professional smart mobile devices and apps as well as high-value supply chain steering tools (e.g., Agheera real-time services, Bag2Go).
- **Real-time order management:** New generation mobile order management apps allow their users to enter and manage shipment orders in real time when on the move (e.g., DHL Activebooking).
- **Real-time risk management:** Real-time information about changes in the condition or integrity of transported goods enables immediate intervention if there are risks such as temperature disruption (e.g., DHL Resilience360, Agheera Pulse).
- **Real-time inventory services:** These track the activities and position of trucks, and have the potential to change current routing solutions from preplanned milk runs to flexible pickup and delivery locations (e.g., Agheera TrackNow, DHL SmartTruck, TelematicOne).
- **Real-time tracing of intelligent logistics objects:** Complex solutions for controlling and operating complete logistics systems, combining various technologies such as video, 3D-scanning, RFID, and sensors (e.g., Fraunhofer smaRTI, TiLO).

Benefits:

For the logistics provider

- Increases efficiency through faster processes and real-time data
- Enhances customer service, enables value-added services
- Improves visibility, transparency, capabilities, and security functions (e.g., asset control, theft reduction)

For the provider's customer

- Information at any time about the location and delivery status of goods
- More transparency, flexibility, and rapid configuration of individual solution scenarios (e.g., flexible last-mile delivery options)

Concerns:

- High data volume, velocity, and variety cannot be handled properly by established solutions; therefore big data adoption is necessary
- Available systems do not work across company boundaries yet
- High investments needed in end-to-end supply chains

Pulse.Agheera.com

- Power-independent sensors attached to cargo containers providing temperature, location, and humidity data in real time
- Information portal connects customers to their cargo and presents vital data about each shipment's journey
- Highly interactive user interfaces, fleet info, and tracking data appear as layers on top of a map
- Additional information layers via Pulse marketplace, individual fields and data streams, and push-notifications

www.agheera.com

B03 Anticipatory Logistics

Topic

In the context of globalization and increasingly digital lifestyles, logistics marketplaces create opportunities for new services that can overcome geographical and functional segmentation, and significantly enhance cost efficiency and capacity utilization.

Description

Today, predictive logistics planning and execution can profit from new analytics methods as well as from new types and sources of data. With more open data being published, shared, and integrated with traditional and new data sources into innovative big data-based analytics, the highest impact can be realized in improving the efficiency of freight operations, enhancing capacity and asset utilization, adjusting and synchronizing transport schedules in the context of, for example, synchromodal or other smart logistics networks, and reducing the risk of supply chain disruption.

- **Volume forecast and predictive capacity utilization and planning:** According to the World Economic Forum, 50–60 % of today's available transport capacity is wasted. Big data-based predictive capacity utilization solutions such as DHL's Parcel Volume Prediction or Transmetrics' algorithms aim to improve the prediction accuracy of expected parcels and freight within the network by correlating data from different sources and with different degrees of privacy protection, e.g., company's internal historic shipment data and external events, public holidays, weather condition, Google search terms, and the shopping behavior of online customers.
- **Anticipatory shipping:** Based on big data analysis of customer product searches and shopping histories, wish-lists, and even cursor activity, Amazon plans to proactively initiate shipments before the customer even places an order. The process includes the packaging of one or more items for eventual shipment to a particular address, without completely specifying the ultimate destination until the package is already in transit. With a completed order, the package can be delivered swiftly to the ultimate destination; if the order is not completed, the package can be re-directed to another location still within the target transit time.
- **Predictive supply chain risk management:** This comprises solutions that use big data algorithms to evaluate different supply chain scenarios by anticipating potential risks. They offer service providers the opportunity to select the most appropriate scenario fitting specific customer requirements and to avoid disruptions in delivery and manufacturing processes.

Benefits:

For the logistics provider

- Increase in prediction accuracy
- Efficient resource and capacity utilization (e.g., warehouse and transportation)
- Supply chain risk reduction through predictive risk evaluation

For the provider's customer

- Faster delivery through efficient network planning
- Individual, dynamically changeable delivery options during the transit time of each shipment

Concerns:

- Prospective shipping is mostly applicable to mass-interest products (e.g., new generations of mobile devices, books by bestselling authors, etc.) and in urban areas; key to the profitability of this approach will be intelligent network design and steering in the background

Transmetrics

- Transmetrics brings big data prediction to transport and logistics to improve capacity optimization
- Prediction of future shipping volumes 3–6 weeks ahead of time, based on cloud predictive analytics, merging external information with historical shipping data from transport companies
- Pilots with DHL and two other large logistics companies

www.transmetrics.eu

B04 Urban Logistics

Topic

Key issues in urban areas are environmental impact (especially pollution) and traffic density. Combined with the growing relevance of e-commerce and home delivery, this makes it essential to have logistics solutions tailored to the specific requirements of urban areas.

Description

Over the last decade, the epicenter of the global economy has continuously shifted towards emerging cities within the developing world. In less than five years, more than half of the world's population will be living in urban areas. At present, both traditional and emerging cities are facing mass urbanization of unprecedented speed and scale.
The sustainable and climate-friendly supply circle of goods and services, when weighed against customer demand for consumer products and home-delivery services, will influence the development of advanced urban logistics solutions. Pollution avoidance for inner-city areas requires anticipatory development and fast implementation of fresh, sustainable, and holistic solutions across all of the urban logistics and supply systems.

- **Urban freight consolidation:** Consolidation through logistics clusters or in Urban Consolidation Centers, with aggregated streams to different consignees within a specific area, e.g., a shopping mall, skyscraper, hospital, etc. There are UCCs in Heathrow airport, Stockholm, Dubai, Kuala Lumpur, and Istanbul.
- **Urban supply-stream consolidation** by bundling logistics and non-logistics services (e.g., retail, MRO, medical care, convenience services) into a 'smart grid' for cities, optimizing supply and demand (e.g., Binnenstadservice.nl).
- **Utilization of urban infrastructure** using existing infrastructure for additional logistics purposes (e.g., overnight use of inner city parking garages as warehouses and distribution centers, utilizing otherwise unused public transport capacities). An example is eBase4mobility.
- **Sector-specific urban navigation solutions:** These sector-specific solutions handle urban business traffic (e.g., Fraunhofer's Urban Business Navigator).
- **Next-generation PUDOs** (pickup and drop-off automation solutions) offer advanced functionality (e.g., refrigerated pickup lockers and DIADISCOUNT App, DIA supermarkets, France; DHL Paketbox, MyByBox, UK).

Benefits:

For the logistics provider

- New operational areas for logistics providers to offer 4PL services; integrated logistics planning for airports, hospitals, construction sites, etc., and innovative logistical rent-and-share solutions, urban mining, and reverse logistics

For the provider's customer

- Decreased variability through adopting a planned model
- Reduced externalities associated with last-mile deliveries
- Improvement of flexibility, speed, and quality of logistic services

Concerns:

- No funding to improve existing urban infrastructure
- Limited public sector financing to incentivize innovation and new business practices
- Stakeholder complexity when engaging with city authorities
- Lack of willingness to collaborate across the logistics sector
- New operating models may dilute volumes on existing networks

Binnenstadservice.nl

- Urban Consolidation Centers in 15 cities in the Netherlands bundling delivery, distribution, and reverse logistics services for shops located in city centers
- More attractive inner city, reduced emissions, increased company profitability, increased efficiency and productivity of logistics processes

www.binnenstadservice.nl

B05 Logistics Marketplaces

Topic

In the context of globalization and increasingly digital lifestyles, logistics marketplaces create opportunities for new services that can overcome geographical and functional segmentation, and significantly enhance cost efficiency and capacity utilization.

Description

Electronic logistics marketplaces (ELM) offer business partners, as well as private customers, flexible logistics services tailored to the specific one-off requirements of a shipper at time of request.

- **Marketplaces for cloud-based IT services enabling logistics processes** are electronic platforms offering, renting, and operating logistics IT applications, services, and processes in the cloud (e.g., Logistics Mall).
- **B2B logistics marketplaces:** These offer business customers the opportunity to find the right carrier for their load at the right time by choosing from a wide range of service providers; they profit from better comparability and transparency of proposals, optimized price/performance ratios, and high security through member certification and rating systems. For logistics providers, an ELM offers the chance to reduce empty running, find fast and efficient additional cargo capacity, reach wider sources of logistics demand, and collaborate smoothly with other logistics companies (e.g., Check.cargo.com, Teleroute.com, Opersoft.com, Movex.co.uk).
- **M2C (manufacturer-to-consumers) and B2C logistics marketplaces:** These are being established to serve growing customer demand for cheap, reliable, company-independent courier and transportation services. Consumers can compare quotes and book upfront, and name their own price or receive auction-style bids from logistics providers ranging from independent owner-operators to the largest freight carriers and brokers (e.g., Klickcouriers.com, Uship.com, Shareload.com, Shiply.com, Chakkr.com, Parcelbroker.co.uk, AnyVan.de).
- **C2C marketplaces for transportation services** (e.g., car sharing for parcels and cargo). These result from the new culture of sharing; they are becoming an increasingly serious and attractive alternative to standard logistics networks and providers (e.g., Carpoolcargo.com, Raumobil.de, NochPlatz.de, Monsterzeug.de).

