چشم انداز توسعه ی صنعت لجستیک
با رویکرد نوآورانه و تاکید بر هوشمندسازی

سخنرانان

دکتر یاسر صمیمی

ریاست دانشکده مهندسی صنایع

خوش آمدگویی و آغاز همایش

دکتر جواد تقی زاده

معاونت فناوری و نوآوری دانشگاه

نقش نوآوری در توسعه ارتباط صنعت و دانشگاه

دکتر سید جواد حسینی نژاد

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برنامه‌های معاونت پژوهشی و فناوری دانشکده مهندسی صنایع جهت ارتقا فعالیت‌های پژوهشی

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Golrang


zap


افق کوروش
فروشگاه‌های زنجیره‌ای


اکالا


Nancy


merci
Happy Babies Love it


BIODENT®
SUGAR FREE CHEWING GUM


Oila


Famila


ACTION


Bingo


Home
Plus®


AVÉ


EUROCELL
Green energy, easy life


Softlan
Softness you will love!


zap

کالا رسان هستی با نام تجاری **"زپ"** از سال ۱۴۰۰ با هدف ایجاد تحول در صنعت لجستیک درون شهری شروع بکار کرد؛

ماموریت **"زپ"**

بهبود فرایندهای لجستیکی درون شهری و ارائه تجربه‌ای منحصر به فرد و نوآورانه به کسب‌وکارها، با استفاده از پیشرفت‌های فناوری و ابداع راهکارهای جدید؛

هدف "زپ"

- ✓ فراهم آوردن پلتفرم انعطاف‌پذیر، جامع و هوشمند؛
- ✓ بهبود عملکرد کسب‌وکارها؛
- ✓ ارائه تجربه‌ای متمایز و نوین به مشتریان.

محصولات

محصولات زپ شامل سرویس های درون شهری بر پایه پلتفرم مبتنی بر فناوری میباشد که شامل دو بخش مجزاست؛

On-Demand Delivery

در این سرویس، پس از ثبت سفارش توسط مشتری، در همان محدوده امکان تحویل فوق سریع تا نیم ساعت فراهم است!

Scheduled Delivery

جمع آوری سفارش به صورت تجمیعی توسط ناوگان اختصاصی آموزش دیده، انتقال به انبار زپ، پردازش و ارسال در زمان معین.

مشتریان

- قرارگیری خدمات زپ در حوزه‌های تجاری بزرگ و کوچک، کسب‌وکارهای آنلاین و آفلاین؛
- ثبت سفارش از طریق پنل اختصاصی مدیریت سفارشات زپ یا رابط برنامه‌نویسی کاربردی(**A**pplication **P**rogramming **I**nterface)؛
- ارسال سریع مرسولات توسط زپ پس از تکمیل مراحل ثبت سفارش.

سازمان‌ها

سوپرمارکت‌ها

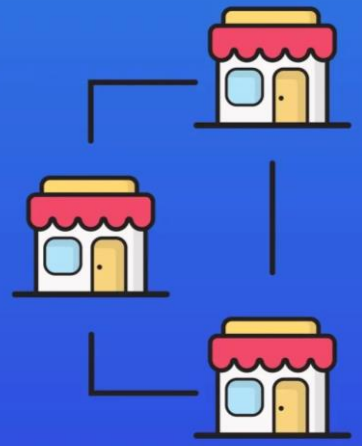
رستوران‌ها

کسب و کارهای همکار "زپ"

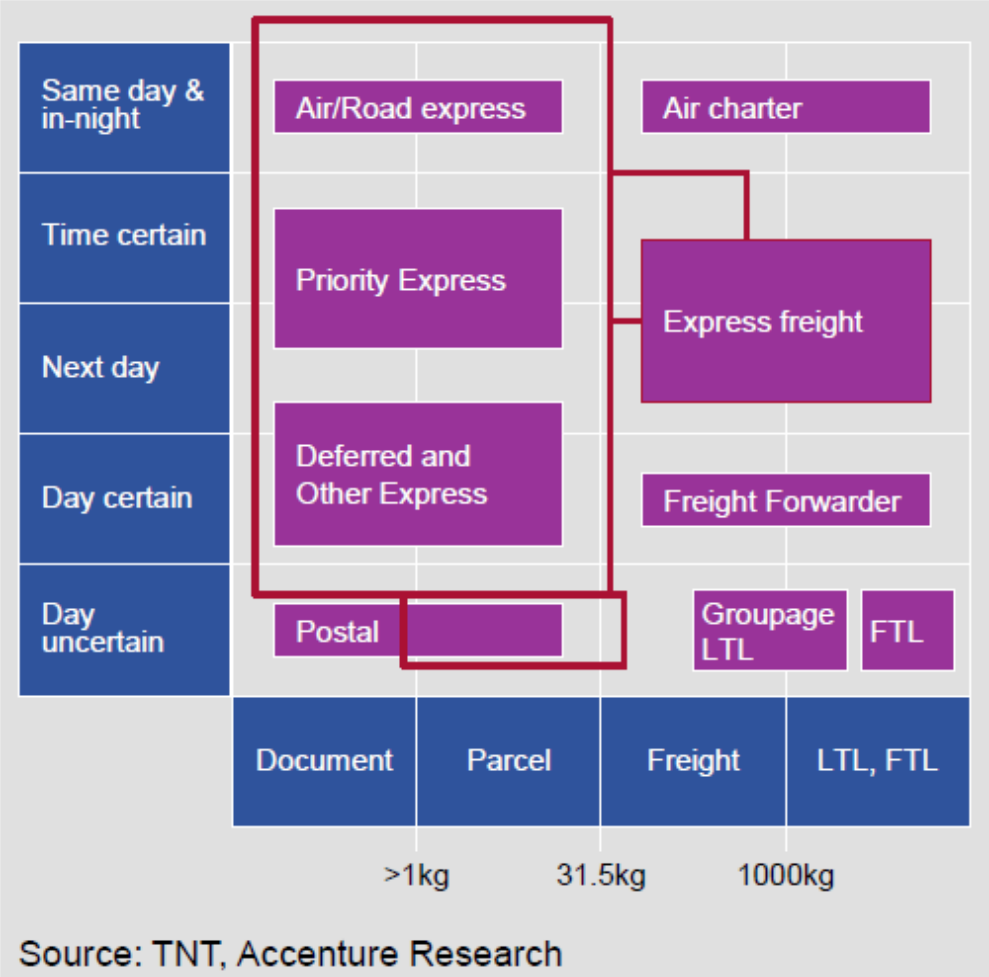
داروخانه‌ها

آنلاین شاپ ها

فروشگاه‌های زنجیره‌ای



Transportation Sectors



Global trends

Collectively, China, US, and Japan represented 87% of global parcel volume in 2022. China grew only by 2%, due to lockdowns of major cities, while the US parcel volume declined at -2%, reflecting a post-pandemic slowdown from 33% growth in 2020. India experienced the highest volume increase in 2022 at 18%, driven by growth in ecommerce. Italy, Australia, Brazil and Norway also had growth in parcel volumes, while the rest of the countries experienced declines, with Sweden at -11%, Canada at -9% and Germany at –7%.

In the last seven years, global parcel volume increased by 150%, from 64B parcels in 2016 to 161B in 2022. The pandemic accelerated parcel volume growth and shifted consumer shopping towards online channels. In 2022, the lockdown in China impacted overall parcel volume growth trends and market normalization started in the rest of the world. In addition, alternative delivery options such as Same Day and Click and Collect (or BOPIS) are impacting traditional carrier parcel volumes.

161bn
parcels in 2022

Up from **159bn** in 2021

Up **1%** year-over-year

5102
parcels per second

441m
parcels per day

42
parcels per person average

Forecasts

In the last six years, with the exception of 2022, Global parcel volume has been growing at double digits. We forecast that parcel volume will continue to grow, but at a single-digit rate. According to our most likely scenario, parcel volume growth is projected to slow down to 6% CAGR 2023-2028.

Covid-19 lockdowns in Shanghai, China, from March to July '22 had the largest impact on the PB Shipping Index for 2022. Last year, we projected the 2022 volume to reach 166B – 175B parcels. If not for the unpredictable China lockdowns, the forecast would have been accurate. The actual volume was 161B parcels.

- We forecast Global parcel volume to most likely reach 225B by 2028, with 6% CAGR 2023 – 2028. According to our conservative scenario, Global parcel volume is expected to attain 200 billion by 2028, at 4% CAGR 2023-2028.
- Parcel volume in China is likely to reach 167 billion parcels by 2028 at 7% CAGR 2023 – 2028
- Parcel volume in Brazil is forecasted to grow at 6% CAGR 2023 – 2028 reaching 2.3 billion parcels
- Parcel volume in India is forecasted to grow at 6.5% CAGR 2023 – 2028 and go from 3.2 billion in 2022 to 5 billion parcels by 2028
- Parcel volume in the US is forecasted to grow at a 3% CAGR 2023-2028 and go from 21.2 billion parcels in 2021 to 25 billion parcels by 2028

China

111bn parcels in 2022

- Up from **108bn** in 2021
- Up **2.1%** from 2022

3507
parcels per second

303m
parcels per day

78
parcels per person
224 parcels per household

China's parcel volume grew 2.1% reaching 110 billion in 2022, an increase from the 108 billion parcels generated in China in 2021. This equates to 3,507 parcels generated per second, or 303 million each day. Parcel revenue reached $157.3billion, with a decrease of -1.8%. Parcels generated per person reached 78, and parcels generated per household reached 224. Parcel volume growth in China in 2022 was significantly impacted by COVID-related shutdowns around Shanghai from February to June 2022.

US

21.2bn parcels in 2022

- Down from **21.7bn** in 2021
- A drecease of **2%**

674
parcels per second

58m
parcels per day

64
parcels per person
162parcels per household

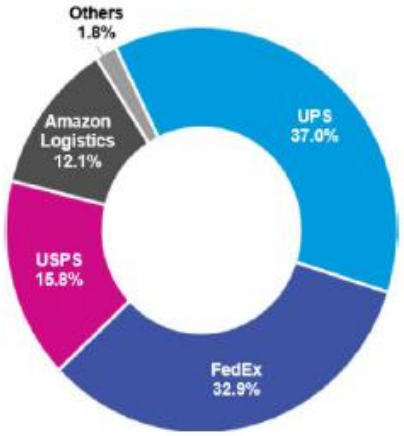
Parcel volume declined to 21.2 billion in 2022, a -2% decrease from the 21.7 billion parcels generated in the US in 2021. This equates to 674 parcels generated per second, or 58 million each day. Parcel revenue reached $198 billion, up 6.5% year-over-year. Parcels generated per person reached 64, and parcels generated per household reached 162.

US breakdown

Carrier revenues

All carriers measured in US except for the USPS generated an increase in revenue from 2021 to 2022. The USPS experienced a slight a decline of -0.1% in YOY revenue growth. Total revenue in the US grew by 6.5% to $198 billion, up from $186 billion in 2021.

Parcel market share, by revenue - US 2022

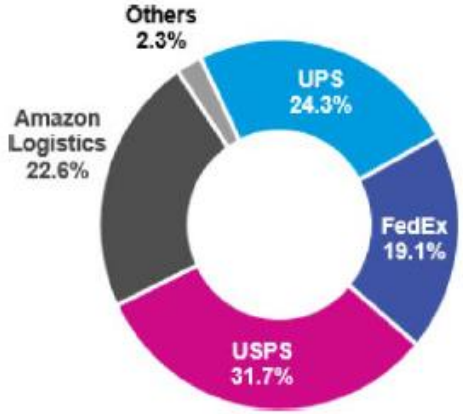


- UPS generated the highest parcel revenue of the major carriers at $73 billion, up 5.5% year-over-year
- This was followed by FedEx at $65 billion, up 5.2% from last year
- The USPS maintained its $31.4 billion in comparison to the year before
- Amazon Logistics had the most significant revenue growth of 21% to $24 billion, also the highest CAGR 2016 – 2022 of 79%
- The 'others' category comprising smaller carriers saw a 28.8% increase in one year from $3.3 billion in 2021 to $4.3 billion in 2022

Carrier volumes

Total volume was down -2.2% from 21.7 billion in 2021 to 21.2 billion in 2022.

Parcel market share, by volume - US 2022



- The USPS generated the highest parcel volume reaching 6.7 billion parcels, down 3% from last year
- This was followed by UPS generating 5.2 billion parcels, down 3% year-over-year
- FedEx declined from 4.3 billion in 2021 to 4.1 billion in 2022 (down 5%).
- Others grew 25% in 2022 from 0.4 to 0.5 billion parcels.