Benefits:

For the logistics provider

- Access to a broader customer base
- Flexible sourcing of externally operated services instead of long-term partnerships and dependencies
- Optimized capacity utilization, acquisition of additional capacity, reduction of empty rides

For the provider's customer

- Access to flexible logistics services
- More price and service transparency

Concerns:

- Guaranteed quality of services only on platforms with member certification
- Customer decisions often rely on customer feedback and rating systems
- Fraud and theft risk

Logistics Mall

- The first worldwide independent SaaS (Software-as-a-Service) cloud platform for logistics
- Virtual marketplace offering networked IT systems and services enabling logistics functions from the cloud
- Standardized business object model for logistics

www.logistics-mall.com

B06 Omni-Channel Logistics

Topic

The next generation of retail, including cross-channel, omni-channel, social, ambient, everywhere and no-line commerce concepts requires logistics networks tailored to the requirements of each single channel. This implies high-quality logistics services with minimum investment, by just intelligently using standard logistics networks and assets.

Description

In future, e-commerce and traditional brick-and-mortar commerce will no longer move on parallel tracks. Even today, traditional traders tend to operate an e-shop in parallel to their physical store, and use one or more e-commerce platforms such as eBay, MeinPaket.de, or Amazon Marketplace to access national and even international markets. The next evolutionary step within the retail business is blending online and offline into a single 24/7 shopping experience.

- **Digitalization of traditional stores** will include tablet/smartphone integration, individual discount offerings, and even Facebook 'likes' displayed on physical items (e.g., Burberry's flagship store in the UK; C&A, Brazil).
- **Store as a materialized app** will provide a completely app-driven shopping experience within a pure digitalized store (e.g., Hointer, US).
- **Customer behavior as a currency** includes runners in Mexico paying for Nike goods with kilometers completed.
- More **home delivery** directly to the end-consumer (manufacturer-to-customer, retail-to-customer, customer-to-customer) and less manufacturer-to-retail transports.
- More **alternative delivery services** (parcel lockers, crowd delivery, urban courier services, dynamic re-routing).
- More **same-day delivery** with intelligent storage and warehouse network enhancements in the background.
- **Retail platforms and marketplaces** enabling omni-channel commerce include payment solutions and end-to-end configurable logistics services (pickup, warehousing, fulfillment, delivery, and after-buy services).

Benefits:

For the logistics provider

- Further increasing volumes in the area of B2C delivery
- New business opportunities in warehousing, fulfillment, and transportation services tailored to the needs of omni-channel commerce

For the provider's customer

- All-round experience, combining the best parts of online and offline shopping
- Flexibility and convenience, with shopping and delivery services fully integrated into daily routines

Concerns:

- Although still in early stages of adoption, there is a high diversity of concepts targeted at integrating online and offline commerce; there are distinct requirements for enabling logistics services

Hointer

- Interactive eTags with personalized content
- Relevant social media delivered to customers when exploring the product
- Omnicart-enabled mobile shopping in the physical store, home, or on-the-go
- Big data-based analytics for sales associates
- Micro-warehouses, same-day delivery via Google Express Shopping and eBay Now, order pick-up stations, direct store2customer shipping

www.hointer.com

B07 Crowd Logistics

Topic

Social networks and crowd-based concepts offer new business opportunities. By placing greater emphasis on crowd sourcing and crowdfunding, logistics providers can speed up innovation-to-market cycles and create a new sense of community with customers.

Description

Crowd-based business strategies such as crowdsourcing first-and-last-mile activities by integrating daily individual routines into professional logistics processes, offer new opportunities for logistics providers. In this area, established operators have to cope with a rapidly changing and expanding start-up-driven competitive landscape, and must develop innovative collaboration strategies, integrating professional and non-professional services, sources, and capabilities.

- **Crowdsourcing:** Currently, almost 60 % of the available transport capacity (rail, road, private cars) is not being used. By involving customers in the pickup and delivery process, not just transportation costs can be significantly reduced. Consolidation of transport volumes per route also makes a significant contribution to CO_2 reduction.
- **Crowdfunding:** The collective funding of individual, innovative products speeds up product lifecycles in an unprecedented way. It is one of the most trailblazing shifts in business today, creating new opportunities for both individuals and established market players. Logistics providers have already discovered the crowdfunding community as an attractive new market and offer services tailored to its specific requirements, such as fulfillment outsourcing.
- **Crowdnavigation:** Networks like Twitter used by employees provide real-time information and often allow a quicker reaction to, say, road incidents, traffic jams, and other significant events than traditional navigation and telematics solutions.
- **Crowdmining and web-screening:** In the age of WEB 3.0 – the web of data and context – an indispensable part of each company's business is to monitor its corporate brand image and the images of its products and services in social networks. Tweets deliver real-time feedback about the impact and acceptance of new products, public perception of special offers and discounts, and detection of defects and incidents. Through all this, customers are increasingly becoming part of the logistics process and its continuous enhancement.

Benefits:

For the logistics provider

- Network enhancement, better capacity utilization, reduction of transportation costs
- New business opportunities by providing crowd-based logistics solutions; an example is C2C-driven last-mile delivery

For the provider's customer

- New level of customer participation
- Reduction of transportation costs
- Flexible service options for deliveries

Concerns:

- Legal/compliance restrictions for customer contribution to pickup and delivery processes

DHL MyWays

- Unique crowd-based delivery for B2C parcels
- Based on a mobile app
- Connecting individuals who ask for flexible deliveries with those offering to transport parcels along their daily routes for a small fee
- Facilitated through the DHL Freight network of service points in Stockholm

www.myways.com

B08 Fair Logistics

Topic

Logistics will lead the way into a fair and sustainable society by generating social benefits and fostering the circular economy with its products and services. In future, dealing thoughtfully with earth's limited resources will go hand-in-hand with fair and respectful human interaction, and sustainable investment in regional empowerment.

Description

As a responsible member of the global society, logistics is challenged to proactively address social and environmental issues, and to develop concepts and solutions providing social benefit, creating value, and generating social win-win outcomes for all parties involved along the supply chain. For example:

- **Encourage fair society:** Logistics must foster the global establishment of a fair society (e.g., the establishment of fair products as a standard part of retail portfolios, fair-trade promotion, and the empowerment of underdeveloped regions and social groups).
- **Establish collaborative business models** by involving private individuals from around the globe, expanding the logistics supergrid via crowdsourcing, and giving participants a fair chance to benefit from their contribution by developing collaborative business models, particularly in areas with underdeveloped logistics infrastructures.
- **Empower local logistics and manufacturing companies** all over the world by providing access to global markets via, say, logistics marketplaces and M2C (manufacturer-to-consumer) networks; and by enabling open logistics networks with the opportunity of fair collaboration for all participants, independent of company size and location.
- **Promote fair end-to-end logistics chains:** Take over responsibility for fair conditions and social benefit along the entire supply chain (e.g., fair working conditions, fair pricing, environmentally friendly transportation and production).
- **Enable the circular economy:** By understanding the economy as a circle, we are increasingly able to replace common 'end-of-life' concepts. This represents a real economic opportunity in times of resource scarcity and environmental pollution. Logistics can enable the turnaround to a more sustainable economy by offering solutions for circular materials management, closed-loop SCM, and circular logistics concepts for big cities, and by enhancing logistics supergrid capabilities with, for example, multiple-purpose networks.

Benefits:

For the logistics provider

- Become a specialist service provider for circular economy business (e.g., reuse/recycle)
- Improve business sustainability by solving social problems (e.g., logistics service with revenue instead of donation)

For the provider's customer

- Support in achieving a fair lifestyle
- Transparency about the social/fair footprint of logistics providers

Concerns:

- Standards and classifications about fair logistics are not yet in place
- Social benefits vary geographically

DHL Envirosolutions

- Integrated environmental solutions for business customers
- Waste and recycling solutions, WEEE (waste electrical and electronic equipment) recycling services, packaging, WEEE and battery compliance, producer compliance schemes, sustainable business solutions, data management services, legislation information

www.dhl.co.uk/envirosolutions

B09 Grey Power Logistics

Topic

In five or more years' time, the first wave of digital natives will enter the aged population segment. Grey power logistics – the logistics for an aging society – will offer new services to answer the resulting challenges of this demographic development (e.g., special home delivery services and health logistics services).

Description

By 2015, the percentage of seniors (60+) in industrial societies will increase from 15 % to 26 %. The population aged over 65 in India and China will rise from 160 million in 2010 to 280 million by 2020. By 2100, there will be 1 billion in these two countries alone. Self-supporting aging concepts that allow people to gain control over their lives and spend their retirement time at home ('aging in place' and 'active aging') are becoming more and more popular. Smart home, remote health, and social care technologies, along with 3D solutions and peer-to-peer (P2P) networking for social 'togetherness' will have diverse implications for the logistics industry.

- **Emergency & welfare services:** The aging population needs both emergency healthcare and well-being services delivered in clinics, hospitals, and surgeries, and at home. These services must be significantly enhanced around the globe. Demand will increase (and include broader product lines) for new or adapted services (e.g., in home safety and care, smart homes), personal activity and healthcare (real-time fitness monitoring, proactive emergency assistance and medicine supply), mobility and transportation (trip planning, driving, routing, navigation) as well as home delivery.
- **Grey power workers:** Working beyond the age of 67 will require logistics organizations to offer flexible HR conditions to employees (self-employment, home and flexible office hours, part-time employment, etc.).
- **Silver surfers:** The percentage of web users aged 60+ increased from 0.2 % in 1997 to 39.2 % in 2012; today's e-commerce digital natives will become the next generation of seniors.