Market share

By revenue and volume, carrier market share remained roughly the same year-over-year.

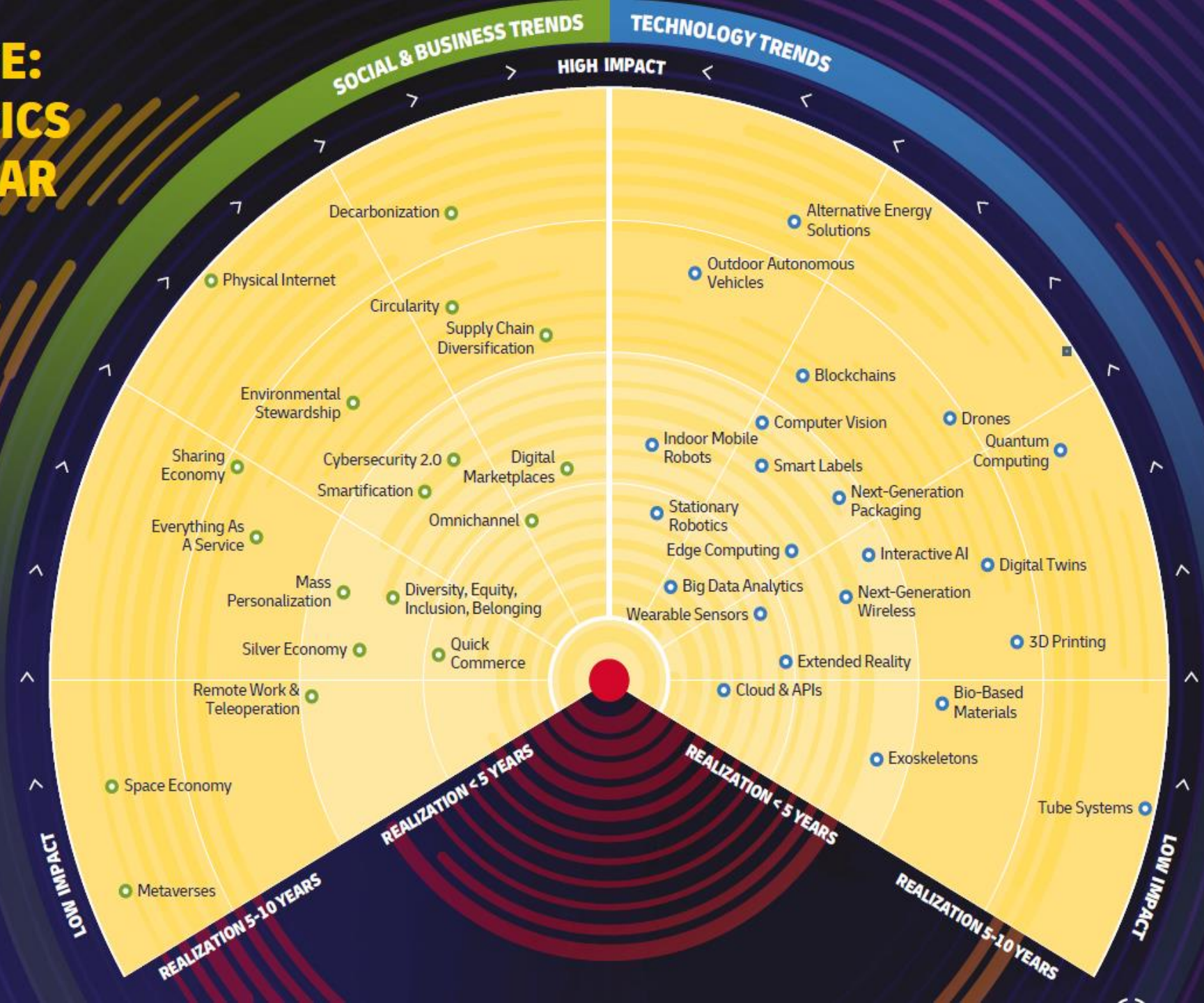
By revenue

- UPS has the largest parcel revenue market share, with 37% of the market, followed by FedEx with 33%
- USPS decreased one percentage point to 16%
- Amazon Logistics increased one percentage point to 12%
- The 'Others' category comprised of smaller carriers maintained at 2%

By volume

- The USPS has the largest market share of 32% of the market followed by UPS at 24%
- Amazon Logistics increased one percentage point to 23%
- The 'Others' category maintained their parcel volume of 2%