Benefits:

For the logistics provider

- Potential new business opportunities, e.g., transportation of elderly, sick, and disabled people, proactive supply of convenience and health goods based on interaction with wearable devices and smart home infrastructure
- Further expansion of e-commerce with special focus on aged customers leads to increased transport volumes and individual delivery schedules adapted to the daily routines or ad-hoc needs of customers

For the provider's customer

- More products and services meeting the specific requirements of the aged population: greater autonomy, security, flexibility, mobility, welfare, and better integration into social life

Concerns:

- Due to demographic changes, logistics providers will have to cope with shortages of personnel in logistics operations

Sensor-based Health Services

- Research project of Connected Technologies Research Campus
- Home and mobile services using sensors in the environment and near the body
- Aims: maintain health and support independent living

www.connected-living.org
Sub-project: Sensor-based health services

B10 Convenience Logistics

Topic

Customers buying goods online appreciate not just price advantage but convenience. It saves costs, time, and physical effort and provides 24/7 availability. Today's market leaders offer food fresher than conventional supermarkets through continuous cold-chain and direct delivery from the producer's site via a standard parcel network.

Description

Convenience logistics is the response to the specific requirements of next-generation e-commerce, covering the entire spectrum of commodity goods including sensitive and cold-chain products. Demand is constantly growing, especially for home delivery of fresh and frozen food through standard networks. This requires the development and implementation of special processes and packaging (from -18°C to room temperature).

- **Cold-chain network enhancement:** Sensitive goods (medicines, food, high-tech) need a constantly secure and monitored cold chain. Chilled items as well as ambient ones must be delivered at customer-preferred times with a minimum of packaging, ready to be stored away. Innovative, reusable cool packaging solutions enable an end-to-end cold chain while using standard parcel network utilities (e.g. Allyouneed.com).
- **Standard network enhancement:** Solutions integrating real-time prediction with standard time schedules enable dynamic and cost-efficient delivery integrated into standard logistics networks. For the special requirements of home food supply, additional delivery slots (e.g., late evening or weekend delivery) and individually selectable delivery slots and places will be adopted (e.g., via platforms like Paket.de).
- **Pickup and delivery enhancement:** Established automated pickup-and-delivery solutions can be enhanced to enable cold-chain services independent of the customer's presence at the delivery location (e.g., cold-chain parcel lockers).
- **Packaging innovation:** Smart, reusable, and recyclable packaging, tailored to standard parcel network capabilities, is required to enhance efficiency, reduce customer effort, and support environmental protection. Today, pioneers like Allyouneed.com already offer a tax-free package recollection, including pre-printed package return labels delivered with the goods.

Benefits:

For the logistics provider

- New business opportunities in the field of B2C food logistics
- Lower food distribution costs, due to using standard networks
- Need to develop flexible solutions to connect with customers (B2C)

For the provider's customer

- Home delivery of convenience goods
- Savings in terms of costs, time, and physical effort
- Minimized shopping inconvenience (e.g., improved recall solutions)

Concerns:

- Convenience logistics is most successful when using the capabilities and capacity of standard parcel networks; this will be an issue for traditional supermarket chains trying to compete with the new players in this sector

Allyouneed.com

- Direct overnight delivery from the biggest single picking food logistics hub in Germany
- Flexible, individually selectable delivery time slots; dynamic re-routing of shipments on the move
- Fresher goods at the point of delivery than conventional supermarkets through end-to-end cold chain and cooling package solutions adapted to standard parcel network utilities
- Closed loop packaging concept; GoGreen delivery

www.allyouneed.com

B11 Multiple Purpose Networks

Topic

'Multiple Purpose Networks' refers to the utilization of standard, existing networks to transport and store temperature sensitive, special, and dangerous goods. This is enabled by innovative methods of transportation, smart packaging solutions, and real-time supply-chain monitoring.

Description

Traditionally, various logistics networks have coexisted, each serving different industries and sectors (e.g., public sector, retail, health) with different categories of goods (e.g., food, medicines, chemicals). They also coexist with standard logistics networks (CEP networks, as well as rail, road, air, and ocean logistics networks). By using standard networks for the transportation of special goods, network and capacity utilization can be optimized, and costs and delivery times for both customers and logistics providers can be reduced. Alternative, existing non-logistics networks (e.g., public transport) can be utilized for logistics purposes or integrated with the logistics infrastructure.

- **Multi-purpose usage of standard networks with enhanced capabilities:** Goods requiring special transport and warehousing conditions (e.g., temperature control), dangerous goods, and high-value goods all require special network capabilities with individual cost- and time-intensive solutions. In future, standard network providers will enhance their capabilities to enable temperature-sensitive transport and handling services (e.g., for B2C food-chain deliveries). These capabilities can be re-used for multiple purposes (e.g., for the transportation of special goods). Standard logistics providers opening their networks for multi-purpose usage will have to include reliable identification and authentication services, and obtain special certificates (e.g., cold-chain food delivery via a standard parcel network, as offered by, for example, Allyouneed.com and MyTime.de).
- **Use of public transportation and infrastructure for logistics purposes:** Public transportation networks offer significant opportunity to optimize the pickup and delivery procedure in urban areas (e.g., by establishing an integrated network of bus and parcel lockers, using multipurpose vehicles or taxis with integrated parcel loading space, or using metro tunnels for shipping goods during the night and at off-peak times, as presented at the DHL innovation contest for city logistics). Other public spaces such as parking garages in cities can be used during the night as warehouse, storage, and distribution centers (e.g., eBase4Mobility).

Benefits:

For the logistics provider

- Optimized load capacity for standard network trucks with enhanced capabilities (e.g., temperature control utilities) for special and dangerous goods
- Cost savings due to better resource efficiency and capacity utilization

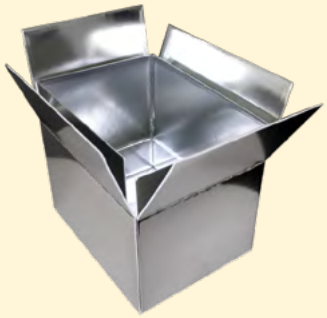
For the provider's customer

- Buying logistics services with constant quality, independent from the logistics provider and from sector- and industry-specific cost- and time-intensive solutions

Concerns:

- There is still a gap between special goods requirements and network standards
- Low volume of special or dangerous goods versus high initial investment for capability enhancement

DHL Thermobox



- Innovative insulating box for the transportation of cold-chain products (0–7 °C) via standard parcel networks
- Insulating efficiency of polystyrene, and as practical as cardboard boxes
- Flat delivery and storage, saving 80 % storage space compared to polystyrene boxes
- Non-flammable, water-resistant, and recyclable

www.dhl.com

B12 Shareconomy Logistics

Topic

A new sharing culture leads to new logistics needs within the digitalized neighborhood. Logistics infrastructure and service sharing with coopetitors open new perspectives for logistics providers, and will create new forms of collaboration across enterprises.

Description

The web and its open-source culture has expanded the circle of people with whom each of us can share; it has taught us how to share, and made sharing a commodity of social interaction. The increasing utilization of social media, transforming the internet into a place for collaborative action, will impact business models in all industries. 'Shareconomy' describes the societal shift from owning to sharing in the offline world, enabled by online technology.

- **Collaborative consumption:** Today's digital neighborhood brings people closer together and facilitates collaborative virtual communities. Sharing and swapping in peer-to-peer models saves costs and time, preserves the environment, and allows people access to products and services which are expensive to own or are being used infrequently. Logistics providers are requested to support this trend with high-quality C2C services, including value-added services such as secure peer-to-peer online and offline payment solutions.
- **Collaborative business:** By sharing development, investments, logistics infrastructure (warehouses, fleet, networks, etc.), and services with coopetitors within flexible and smart business networks, logistics providers can increase capacity utilization, and reduce costs and CO_2. Open logistics networks and marketplaces involving small enterprises (e.g., ad-hoc cooperation) foster local and regional empowerment. Collaboration between logistics providers and public sector institutions (e.g., to integrate transportation of people and goods, logistics pooling, or shared usage of public space) offers benefits such as sharing investment and maintenance costs. Co-working business models involving established logistics enterprises and start-ups in creative factories will speed up innovation and shorten development and implementation lifecycles.

Benefits:

For the logistics provider

- Flexibility, agility, elasticity, better capacity and capabilities utilization, 'on-demand logistics infrastructure', one-off cooperation
- New hybrid business models, listing excess capacity (truck load, warehouse capacity, and equipment, etc.) on peer-to-peer rental sites or shareconomy courier platforms
- Operational costs optimization, environmental protection, CO_2 reduction

For the provider's customer

- More comfort and convenience through access to a broader range of high-value products, services, and infrastructure

Concerns:

- Regulatory uncertainty (e.g., taxes for peer-to-peer services); rules need to be updated to protect consumers; possibly unclear liability and uncertain quality standards within open business networks
- Competition between incumbents and peer-to-peer providers (e.g., hotels vs. home swappers, official vs. peer-to-peer taxi services)

Shareconomy Courier Platforms

- Web platforms connecting people needing items to be delivered with drivers and couriers 'going there anyway'
- Open to individuals as well as to professional service providers (couriers, freight operators, taxi drivers) to act as a carrier
- High security and quality standards through carrier rating, selectable 'business only' restrictions, driver license number registration and CRB check

www.Stuff2Send.com
www.CheckRobin.com
www.CarPoolCargo.com

B13 Near- and X-Shoring

Topic

Following on from the offshoring wave of the last decade, changing economic and social conditions will bring up new sourcing strategies such as near-shoring, re-shoring/ back-shoring, and even x-shoring.