AT A GLANCE: THE LOGISTICS TREND RADAR



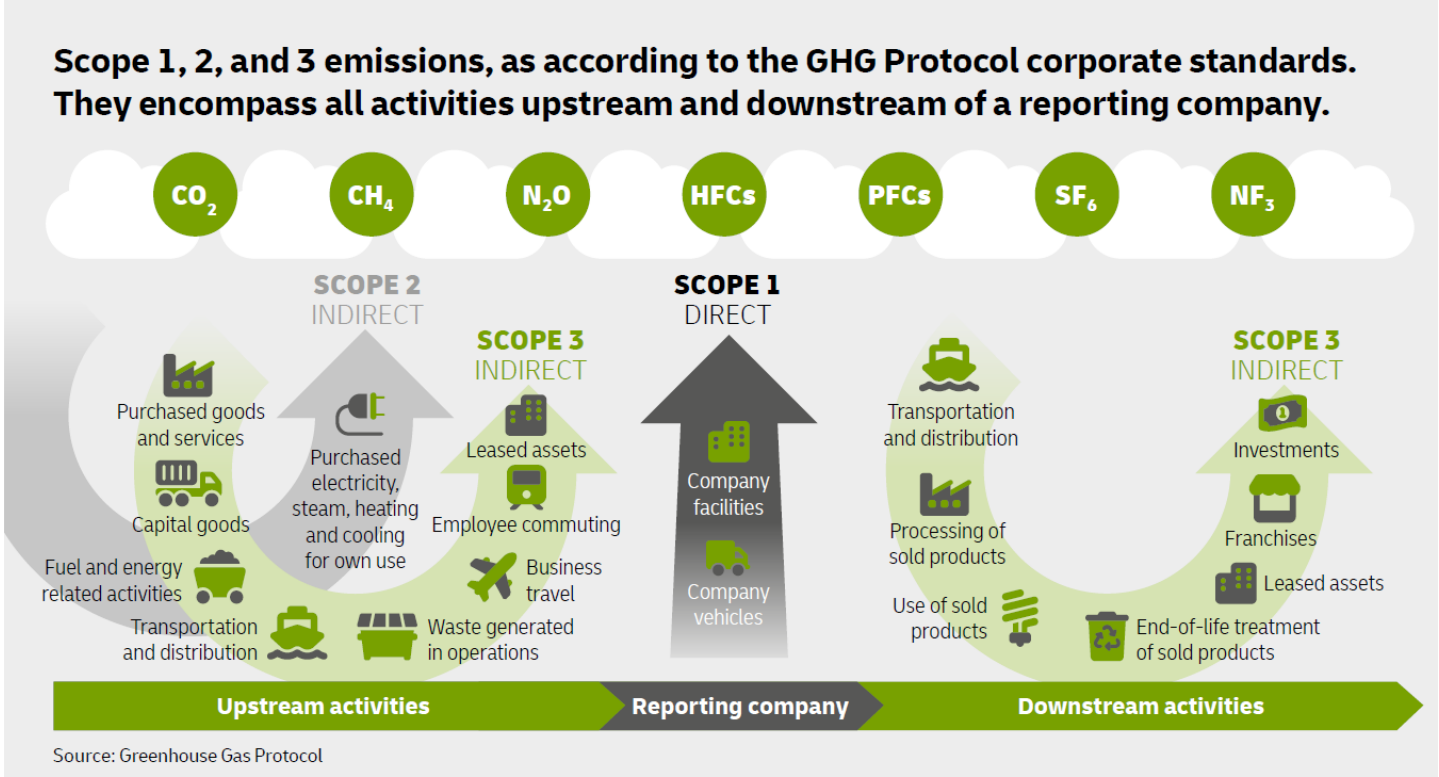
High Impact
Revolutionary applications that are potentially disruptive.

Low Impact
Evolutionary changes with incremental improvements.

Realization
The normal way of operating and doing business in the logistics industry.

DECARBONIZATION

- **The trend of Decarbonization is the movement towards reducing the amount of carbon dioxide (CO2) and carbon dioxide equivalents (CO2e) in the atmosphere. This involves burning less and burning clean to reach carbon neutrality, as well as actively removing existing CO2e in the environment to become carbon negative.**



Relevance to the Future of Logistics

Carbon Accounting & Tracking

Today, comprehensive accounting of Scope 1, 2 and 3 product emissions (direct, indirect, upstream and downstream, respectively) remains a challenge. Many businesses, including logistics organizations, do not account for these emissions at all. The ones that do may rely on various secondary sources of carbon calculation with generalized values and assumptions, and often fail to factor in emissions by second-tier and third-tier players. This makes it difficult for B2B and B2C customers to accurately compare and choose suppliers and service providers that meet their environmental standards, especially when evaluating on a product-level basis.

However, steps are being taken to address this customer need. For organizations that currently struggle with carbon accounting, we here at DHL offer carbon calculators, estimates, and externally verified reports. This enables companies to account for Scope 3 emissions from a single shipment across all trade lanes, including data from our third-party service providers.

In future, more granular data will be obtained. As sensor technology rapidly permeates the supply chain, it will be possible to accurately calculate and track at shipment level and even product level how much CO_2e a truck or airplane emitted, as well as how much total energy was used to move a shipment through a facility. With this sensor data, logistics providers will not only provide companies with more accurate carbon footprint figures but also identify areas along the supply chain for decarbonization improvements.

Carbon Capture

Whether offsetting CO_2e emissions elsewhere through insetting or making the supply chain carbon negative, carbon capture technology helps logistics organizations meet sustainability goals. While today much attention is on newly constructed experimental facilities specifically designed to absorb CO_2 from the air, logistics professionals can apply several existing and upcoming practical solutions to the supply chain.

American startup Remora, for example, has developed a truck tailpipe filter that is able to capture up to 80% of CO_2 emitted, while Aramco is looking into adapting its own car-based carbon capture solution to ocean freighters. Solutions such as these often deliver a favorable return on investment (ROI) for interested logistics organizations as both the collected CO_2 and the associated carbon credits are commodities that can be sold to recoup costs. In this way, carbon capture technology can provide lower-cost solutions for decarbonizing supply chains.

Vehicle Electrification

Before COVID-19, freight transportation accounted for almost 10% of all global carbon emissions. While this stalled a bit during the pandemic due to travel restrictions, carbon emissions from freight transportation are projected to climb as the global economy recovers and e-commerce booms. To play an active part in the trend of Decarbonization, logistics organizations must focus on reducing emissions from vehicles in first-, middle-, and last-mile operations.

Electrification is an effective go-to solution across all transportation modes. In 2021, DHL Express ordered 12 electric airplanes from Israeli company Eviation to achieve emissions-free regional flights. In that same year, truck manufacturer Continental Automotive broke a world record with its electric delivery truck travelling almost 1,100 km (682 mi) on a single charge, while in early 2022, Ford released its E-Transit courier vans with a range of about 200 km (126 mi), 70% more than the average daily service range needed for such vehicles in the US.Furthermore, electric bicycles, tricycles, and scooters have been scaled in delivery operations around the world.

Although electrifying fleets is a powerful way for logistics industry players to reduce the carbon footprint, each transportation mode has different time horizons for viable electric alternatives. This means that for some modes, especially those carrying heavier loads and covering greater distances, it may make more sense for logistics leaders to investigate alternative fuels as near-term solutions to reduce, but not eliminate, carbon emissions in their supply chains. These can range from traditional biofuels like ethanol to renewable diesel, as well as sustainable aviation fuels (SAF) that act as 'drop-in' fuels to be mixed with traditional fossil jet fuel.

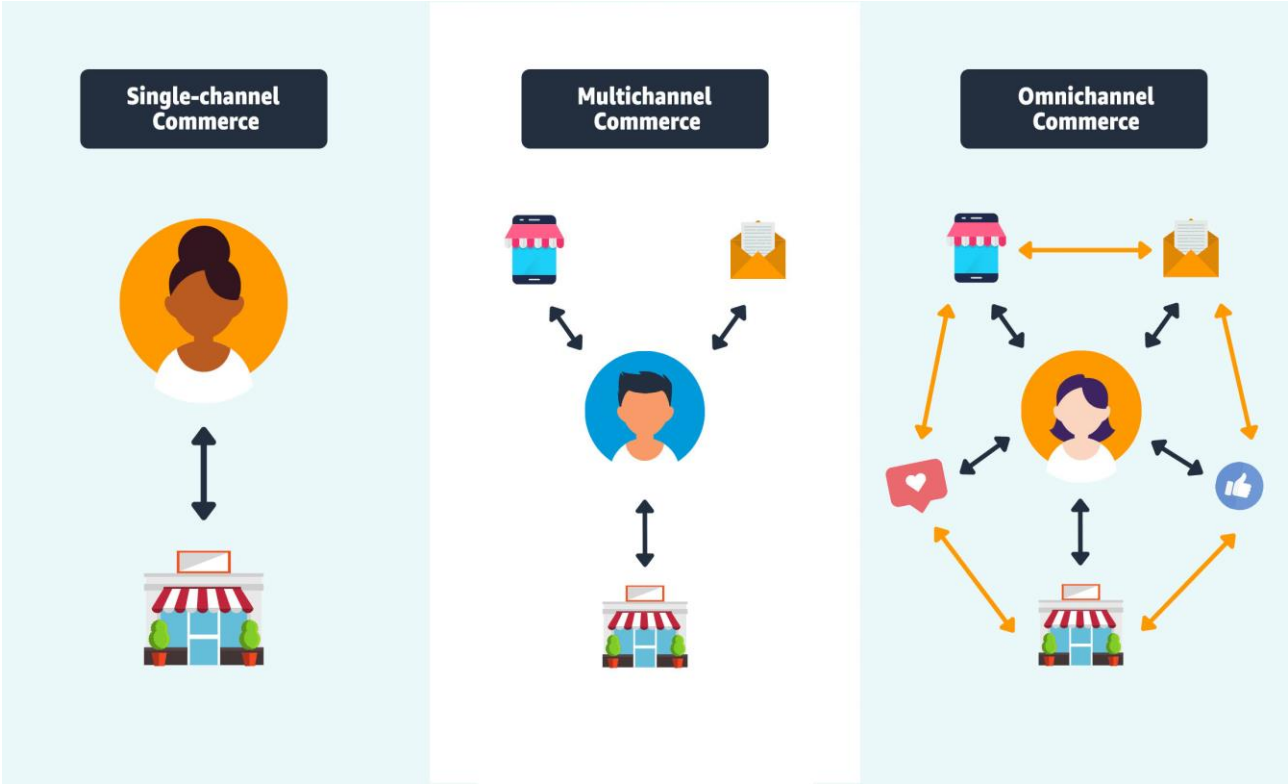
Optimizing Operations

Environmentally friendly solutions may be overlooked or rejected because of higher initial costs than more wasteful alternatives. Although many logistics organizations may want to replace whole truck fleets with electric models or cover an entire warehouse rooftop with solar panels, moves like this represent a significant investment. However, with customer demand for greater sustainability in the supply chain and with CO_2e emissions becoming more commoditized and framed as operating costs, logistics players are finding ways to simultaneously reduce expenditure and waste.

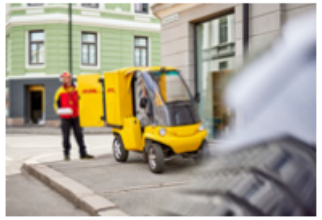
For example, last-mile service providers can use German startup Greenplan's route optimization software to reduce the distance vehicles travel. In doing so, they save on time, fuel, wear and tear, and maintenance costs, plus they achieve a reduction in CO_2 emissions that is almost proportional to the travel saved. Similar principles can be applied when upgrading machinery to more efficient models – a unit of resource (electricity, gas, paper, etc.) is utilized more fully and with fewer emissions when manufacturing and using the new model.

OMNICHANNEL

- **The trend of Omnichannel refers to the progressive synchronization and combination of all product sales, distribution, and return channels accessible to a customer. This trend goes further than a multichannel system in which the customer is exposed to many channels but must buy and return through the same channel. Omnichannel systems empower the customer to browse in all channels and select any channel for purchase, product receipt, and return.**



Relevance to the Future of Logistics



Logistics As An Omnichannel Differentiator

The successful implementation of an omnichannel strategy today depends, above all, on the online presence of companies and their e-commerce sales channel.

For companies that are adopting an omnichannel strategy, a key differentiator is logistics. Logistics service providers play an important role in the entire customer journey. Research shows they even influence the final purchase decision, as 46% of online customers abandon online shopping carts if required to wait too long for delivery of their purchase. There is also clear evidence that customers want the ability to track the shipment of their purchases right to their pickup point or front door.

To ensure a superior customer experience, the key to success is end-to-end integration of supply chain planning involving all relevant stakeholders. After all, an omnichannel strategy can only be successful if there is continuous visibility of product locations and quantities as well as seamless integration of all relevant platforms and service providers. Furthermore, a successful omnichannel strategy includes giving customers the options to choose their preferred logistics providers and services, as well as delivery time and location, regardless of whether they use one or multiple channels throughout their entire customer journey.

The realization of various delivery options requires the omnichannel strategy is taken into account when planning the supply chain network in close cooperation with the logistics service provider. In future, a combination of 'dark stores' which are small micro-fulfillment centers near city centers and strategically positioned distribution centers will be of enormous importance for fast and cost-efficient delivery.

Companies can benefit from the know-how of logistics service providers and improve the customer experience through this collaboration to achieve long-term customer retention.

Inventory Movement

With the reopening of retail stores in the wake of the COVID-19 pandemic, the relevance of brick-and mortar stores as a place for customer engagement and brand building has become more visible again. New delivery and return models such as BOPIS or in-store return options have led many retailers to increasingly use their brick-and-mortar stores as fulfillment centers.

This is evidence of a clear trend towards omnichannel solutions, so that online and offline channels are becoming more and more complementary and connected, and are no longer seen as substitutes. A central aspect of the implementation of an omnichannel strategy is the movement of inventory, which requires a high degree of precision and even more flexibility to respond to fluctuations in demand. Strategically, this also means a shift from large distribution centers to a more decentralized setup, local micro fulfillment centers or even using brick-and-mortar stores as inventory hubs. This shift was first accelerated during the COVID-19 pandemic, when retailers began using their retail storefronts as fulfillment centers when they were not allowed to open them.