Description

Rising wages and fuel costs, as well as increasing supply chain risks, drive many globally operating enterprises to re-envision their sourcing strategies. As an alternative to the offshoring praxis, near-shoring moves core business and enabling services closer together (e.g., to neighboring countries). The concept of X-shoring provides holistic methods to dynamically rebalance logistics networks, meeting a broad range of decision criteria.

- **Near-shoring:** In recent years, the economic conditions in 'classic' outsourcing countries (e.g., Asia) changed significantly. Together with the growing complexity of globally fragmented supply chains, this is forcing global enterprises to reconsider the location of services and manufacturing facilities. A typical development is the closer collaboration between US and Mexican companies. Sourcing from surrounding countries lowers logistics costs, offering multimodal services (flexibility to choose air, road, rail, and even LTL shipments); shorter delivery cycles enable more effective inventory control; and due to shorter distances, costly warehouses and fulfillment centers can be avoided.
- **X-shoring or Right shoring** is the next evolutionary step in 3PL, implying the dynamic rebalancing of supply chains. The approach gives companies the choice of the most appropriate sourcing strategy with respect to current economic conditions (in some cases, it might be offshoring, in others near-shoring). X-shoring decisions are driven by a broad range of criteria including risk, quality- and service-related costs, impact on innovation and customer goodwill, time-zone and currency advantages, transit and transport times, intellectual property protection, natural disasters, political risks, trade regulations and compliance, legislative environment, and environmental sustainability.

Benefits:

For the logistics provider

- Lower freight and in-transit inventory costs
- Greater forecasting flexibility
- Supply chain risk reduction

For the provider's customer

- Improved speed-to-market
- Time-zone advantages
- Improved cultural alignment

Concerns:

- Adaptability of network
- Modular approach for infrastructure set-up
- Need for highly flexible, skilled workforce

DHL Supply Chain: Right Shoring

- Supports manufacturer searching for the right balance between offshoring, near-shoring, and back-shoring
- Reduction of supply chain disruption, transportation cost savings, lower inventories, reduced lead time, better customer service, faster recovery time, more sustainability
- Favorable for industries with high design complexity, intellectual property requiring close protection, capital intensity, large size/ weight, proximity of raw materials

B14 De-Stressing the Supply Chain

Topic

Complexity of supply chains and vulnerable customer requirements necessitate the right mix of transportation modes and services. De-stressing means that the transportation of a subset of goods may tolerate a tactical 'slow-down' to optimally balance the supply chain and reduce costs in storage and warehousing.

Description

Adjusting supply chain modules and selecting the right configuration of logistics services according to specific customer requirements in terms of speed, security, carbon footprint, etc., enable logistics to operate more sustainably, at lower cost, and with higher quality. To make de-stressing a significant part of the logistics provider's strategy and a real asset for shippers, effective IT must be in place to handle synchromodal transportation, to facilitate collaboration even between competing logistics service providers, and to provide 360-degree supply chain visibility at individual shipment level. Predictive analytics enable ad-hoc adjustments in real time according to critical events such as strikes, weather conditions, or accidents. The following strategies and tools can contribute to more de-stressed supply chains:

- **'Slow Steaming':** Within the sea freight business, already a small speed reduction shows significant impact on fuel costs and the carbon footprint.
- **'Synchromodality':** Logistics method allowing dynamic interchangeability of transport modes at any point of the supply chain and at any given time during its execution. This means turning away from pre-defined routes and schedules, and the possibility for logistics service providers to mix road, rail, air, and ocean to create an individual one-off solution that is both more efficient and more environmentally friendly.
- **Supply chain risk management:** Holistic supply chain risk management solutions like DHL's Resilience360 contribute to de-stressing logistics operations by aggregating and evaluating data safeguards to reduce risk, enhance flexibility, and improve the efficiency of supply chains.

Benefits:

For the logistics provider

- Efficient capacity utilization across transportation modes and velocity levels
- Optimized cost and quality of operations balance
- Tactical and operational flexibility

For the provider's customer

- Tailored transportation and supply chain solutions serving different priorities (e.g., speed, timeliness, cost, environmental impact)
- Logistics costs and operational quality optimization through better orchestration of transportation, storage, and warehousing times and schedules

Concerns:

- Capabilities for ad-hoc re-orchestration of synchromodal supply chains are still in early stages of development and adoption

European Gateway Services

- High-frequency rail and barge connections between Rotterdam and a rapidly expanding network of inland terminals in the European hinterland
- Synchromodal organization and best combination of transport modes for each trip (rail, barge, feeder, truck); if necessary (due to speed requirements or obstructions en route, for example), modes of transport can be switched immediately

www.europeangatewayservices.com

IN-DEPTH: TECHNOLOGY TRENDS

T01 Big Data / Open Data

Topic

Big data carries huge untapped potential for optimizing capacity utilization, reducing risk, improving customer experience, and creating new business models. Open external data sources will add a new dimension to big data use cases.

Description

Big data and logistics are a perfect match. Thanks to the vast degree of digitalization, the enterprise's data can become liquid and shareable in an unprecedented way. Integrated supply chain data streams from multiple logistics providers and open data sources have the potential to overcome logistics market fragmentation and empower global logistics supergrids.

Today, not only structured data but also additional data types such as unstructured (social, channel-specific, etc.), sensor (RFID), and new data types (GPS, voice, video, images) are becoming increasingly important. Volume, velocity, and variety (the '3Vs' that define big data) build the foundation for a 4th important V – value. In this respect, capitalizing on the value of information is a new strategic asset for enterprises and organizations. From the value perspective, applying big data can contribute to the following dimensions:

- **Operational efficiency:** Using big data can increase transparency, optimize resource utilization, improve process quality and performance, and enable anticipatory logistics. Examples include last-mile optimization with real-time scheduling of assignments for crowd-based pick-up and delivery and real-time prediction of ETA (estimated time of arrival); and predictive network and capacity planning at both strategic and operational level.
- **Customer experience:** Big data usage provides an integrated view of customer interactions and operational performance, can increase customer loyalty and retention, and can enable precise customer segmentation and targeting, and optimize customer interaction and service.
- **Supply chain risk management:** Predictive analytics on a global scale can enable risk evaluation and resilience improvement for complete supply chains.
- **New business models:** Use big data to expand revenue streams of existing products and create new data-based products (e.g., market intelligence, real-time local intelligence, environmental intelligence).

Benefits:

For the logistics provider

- Enhance operational efficiency, visibility, and control over supply chains, assets, and staffing
- Enable better forecast and real-time adjustment, reacting to demand and capacity fluctuations

For the provider's customer

- More reliable, customized, personalized logistics services
- Greater transparency, control, information, participation

Concerns:

For the logistics provider

- Business and IT alignment needed as the foundation for use case implementation
- Data transparency and governance
- Data quality, clearly defined data protection and privacy rules, data science skills, and appropriate usage of data and information technologies

DHL Resilience360

- Resilience360 Risk Assessment: Transparency on exposure and vulnerability in over 20 risk categories, resiliency rating, risk hotspots, costs and benefits of mitigations, and alternatives; review and execution based on predefined business continuity plans
- Resilience360 Incident Monitoring: Real-time tracking of incidents with supply chain relevance, notification alerts with site feedback loops, planning and booking of emergency shipments and capacity

www.dhl.com/Resilience

T02 Cloud Logistics

Topic

Beyond the hype, the paradigm of cloud-based services is increasingly tangible for logistics. Logistics-as-a-service (LaaS), logistics mall, Supply Chain-as-a-Service (SCaaS), and on-demand SCM belong to the 'Future Topics of Logistics', according to the Scientific Advisory Board of the BVL.

Description

Cloud computing meets the challenges of complex, distributed, uncertain, volatile, and less-predictable logistics environments.

- **Open cloud logistics platforms:** More and more companies offer open, web-based access to a complete range of modular, flexibly configurable logistics-on-demand services. In particular, small and medium-sized businesses benefit from instant access to unified operations management from a global logistics network. Pay-per-use models allow flexible reaction to market volatility. Service integration with new, emerging sales channels like social, community, crowdfunding and flash-sales offer unprecedented potential to expand distribution partnerships on a global level.
- **Cloud IT services:** Cloud computing enables the provision of scalable service levels (e.g., fixed or flexible delivery times) without additional resources. Services can be integrated into customized logistics solutions or removed dynamically with respect to changing volume requirements or to requested additional capabilities (e.g., compliance).
- **Cloud-based subject-oriented BPM:** Logistics services rely on globally seamlessly synchronized processes. Process cloud-based concepts such as subject-oriented BPM (S-BPM) provide new methods to cope with the complexity of globally distributed, federated logistics networks and enterprises. S-BPM pioneers like METASONIC offer a new cloud-based method of business process modeling and management that allows both bottom-up process integration within federated environments and stepwise top-down standardization supported by a cloud-based reference process model containing immediately executable processes.

Benefits:

For the logistics provider

- Reduction of the total cost of services (including costs for installations, upgrades, maintenance fees, IT resources)
- Agility, flexibility, and elasticity of business; quick and cost-efficient reaction to less-predictable events and changing customer requirements
- Risk reduction, globally accessible services, easy and fast implementation

For the provider's customer

- Customized, personalized logistics services become affordable and more of a commodity
- More transparency, control, information, participation

Concerns:

- Several cross-company projects on cloud logistics service marketplaces in Europe with mostly transnational or regional scope
- No clear evaluation of cloud logistics use cases and business models for different types of logistics providers

Shipwire Enterprise Logistics Platform

- "World's leading multichannel fulfilment platform providing Enterprise logistics for everyone™"
- Free cloud-based order management software
- Dynamically adjustable conditions depending on handling and shipping volumes, no long term tie-ups, flexible month-to-month pricing
- Omni-channel logistics integrated with new emerging sales channels like social, community, flash sales

www.shipwire.com

T03 Autonomous Logistics

Topic

This utilizes innovations such as cellular transport systems, self-steering vehicles, and unmanned aerial vehicles (UAVs) that offer new transport and warehousing solutions, enhancing the efficiency of established assets and providing infrastructure alternatives in remote areas.

Description

Autonomous devices can be found along the entire supply chain: From 'warehouse of the future' to driverless vehicles and unmanned aerial vehicles for last-mile delivery. In the coming years, autonomous devices will reach maturity and become reality in logistics and everyday life.

- **Warehouse of the future:** In future, warehouses will transform into fully automated environments. Traditional push-driven multiple-layer distribution will be replaced by consumer-driven pull for goods directly from a central warehouse. This means more single cases and individual picks will have to be handled. Real-time warehouse control systems (RTWCS) will steer the continuous interaction between warehouse and web. Fully automated warehouses will be equipped with cellular systems using swarm intelligence and sensor-guided robots moving on horizontal and vertical tracks. Autonomous units will enable fast execution of tasks and secure interaction with people and things.
- **Cognitive vehicles:** Following on from the first wave of pilot projects such as Google's self-driving car, an increasingly hot topic in the automotive industry is self-steering vehicles capable of acting and reacting pro-actively on behalf of the operator. Autonomous vehicles equipped with radar, GPS, DGPS (Differentiated Global Positioning System), RTK (Real-time Kinematic), and ultrasonic sensors can not only steer themselves but also enable dynamic real-time routing depending on traffic and events by creating ad-hoc networks.
- **Autonomous logistics in the air:** In 2013, the first demonstrations of UAV application pilots in logistics went public. Today, UAV pilots and research projects are on the agenda of all big players in the CEP (Courier Express Parcel) sector. Rather than being an alternative for standard delivery methods, UAVs can be used, for example, for urgent deliveries into areas that are geographically difficult to access. Unmanned aerial delivery is a reasonable option in places with major environmental issues and where e-commerce is growing faster than infrastructure.

Benefits:

For the logistics provider

- Reduction of traffic, risks, accidents, congestion and pollution
- Increased reliability and elimination of human error
- Increased operational productivity
- Logistics network expansion and enhancement

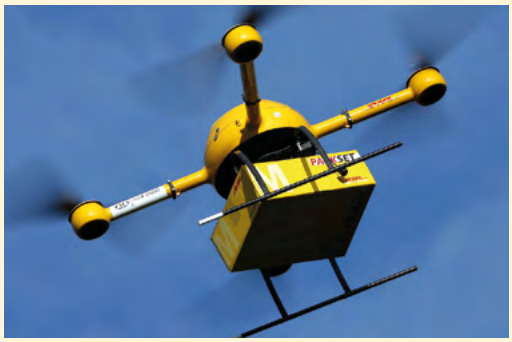
For the provider's customer

- Increased service availability and flexibility
- Reduced transport costs and time

Concerns:

- Potential risk from hackers and software bugs
- Legal restrictions
- Cultural differences/reluctance of some social groups

DHL Parcelcopter



- Research & innovation project prototype
- Potential application areas: Urgent and emergency deliveries, especially in remote regions with fragmented logistics infrastructure, or to places affected by natural disasters

www.dhl.com

T04 3D Printing

Topic

This disruptive technology will change tomorrow's logistics by adding a new diversity of manufacturing strategies. Innovative logistics providers can become thought leaders in orchestrating complex networks that include traditional and 3D manufacturers.

Description

3D printing or additive manufacturing (AM) is a process of making three-dimensional solid objects from a digital model. After the first wave of pilots enabling the fabrication of simple plastic prototypes, the current generation of 3D printers can handle a much broader range of materials (from titanium up to food and stem cells), manufacture fully functional tools (such as complex mechanisms, batteries, transistors, and LEDs), and enable manufacturing of larger-sized products, with higher precision and finer resolution while wasting less material. According to the McKinsey Global Institute, the economic impact of 3D printing is likely to grow significantly, up to $550 billion per year by 2025.

- **3D impact on logistics networks:** 3D printing will lead to a new diversity of manufacturing strategies: Some industries will be able to completely replace traditional fabrication by additive methods; some will use 3D for selected ingredients of their end products; some will not be able to gain any profit from the new technology. This diversification, as well as the integration between traditional methods and 3D printing, will challenge established logistics networks. Especially aftermarket supply chains (e.g., warehousing and distribution of spare parts) will be transformed by the possibility to fabricate in small factories with on-site 3D printing capabilities or outsource the task to small fabricators located, say, close to airports and other hubs instead of storing stock in warehouses.
- **3D opportunities for logistics providers:** These range from purely supporting the new logistics needs of the industry (e.g., 3D material supply) to becoming a player in the industry itself (e.g., by establishing own 3D on-site factories located close to hubs, warehouses, and fulfillment centers, or by hosting and distributing 3D data models).

Benefits:

For the logistics provider

- Opportunity to become a thought leader in new, potentially disruptive technology, and an orchestrator of complex and fragmented supply chains for raw materials and end products
- Participate in new market segments, such as a 'digital warehouse' or '3D fab', and become a trusted service provider for secure data hosting and exchange (e.g., through online platforms for spare part items)

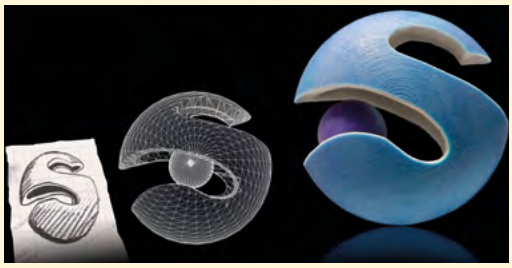
For the provider's customer

- Increased service availability and flexibility
- Reduced transport costs and time

Concerns:

- Potential risk from hackers and software bugs
- Legal restrictions
- Cultural differences/reluctance of some social groups

Sculpteo



- French company founded 2009, specialized in 3D printing in the cloud
- Online service, using rapid prototyping and a manufacturing process involving laser sintering or stereo lithography
- 3D cloud factory services for designers, brands, and 3D model platforms
- Sculpteo app offers 3D design and customization utilities

www.sculpteo.com

T05 Robotics & Automation

Topic

Robotics and automation technologies support zero-defect logistics processes and enable new levels of productivity. The new generation of robots and automated solutions with significantly improved performance and enhanced sensing capabilities offers a serious alternative to manual handling.

Description

Due to the growing popularity of e-commerce, an increasing number of small individual orders have to be handled in warehouses, and fulfillment and distribution centers. Robotics and automation are an increasingly hot topic for global players. For example, Google purchased seven companies in an effort to create a new generation of robots that can be used in manufacturing and retailing (e.g., for product picking and placing). With constant improvement in robot performance, speed, and repetition accuracy, and with rapid progress in grip and sensor technology, the cost-effective use of 3D object recognition, and an improved price/performance ratio, we are likely to see more intensive adoption of these technologies in different operational areas.

- **Flexible automation in warehousing and fulfillment:** In order to fulfill e-commerce orders more efficiently, many retailers or their distribution and fulfillment partners are embracing a flexible automation approach. Up-and-down scalable automation systems like tilt tray sorters (rapid continuous loop sortation conveyor) enable accurate, high-speed sorting, and quick and efficient transportation for a wide product mix and huge variety of materials. Self-learning systems can flexibly adapt to changing logistics environments. Autonomous transport robots offer significant alternatives to traditional material-handling technologies.
- **Automation for transshipping in courier, express, and parcel services:** Containers or vehicles filled with loosely stored parcels of different sizes represent time-intensive laborious activities. Parcel robots enable seamless, automated connection between parcel delivery in a transshipping center and subsequent parcel distribution.
- **Automated pickup and drop-off points (PUDOs)** are being adopted by more and more companies. Further capability enhancements (e.g., cold-chain PUDO) and collaborative urban networks consisting of bus stop/PUDO nodes connected via integrated people/parcel transport units can meet the growing demand for convenience logistics.

Benefits:

For the logistics provider

- Flexible automation and robotics solutions offer more agility and elasticity of logistics infrastructure capacity to cost effectively meet market fluctuations
- Optimization of time-intensive laborious activities
- Improved efficiency and cost reduction

For the provider's customer

- More personal flexibility through 24/7 service availability

Concerns:

- Cost-prohibitive infrastructure requirements currently limit greater uptake and application of robot technology
- Requires the right balance of flexibility and automation; the concept of fully automated factories, warehouses, and fulfillment centers has been revised in favor of hybrid concepts

Multishuttle Moves®

- Autonomous transport shuttles steer each other with complete freedom through available space without any guidelines, by using swarm intelligence
- Shuttles equipped with location and navigation technology, and a newly developed hybrid sensor concept with signal-based location capability, distance and acceleration sensors, and laser scanners

www.dematic.de
www.fraunhofer.de

T06 Internet of Things

Topic

The Internet of Things (IoT) empowers smart objects to be active participants in self-steering, event-driven logistics processes. Logistics is one of the major industries which will benefit from the intelligent conjunction of information and material flows.