Currently, the decision on warehouse locations and quantities is primarily made by humans. However, companies are increasingly aiming to automate these decisions in regards to internal movement of inventory using smart algorithms based on various data points, such as regional weather changes or online customer behavior.

The challenges for logistics are finding the ideal logistics solution for the respective shipments and, above all, to adapt the more flexible, smaller-scale movement of inventory to route planning, as exact information about delivery options (eg, specific delivery periods and zones within inner cities) as well as measurements to help select the right means of transportation (eg, small van or large truck) are necessary for efficient planning. Only in this way can effectively shared inventory be realized across the various channels, online and offline, and an omnichannel strategy be successfully implemented.

Anytime & Anywhere: Last-Mile Omnichannel

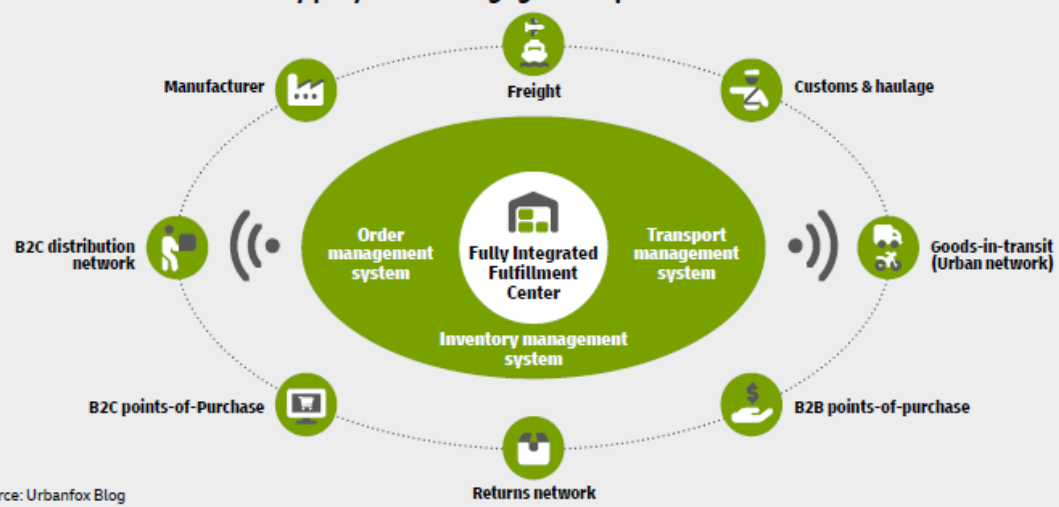
The growth of e-commerce during the Covid-19 pandemic has accelerated developments of comprehensive omnichannel offerings. Companies recognized pandemic-favored delivery options such as 'buy online, pick up in-store' (BOPIS); in fact, the use of BOPIS services in the US increased by 106.9% in 2020. Other new omnichannel examples include a kiosk solution from collaboration between e-commerce software provider Shopify and Portuguese kiosk manufacturer PARTTEAM & OEMKISOSKS. Designed for use in brick-and-mortar stores, this digital kiosk presents customers with a complete online store selection, including individual offers and discounts. After making a purchase, the customer can opt to have their goods delivered or decide to take them directly from the store, if this option is available.

Customers appreciate this flexibility and particularly like choosing their delivery location. This could be the nearest branch, a smart locker solution such as the DHL Packstation, or even delivery to a neighbor. They also want to select the most convenient delivery time.

To offer this level of flexibility, companies must have an accurate inventory management system, one that is connected to all retail stores as well as warehouses and production facilities, with seamless connection to the logistics service provider.

In future, autonomous deliveries via drones and vehicles such as the Nuro delivery vehicle can help further personalize last-mile services, enabling a fully anytime, anywhere solution.

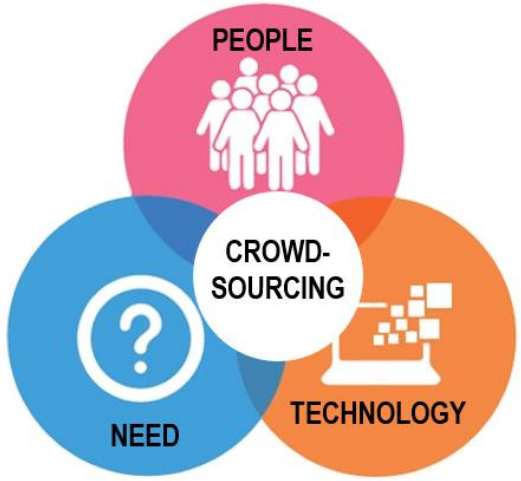
An ideal omnichannel logistics network requires active communication, visibility, and coordination between many players and engagement point with customers.



Source: Urbanfox Blog

SHARING ECONOMY

- **The trend of Sharing Economy refers to an ecosystem in which users (businesses and consumers) temporarily share, rent, or borrow assets or services instead of buying and owning them. This peer-to-peer system is typically facilitated by digital platforms that help connect supply and demand (for example, a platform connects owners of underutilized assets with people who want to use those assets).**



Relevance to the Future of Logistics

Sharing Storage & Parking Space

According to statistics from the United Nations Population Fund, more than half of the world's population already lives in cities, and the figure is rising. A consequence of this rapid urbanization is limited space availability for storage and parking. Nevertheless, space exists in cities that is hardly used (or not used at all) due to a lack of transparency.

The principles of the sharing economy enable both private individuals and companies to increase space utilization. One example of a platform that tackles the problem is Stashbee, a UK-based company that connects people and businesses that need storage or parking space with others offering available space. The company does not limit its offer to sheds and basement space, but also provides the option of renting larger areas ranging from storage containers to entire warehouses.

This application example of the shared economy in logistics can inspire large supply chain companies to rethink the way they optimize existing unused space and develop new concepts.

Collaborative Transportation

In the EU alone, about 1 in 5 of all freight transportation vehicle-kilometers in 2020 were comprised of empty runs. The sharing economy in the form of shared logistics transportation offers a solution. Although logistics marketplaces attempt to tackle empty runs by providing transparency of available vehicles and routes, they do not typically support collaborative bidding. The problem is that competing companies avoid collaborative transportation as they are reluctant to share sensitive data, such as transportation routes and volumes, with potential competitors. In the long term this may be outweighed by the advantage of shared transportation (better truck utilization) which leads to lower costs and an overall reduction of emissions.

Within the framework of a project called 'Exchange Mechanisms in Logistics', two Austrian universities – the University of Klagenfurt and the University of Vienna – are exploring how to remove barriers to horizontal collaboration in order to implement shared logistics transportation on a broad scale. The focus is to develop a solution for the fair and cost-effective distribution of transportation orders between logistics providers with as little information exchange as possible.

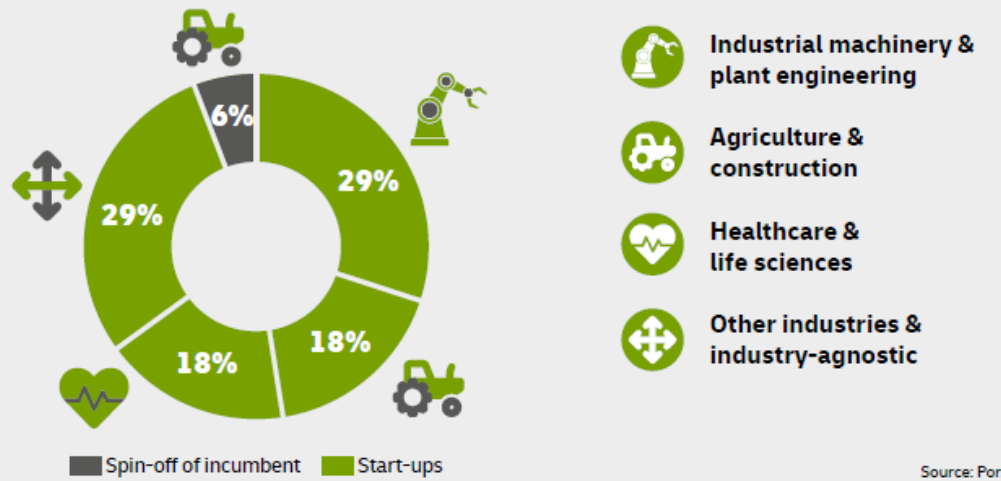
Shared Labor

With a shortage of workers in all areas of the logistics organization, from IT personnel to truck drivers and warehouse operatives, it is time to rethink traditional labor models.

One way to offer more reliable, attractive jobs to scarce talent is through labor alliances with companies in the same or in a different industry. A logistics company could work with a manufacturer, for example, allowing employees to work in the warehouse during peak periods but switch to the manufacturer's production facility through the remainder of the year. This form of employee sharing can be extremely beneficial in times of crisis. The model was established in China during the Covid-19 pandemic, when workers from crisis-hit industries such as hospitality were able to find work in other industries such as e-commerce. With this type of shared workforce model, the original employer provides insurance and other benefits along with a share of annual salary while the other employer pays its share of the annual salary. Due to the success of this model, Alibaba's subsidiary grocery store chain Hema Fresh has opened a B2B network platform supporting employee sharing in the future.

Although this model is relatively new and not yet widespread, it offers great potential for logistics companies and could also be applied for office jobs in the area of IT or project management.

Only 6% of B2B asset sharing platforms are incumbent-driven platforms. 94% are startups new to the space.

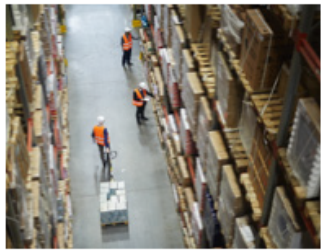


Source: Porsche Consulting

BIG DATA ANALYTICS

- **The trend of Big Data Analytics refers to the analysis of large quantities of data to reveal patterns of the past, highlight real-time changes in the status quo, and create predictions and forecasts for the future. This trend involves various processing techniques of structured data, which consists of specific numbers and values that are searchable and stored in a predefined format, as well as unstructured data, which may come in various native formats like video and audio files from sensors and social media posts.**

Relevance to the Future of Logistics



Inventory & Asset Optimization

One of the main opportunities of analyzing big data is providing logistics players with organized, filtered, and digestible real-time visibility of the current situation on the ground in facilities like warehouses and hubs.

On the descriptive end, the processing of big data from sensors can reveal where assets such as roller cages are located and what their current status is – for example, if they are currently being used or they are broken. Analysis of inventory data from sensors can help determine if stocks are running low or if any vacancies exist on pallet shelves. For diagnostic purposes, analyses may reveal how certain shipments cause a particular conveyor to frequently break down or can identify world or local events that have a dramatic effect on the inventory level of specific products.

Meanwhile, when it comes to prediction, the analysis of sensor data on assets like machinery and vehicles can support predictive maintenance procedures, flagging damaged assets that should be inspected and repaired before they break down. For inventory, forecasts can be made to project an expected pattern of incoming orders and deliveries during upcoming peak and low seasons. Finally, prescriptive analyses can compare inventory plans with actual adoption to better allocate inventory space to various stock keeping units (SKUs). DHL's Applied Analytics team, for instance, performs studies for customers that can recommend changes based on identified patterns in the data, where inventory may have exceeded original demand forecasts, for example, or in which safety stock may have depleted below critical thresholds. For assets, historical data can be processed to suggest the best place to store tools and other equipment to limit the distance workers must travel to retrieve them.

In general, big data analytics can give logistics organizations the necessary visibility to optimize shipment storage and movement through facilities, as well as to improve the utility and lifetime of assets.

Supplier Risk & Due Diligence Assessment

Auditing existing and potential partners, whether a robotics provider or a packaging supplier, as part of a risk-and-resilience due diligence evaluation can be tedious work. Leveraging big data analytics to drive decisions and even automate some evaluation processes can help logistics organizations save time, money, and risk.

On the descriptive end, data from sensors and other sources can be used to evaluate the timely delivery and quality of offerings by suppliers in real time. This, paired with diagnostic analysis, can help logistics leaders find patterns and understand the factors that make certain suppliers superior to others, informing organizations of variables and attributes to look for when evaluating partners in the future. For example, if the results of a diagnostic study finds suppliers from certain regions are chronically late with their shipments due to customs checks, this signals to inventory planners where the problem may lie.