Description

IoT is disruptively changing industry rules, leading to a new revolutionary step: Industry 4.0 is imminent. Wireless sensor networks turn physical space into an information system and enable maximum flexibility in logistics.

- **Intelligent objects, smart packages, and load units:** Intelligent, uniquely identifiable material flow objects will start sharing information and follow swarm algorithms to find their way to autonomously process real-time information and contribute to self-orchestrated operational efficiency.
- **Intelligent grids:** The sensor network, sensor cloud, or even smart planet represent an overall dynamic framework with self-configuring capabilities enabling smart services by interconnecting (physical and virtual) things, taking into account object identification, virtualization, and decentralization, and ensuring interoperability across application areas.
- **Intelligent technologies enabling IoT:** These include RFID, near-field communication, barcodes, visual recognition, 3D scanning, remote control, machine-to-machine (M2M) communication, object-generated content (OGC), device-to-grid, geotagging, GPS, wearable computing, responsive environments, augmented reality, mobile internet, semantic data integration, and IPv6 (Internet Protocol version 6).
- **Smart application areas:** These include smart cities (lighting, traffic control), smart transport (electro mobility, smart cars), smart buildings (presence sensors, thermo-stats), smart energy (electric grid), smart living (enter-tainment), smart health (bio sensors, remote health), smart industry (production control, robotics), and smart planet (environmental sensors).

Benefits:

For the logistics provider

- IoT increases significantly the transparency, traceability, and reliability of all logistics processes
- IoT automates decision-making in complex environments, and increases efficiency through flexible use of logistics infrastructure and equipment

For the provider's customer

- Logistics costs reduction (in-stock items, delivery routes)
- End-to-end real-time monitoring of goods condition, and smart interactive logistics solutions, tailored to individual requirements and routines

Concerns:

- Little or no thorough assessment of IoT business potential; need to develop new business models for incumbents and new, innovative players
- Little or no public evaluation of use cases, business models, and ROI for different types of sensor-enabled logistics networks
- Privacy protection concerns

Smart Reusable Transport Items (smaRTI)

smaRTI
SMART REUSABLE TRANSPORT ITEMS

- Cross-industry approach for an intelligent material flow
- Based on intelligent loading aids – from letter containers to airfreight pallets – and standardized software for AutoID technologies (RFID, RTLS, barcodes)
- Industry partners from airfreight, mail, and retail, transferable to all industries
- Efficient Consumer Response (ECR) Award winner 2013

www.smart-rti.de

T07 Localization & Local Intelligence

Topic

By integrating location and spatial information with traditional analytics data, localization and location intelligence (LI) help to increase process efficiency, and provide enterprises with powerful insights into asset utilization.

Description

By adding the dimension of 'where' to the traditional parameters of 'who', 'what', 'when', and 'how much', LI offers critical insights to enterprises, enabling better operational and strategic decisions and supporting process improvement and applications automation. In the next few years, fostered by new analytics features such as big data and open data as well as new technologies such as light field communication (LFC, Li-Fi) and Bluetooth low energy (BLE), the following key application areas will shape the market of location intelligence services:

- **Indoor localization and indoor navigation:** Examples include individualized, mobile device-supported guidance to the right products, real-time navigation inside a building, finding the precise location of assets and people, and increasing security in emergency situations (Google Indoor Maps, InLocation).
- **Indoor location analytics:** Supported by big data applications, business actors will be able to monitor the exact position of people and their movements within a building, assessing usage, usage frequency, space utilization, optimum positioning of assets, and more (Locoslab).
- **Location intelligence for places of interest and urban landscapes:** This gives people the power of knowing what a place is like before they arrive; it collects and serves up-to-the-minute information about places of interest (Placemeter, Live!Singapore, LeanCiti).
- **Crowdsourced location information:** Utilizing local people to collect location-relevant information (e.g., address verification, property conditions, product placement) and local insider knowledge in real time (Streetspotr).
- **Next-generation predictive traffic management:** Intelligent real-time, dynamic traffic orchestration by reserving timeslots for cars on the streets, thus preventing traffic jams, enabling traffic flows twice as fast, and reducing CO_2 (Greenway/ NUNAV).

Benefits:

For the logistics provider

- New insights into operational processes, asset, resource and capacity utilization and their optimization potential
- Technology foundation for warehouse of the future and more
- New sources of real-time location information for more precise network design and asset management

For the provider's customer

- Localization services can provide real-time information on the current location of couriers and shipments

Concerns:

- Availability of indoor maps is still limited; information still distributed over diverse platforms
- Confidentiality, privacy, copyright issues

Locoslab

- Locoslab indoor positioning system (IPS): Precise localization of mobile devices in indoor environments
- Indoor navigation for airports, fairs, and shopping centers; precise navigation, location-based services; social interaction
- Location analytics: Advanced RF-based active and passive tracking solutions for people presence monitoring at a particular location, allowing analysis of flows of people in buildings

www.locoslab.com

T08 Wearable Technology

Topic

Beyond the hype, wearable devices (together with responsive environments and contextual apps) will in the long run significantly change the ways we work and manage our lives and will impact all industries. Enterprises need to develop a strategy for adopting wearable devices at an early stage.

Description

The term 'wearable computing' refers to computer-powered devices or equipment that can be worn by a user, including clothing, watches, glasses, shoes, and similar items. Wearable computing devices can range from providing very specific, limited features like heart rate monitoring and pedometer capabilities to advanced 'smart' functions and features similar to those a smartphone or smart watch offers.

- **Wearable devices supporting working routines** based on the methods of gesture and thought recognition (e.g., Airwriting – a wristband-operated gesture control system that aims to allow people to control anything digital with simple muscle movement).
- **Wearable devices offering context information and enabling context-driven, hands-free interaction:** Examples include glasses (Google Glass, TelepathyOne, Smart Glasses M100, Olympus MEG 2.0), jewelry (Bluetooth necklaces and rings), and watches (iWatch, Pebble).
- **Wearable devices monitoring physical and mental condition, health and fitness** including activity monitors, heart-rate monitors, and pedometers, either as a solitary device or interacting with a smartphone app (e.g. Nike+, Fuel).
- **Wearable books:** Even the most offbeat concept in the area of wearable computing has the potential to impact industrial operations in terms of wearable, interactive manuals or working instructions allowing the reader to virtually experience the real work situation.

Benefits:

For the logistics provider

- Real-time operational analytics with proactive correction capabilities
- Revolutionary potential for task execution through gesture and thought control, hands-free operational processes

For the provider's customer

- Holistic life experience seamlessly integrating the online and offline worlds into a new enhanced reality

Concerns:

- Industrial adoption of wearable devices still at an early stage of development

Airwriting

- Wearable input system which enables interaction through 3D handwriting recognition
- Capable of recognizing alphabet-like patterns from among the millions of arm movements people make in a normal day
- Possible integration with Google Glass
- Google Research Award 2013

Research prototype at Karlsruhe Institute of Technology (KIT)

T09 Augmented Reality

Topic

By adding virtual layers of contextual information at the right time and in the right place, augmented reality (AR) will provide new perspectives in logistics planning, process execution, and visual analytics.

Description

AR applications are playing an important role in the fusion of the digital and physical world. By 'understanding' what's happening in their surroundings, augmented reality applications can react in real time by integrating contextual information in the field of view and into the real-world scene. AR was first introduced in the maintenance and repair sector in 1990. Thanks to the latest developments in contextual computing, AR will become more and more a part of our everyday life. In the following logistics areas, AR has the potential to significantly enhance process efficiency and quality, reduce risk, and make handling less stressful.

- **Logistics operations, manufacturing, and production** covering execution of warehouse operations such as picking and assembly (pick-by-vision), facilities service and maintenance, staff training, and risk, quality, and incident management.
- **Logistics transport, first-and-last-mile logistics:** AR is integrated into car intelligent infotainment, contextual and predictive navigation, and transport management, and provides courier support by mapping shipment data to real-time scans of physical entities (buildings, streets, etc.).
- **Logistics planning and modeling:** This includes integrative modeling of warehouses with virtual walkthroughs, simulations of air, light, and acoustics, conveyance integration, material flows, and more.
- **Visual analytics** support fast operational decisions by providing 3D or 4D visualization of complex data at the right time and in the right context.
- **Customer solutions** enable customer decisions by providing AR reality-supported assistance in choosing the right solution such as packaging for a shipment.

Benefits:

For the logistics provider

- Picking solutions enable higher efficiency, error-free processes with ongoing quality checks and navigation guides (reduces training time)
- Reduction of assembly training
- Shorter warehouse handling times
- Business opportunity to become pioneer and market leader in the logistics industry for augmented-reality technology

For the provider's customer

- Increased performance, reduced costs, improved quality

Concerns:

- Complications with regards to integrating the technology into existing warehouse management systems
- Difficulties in meeting customer-defined requirements of standards and disclosure
- Cost intensive
- Robustness and reliability of AR systems

SAP & Vuzix Augmented Reality for Warehouses

- Real-time data streaming from SAP systems to glasses, enabling hands-free working with augmented reality via smart glasses
- Assistance for loading, unloading, and handling merchandise, and inventory pick-up
- Allows employees to interact with animated stock lists; helps to control warehousing functions; streamlines the process and reduces mistakes
- Ongoing research project – no market launch yet

www.sap.com
www.vuzix.com

T10 Low-Cost Sensor Technology

Topic

Established consumer sensor technologies enable new applications within the logistics industry. With access to low-cost sensors, logistics is likely to increase the use of sensors, creating smart infrastructures for monitoring, inspecting, and controlling industrial and logistical processes.

Description

With sensors, everything can get measured. As universal tools capable of online data access and exchange, and designed to be physically robust, smartphones and tablets are clearly suited to many business and industrial applications.

- **High-tech sensors become commodity:** Today, smartphones contain many types of sensor including three-axis gyro, accelerometer, proximity, ambient light, temperature, humidity, and barometer sensors. Upcoming devices will even be equipped with depth-image sensors, RFID, and air quality sensors. Additional capabilities are standard features of some personal mobile devices – motion, gesture, facial, and voice recognition, location and environmental analysis (temperature, brightness, and humidity), and passive tag identification.
- **Industrial benefits of technology transfer:** Once equipped with one or more sensors, mobile devices are ideal for monitoring and controlling the supply chain which may enable completely new business uses and improve current solutions. As innovation cycles for consumer sensors are significantly faster than for industrial sensors, consumer-to-industrial application transfer is easy. Combining this highly dynamic development with required quality and durability is a key success factor for low-cost sensors in logistics.
- **Operational enhancement:** The sensor technology in mobile devices is already suitable to execute a broad range of logistics operations, from barcode scanning, freight image documentation, proof of delivery (POD) capture, and wireless RFID-identification, to smartphone and cloud app-supported tracking, and synchronization of delivery routing and customer availability. In particular, 3D sensors enabling 3D freight volume scanning (e.g., Kinect) will become key assets for dynamic load capacity optimization, generating unique shipment fingerprints, and controlling robotic unloading systems.

Benefits:

For the logistics provider

- Picking solutions enable higher efficiency, error-free processes with ongoing quality checks and navigation guides (reduces training time)
- Reduction of assembly training
- Shorter warehouse handling times
- Business opportunity to become pioneer and market leader in the logistics industry for augmented-reality technology

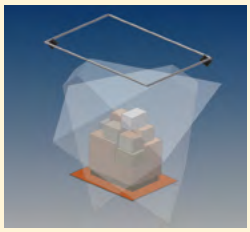
For the provider's customer

- Increased performance, reduced costs, improved quality

Concerns:

- Complications with regards to integrating the technology into existing warehouse management systems
- Difficulties in meeting customer-defined requirements of standards and disclosure
- Cost intensive
- Robustness and reliability of AR systems

Volume Scanning Using Low-cost 3D Sensors



- DHL field test on the integration of low-cost range imaging sensors in logistics applications
- Two scenarios for a stationary and a mobile solution
- In-process measurement and photo-documentation of all visible sides of the freight, low shading effects even with complex structures, complex system calibration and integration
- Use cases: Optimized packaging sequence, status documentation, contour check prior to loading, volume-based pricing

www.dhl.com

T11 Crypto-currencies & Crypto-payment

Topic

Started by an underground community of cyberpunks in the 1990s, crypto-currencies and crypto-payment quickly evolved to become a significant technology trend with strong potential as a serious alternative to the established financial infrastructures of governments, banks, and credit card companies.

Description

The e-commerce revolution and its next evolutionary step – omni-channel commerce – are making high demands on secure digital payments. The established electronic payment platforms, like PayPal, rely exclusively on financial institutions serving as trusted third parties and interact seamlessly with the existing financial infrastructure. Crypto-currencies and crypto-payment as a peer-to-peer version of electronic cash (allowing any two willing parties to transact directly with each other) is based on cryptographic proof, without financial institutions being involved. Despite the turbulence of bitcoin (the pioneer crypto-currency), crypto-payment is sure to continue as a significant innovation topic, especially in the following focus areas.

- **Next-generation integrated crypto-payment networks:** Service provider like Ripple or Coino enable secure, instant, and nearly free global financial transactions of any size with no chargebacks. They support any fiat currency (€, $, etc.), crypto-currency (bitcoin, litecoin, etc.), commodity, or other unit of value (frequent flier miles, mobile minutes, etc.).
- **Crypto-currency integration into established platforms:** With the first countries introducing their own crypto-currencies as an alternative to their fiat currency (e.g., Auroracoin in Iceland), established digital payment and e-commerce platforms will have to cope with changing user expectations. First players are already providing services that allow online shops to accept crypto-currency while getting paid in local currency (e.g., Cryptopay, UK).
- **Convertibility of virtual and physical currency:** Today, reward points earned in customer loyalty programs can mostly be cashed for goods and services from the same provider or a limited community of providers. In future, people will earn credit points by just executing daily routines (e.g., jogging or making phone calls), which will be easily transferable into crypto-currency or physical currency.

Benefits:

For the logistics provider

- Potentially new payment and charging modes for logistics services
- Fluid financial transactions and settlement across country and currency boarders based on a virtual reference currency as a potential core capability of a global logistics supergrid

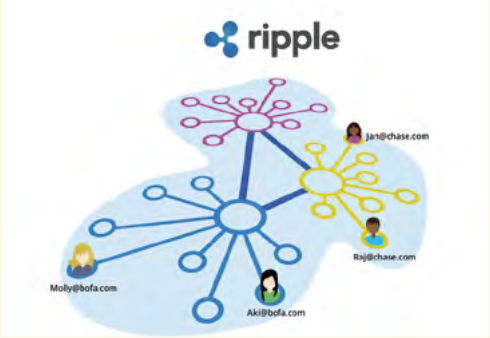
For the provider's customer

- Flexible cross-national payment and settlement options
- End-to-end-convertibility and equality of conventional currency, crypto-currency, and loyalty points

Concerns:

- Fragmented and instable crypto-currency market still not mature enough to support potential high-scale use cases
- Data security
- Integration into operational processes

Ripple



- A universal payments system allowing global cross-currency payments to clear in seconds
- XRP transactions are processed by a global federated network of computers running the Ripple transaction protocol
- Cryptographically secure and algorithmically verified accounts and transactions
- Micropayments enable new pricing systems and business models

www.ripple.com

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B01 Supergrid Logistics
Regional Supergrids: LOGICAL / InterLogGrid, ESSENCE Project
Global Supergrids: SAP One-World-Logistics Project
Country Supergrids: China Smart Logistics Network

B02 Real-Time Services
Real Time Tracking: Agheera: agheera.pulse, DHL Global Forwarding: Cargo Mobile Tracking, DHL Express: SMART SENTRY, DHL Supply Chain / Microlise: SmartPOD, Effizienzcluster LogistikRuhr: TiLO, SmaRTI
Real Time Order Management: DHL Freight: ACTIVEBOOKING Mobile App
Real Time Location Sharing & Tracking: GLYMPSE, T-Systems Arrival Control
Real Time Navigation: TelematicOne, ConnectedCar
Multidimensional Real Time Application Cases: Hamburg SmartPort Logistics, Metro: Future store initiative, Wal-Mart: Retail Link Private Extranet & JiT-Inventory

B03 Anticipatory Logistics
Anticipatory Capacity Planning: Transmetrics, DHL Parcel Volume Prediction
Anticipatory Shipping: Amazon
Anticipatory Risk Management: DHL Resilience360

B04 Urban Logistics
City Logistics Services: Binnenstadservice.nl, Service2City/Eco2City, City-Log.eu/City-Move.eu
Urban Consolidation Centers (UCC): Heathrow, Stockholm, Dubai, Kuala Lumpur, Istanbul
Integrated Air Cargo Hubs (IACH) / End-of-Runway Warehouses: DHL HUB Leipzig, Pudong
Urban Logistics Innovations: SmartTruck
Lockers, Boxes and other intelligent storage: Parcel Lockers (DHL, Amazon, Google, Swapbox), Refrigerated Pickup Lockers (DIA Supermarkets), Boxbee urban storage solutions (USA), MyByBox (UK)
Urban Business Navigation: Fraunhofer's Urban Business Navigator
Urban Retail Logistics: eBase4mobility

B05 Logistics Marketplaces
B2B: Logistics Mall, Check.cargo.com, Teleroute.com, Opersoft.com, Movex.co.uk (sector specific logistics marketplace: automotive)
M2C: MediPx.com: Medical Logistics Marketplace
B2C: Klickcouriers.com, Uship.com, Shareload.com, Shiply.com, Chakkr.com, Parcelbroker.co.uk, AnyVan.de
C2C: Carpoolcargo.com, Raumobil.de, NochPlatz.de, Monsterzeug.de

B06 Omni-Channel Logistics
New Generation Digital Stores: HOINTER
Digitalization of Traditional Stores: Burberry Flagship Store, C&A Brazil
Showrooming: Bonobos
Augmented Reality Stores: Yihaodian
Enabling Devices and Shop Solutions: Apple iBeacon & Shopkick, Turnhills
Shopping Delivery Solutions: DELIV Same Day Delivery

B07 Crowd Logistics
Shareconomy-driven C2C services: Polyport Mitbringservices Zürich: BringBee (IKEA-products), Das Kartoffeltaxi (organic food from local farmers), craigslist.com, lifecycler.de
Crowdsourcing: DHL MyWays, Shyp.com, Barnacle, Streetspotr.com, microtask.com, brain-sourcer.com, passbrains.com (on-demand software testing), crowdguru.de, hyve-community.de, CrowdSource.com, workvestor.com, clickworker.com,
Crowdnavigation: Inrix crowd sourced real-time traffic navigation, TomTom, MDM
Crowdmining & crowd sources data mining: wisdom.com, LIVE!Singapore
Crowdfunding: Kickstarter, Indiegogo, Startnext, Seedmatch

B08 Fair Logistics
Circular Economy Best Practices: DHL Envirosolutions, H&M LongLiveFashion & CharityStar, Patagonia Responsible Economy concept
Overall Fair Logistics Practices: DHL Living Responsibility: GoGreen, GoHelp, GoTeach, UpStairs; VillageReach, TheLogisticsProject.org, European Business School (EBS): Global Sourcing Code

B09 Grey Power Logistics
Connected Health & Living Solutions: Sensor based Health Services research project, SmartSenior research project, Abilia Smart Home Products and Services, MindMe personal GPS devices for dementia patients
Mobility Solutions: MV1 / MV1 LX: Vehicle for aged or disabled people (MV1 Mobility Ventures, USA), Independent Transportation Network (USA & Canada)
Grey Power Movements: The Village Movement USA, Grey Power New Zeeland, Seniors a Go Go USA
Senior Brainpower: SES Senior Experten Service, Bonn, Germany
Research Institutes and Initiatives: MIT Age Lab, MoPAct EU Project

B10 Convenience Logistics
Online Supermarkets: Allyouneed.com, MyTime.de, foodstore-online.de, edeka24.de, gourmondo.de, biomondo.de, amorebio.de, emma-mobil.de, froodies.de, kochzauber.de (Germany), LeShop.ch (Schweiz), toptomato.in (India), RedMart.com (Singapore), waitrose.com, sainsburys.com, ocado.com, tesco.com (UK)

B11 Multiple Purpose Networks
Smart Packages: DHL Thermobox for Cold Chain delivery via standard parcel network, SemProM Research Project (Semantic Product Memory – Identification and Authentication Solution)
Alternative Supply Networks: Project CargoTube

B12 Shareconomy Logistics
Collaborative Consumption & Sharing: carzapp.net, tamyca.de, getaround.com, car2go.com (cars), parku.ch (parking slots), Deinbus.de (buses), flinc.org, mitpackgelegenheit.de (private delivery services), foodsharing.de (food), bookelo.com (books), friendsurance.de (insurances)
Re-Use, Swapping & Lending: ASOS Marketplace (clothes), frents.de, kidd-e.com, netcycler.de, lifecycler.de, game-change.de (commodity goods), homeforhome.com, Airbnb.de, homeswopping.de (homes & houses), exchangeme.de, diensttausch.com (services)
Collaborative Business / Co-Working: the-hub.net, betahaus.de, cowobo.de, coworking.de, socialteams.de
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B13 Near- & X-Shoring

Right Shoring Solutions: DHL Supply Chain: Right Shoring, Agility: Global Integrated Logistics
Backshoring and Nearshoring: The Global Intelligence Group: Nearshoring Manufacturing in Mexico, HP: IT Support and Development from Mexico, Avnet: Value-added supply chain operation in Nogales, Mexico, to serve both the United States and Latin America

B14 De-Stressing the Supply Chain

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Overall Research Initiatives: EU research and innovation funding Horizon 2020: Project MG.6.2-2014. De-stressing the supply chain

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Open Data Platforms: MATERNA Mobility Data Marketplace, ArcGIS Online Open geodata and maps, Open Data Globe/CitySDK API: Real Time Traffic Flows, GB Road Traffic Counts: Governmental Open Data

T02 Cloud Computing

End-to-End Cloud LaaS Providers: Shipwire Enterprise Logistics Platform, Westfracht Spezialverkehre: LaaS (logistics-as-a-service.de), Cloud Logistics (gocloudlogistics.com), LogFire Cloud Solutions (logfire.com/cloud-solutions)
Cloud based Supply Chain on Demand: Solvoyo, Lessoftware
Cloud Logistics Marketplaces and Supergrids: Logistics Mall / LaaS (Fraunhofer Effizienzcluster Logistics), LOGICAL / InterLogGrid
Cloud Business Process Management: Metasonic S-BPM

T03 Autonomous Logistics

Autonomous Air Logistics: DHL ParcelCopter, Matternet, ARIA, Skymail, Skycatch, Drone Deploy, Archon multi-drone mission planner, Seegrid vision-guided automated vehicles (AGVs)
Autonomous Warehousing Logistics: Effizienzcluster LogistikRuhr / Fraunhofer IML: Cellular Transport Systems
Autonomous Road Logistics: Google Driverless Car, Autonomous Labs (Brain Driver, Made In Germany, Spirit Of Berlin), EC EUREKA Prometheus Project in collaboration with Daimler Benz (VaMP, Vita-2), KIT Cognitive Car Project

T04 3D Printing

Web & Cloud Factories and Marketplaces: Sculpteo, Shapeways, Freedom of Creation
Industrial 3D, 4D and rapid prototyping solutions and projects: DirectSpare research project (EU), 4D Solution, Rapitech Solutions, MicroTec
Communities: Wohlers Associates

T05 Robotics & Automation

Warehouse and Operations: Multishuttle Moves® Autonomous transport shuttles (Dematic / Fraunhofer), Universal Robotics: Neocortex, AutoStore, Quiet Logistics, Office Depot: KIVA Automation robotic mobile fulfillment solution, ESB-Logistikfabrik: RobLog, SSI SCHAEFER (SSI Robo-Pick), Amazon / KIVA: real-time cloud controlled order processing robots
Automated delivery solutions: DHL Packstation; AmazonLocker, Google BufferBox; Zalando Fashion Concept Car

T06 Internet of Things

Smart Items & Load Units: smaRTI Smart reusable transport items: Research project, Fraunhofer Institute, Smart container chain management (SMART-CM), DyCoNet autonomous airfreight containers & smart grid
Smart Materials: AGILITA materials flow system
Smart Health: BMWi project AUTONOMIC: SmartOR: IoT enabled operating theatre
Smart Home & Smart Environment: SKT (Korea): M2M based IoT platforms for Smart Home, Smart Weather Observatory
Overall Initiatives: Internet of Things Europe (internet-of-things.eu)

T07 Localization & Local Intelligence

Localization & Indoor Navigation: Indoor Google Maps, Inside Navigation
Indoor Location Intelligence: LOCOSLAB, ByteLight: Li-Fi / LFC technology for indoor positioning
Outdoor Location Intelligence: PLACEMETER, LeanCiti, Live ! Singapore, Streetspotr
Intelligent Navigation: NUNAV / Greenway Navigation solutions
Communities: LocationTech open source geospatial community, Open Geospatial Consortium, InLocation Alliance, MapStory.org

T08 Wearable Technology

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Glasses: Google Glass, TelepathyOne, Smart Glasses M100, Olympus MEG 2.0, Vuzix
Health and fitness wearables: Activity monitors, heart-rate monitors, pedometers (Inephro iPhone app, Healthbook iWatch App)
Bluetooth Jewelry: Necklaces, rings, watches (CSR, iWatch, Pebbles, Nike+ Fuel)
Sensory fiction: Wearable "augmented" book (MIT Media Lab Pilot)

T09 Augmented Reality

AR for Warehouse Operations: SAP & VUZIX, LFS.glass, DSC Global IT Strategy & Solutions: AR project Vision Picking, Total Immersion, KNAPP: 3 KiSoft Vision
AR for Customer Self Services: DHL Paketassistent, USPS Virtual Box Simulator
AR for Mobility: RealityCap, Skully Helmets

T10 Low Cost Sensor Technology

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Low Cost Sensor Innovations: University of Tokyo, Kyushu University and NMEMS Technology Research: Silicon (Si)-based low-cost, high-sensitivity, near-infrared sensor

T11 Crypto-currencies & Crypto-payment

Cryptopayment Platforms & Solutions: Ripple, CryptoPay, Benscha, CoinToPay
Cryptocurrencies: Bitcoin, Namecoin, PPCoin, Mastercoin, Hashcoin, Betacoin, Coino, NXT, Globe, Valutacoin. Auroracoin, Dogecoin, Litecoin, Peercoin, Amazon Coins
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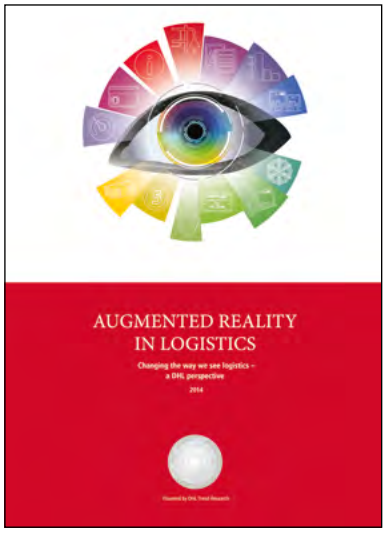

www.dhl.com/augmentedreality

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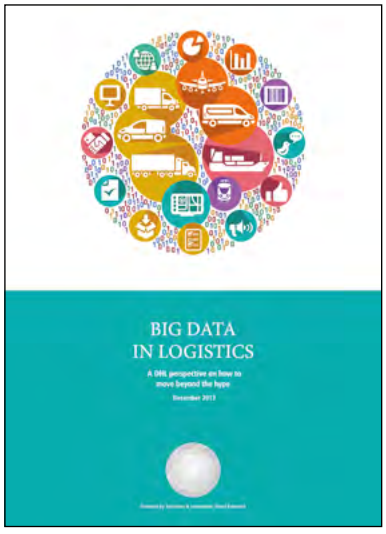

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