Predictive information can help with vendor selection. Processing the various attributes and the supply chains of potential vendors can achieve automated forecasting of each vendor's likelihood of meeting the logistics organization's needs in certain emergency scenarios like natural disasters in a particular region. Finally, with prescriptive analysis of vendor past performance, the logistics company can receive a recommendation on contract renewal. Results from this type of analysis also help the organization to grade and classify existing and potential partners, facilitating strategic business decisions like pursuing a contract or purchase order.

In general, big data analytics can be a useful tool for logistics organizations when evaluating existing or potential partnerships with suppliers and vendors.

Transport & Delivery Optimizations

The trend of Big Data Analytics offers various solutions to overcome challenges that logistics organizations often face in the transportation and delivery segments of the supply chain.

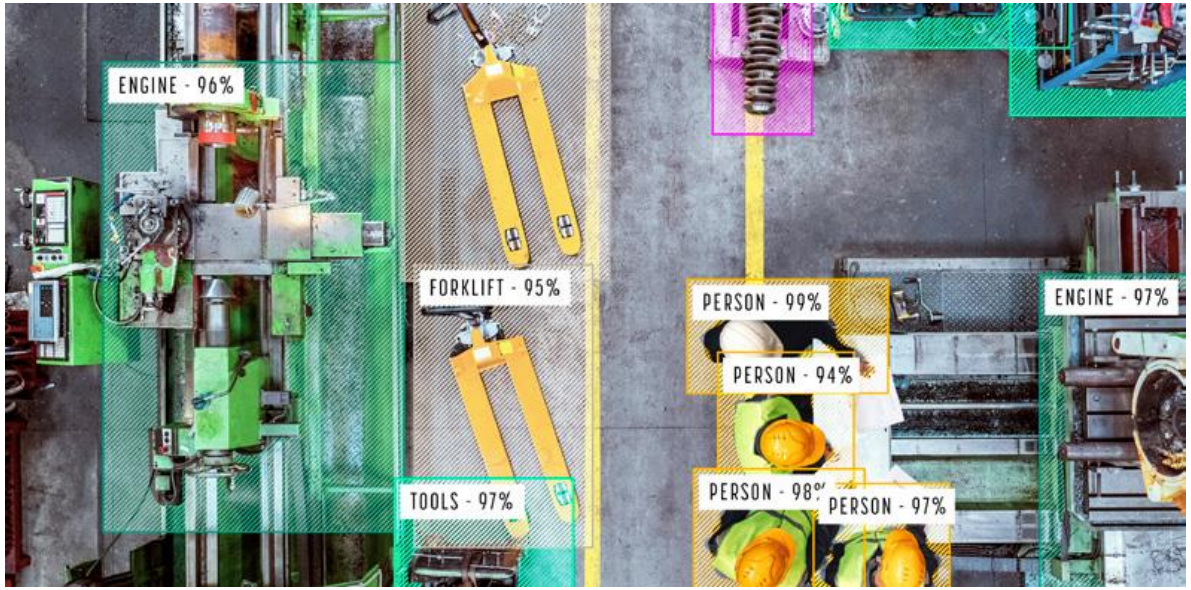
For descriptive analysis, big data processing can help monitor service levels on a particular route or lane, identifying disruptions like truck breakdowns in real time when they occur. Additionally, data from dozens to thousands of sensors gives visibility to supply chain organizations on whether products are being delivered in a high-quality state or are damaged along the way. With diagnostic analysis, companies can see why certain shipments are chronically late – this may be because the route schedule coincides with rush hour traffic or the shipment passes through understaffed ports of entry, for example.

For predictive purposes, various sources of data can help calculate the risk of lane disruption along segments of the supply chain. For instance, Everstream Analytics utilizes global news feeds and other propriety data to make predictions for its supply chain customers across 30 risk categories, including natural disasters and political violence. In doing so, it claims to reduce disruption-caused revenue losses by 30%, achieving 100 million USD in savings from transport-mode optimization. For prescriptive information, logistics leaders can look at past data and adjust scheduling and fleet sizes accordingly, ensuring vehicles are maximally utilized and products are delivered on time. Such analyses may show supply chain managers the wisdom of modifying routes and lanes where historical theft has occurred in a particular segment of the supply chain.

Overall, big data analytics can improve the performance of delivery, ensuring shipments are delivered in good condition and on time, in a cost-efficient manner.

COMPUTER VISION

- **The trend of Computer Vision utilizes cameras to capture photos or videos and applies artificial intelligence (AI) algorithms to analyze data extracted from this digital imagery. Rudimentary visual AI systems are trained to simply differentiate objects from each other, while more advanced versions can track objects across viewpoints and learn on their own.**



Relevance to the Future of Logistics

Order & Shipment Processing

Many tasks in the warehouse involve humans to visually assess or confirm elements of a product, parcel, or pallet as it passes through the facility. As computer vision technology advances, we here at DHL recognize such tasks can be gradually delegated to computer vision-enabled AI systems.

One practical use case is dimensioning a shipment, or measuring its area or volume. This can be difficult when shipments are large or oddly shaped, or they are on fast-moving conveyor belts. Companies like German-based Metrilus have recently developed low-cost solutions that automate this dimensioning process, capturing measurements in milliseconds and sending this data to the warehouse management system. Accurate measurement and volume detection enables best fitting packaging selection to avoid shipping air, thereby reducing waste and keeping sustainability at the forefront of logistics.

Another use case is object identification for picking and packing. Currently, most orders are picked by hand, and those that utilize computer vision in robotics solutions tend to identify a product by its barcode or QR code. But developments in computer vision have enabled robots to identify tens of thousands of products with high accuracy, regardless of the presence of identifier codes.

With this level of visual AI, logistics providers can optimize processes, reducing cost while increasing throughput.

Safety in the Workplace

Maintaining and improving safe working conditions is a top priority for the logistics industry. The COVID-19 pandemic increased attention to this and visual AI technology will be relevant and helpful to workplace safety in the years ahead.

During the peak of the pandemic, computer vision was used to ensure workers adhered to personal protective equipment (PPE) regulations. At DHL, we now see this technology expanding into other workplace safety use cases. Cameras and the AI behind them may one day detect if employees are utilizing ergonomic best practices to minimize injury risk, identify lone-worker emergency situations in less-trafficked areas, ensure vehicles are complying with local speed limits, and even determine if predefined walking pathways are being respected in a facility.

To ensure personal and data privacy, advanced computer vision solutions can blur out faces or separate personal identifying factors from analyses. This is helpful as it demonstrates to all parties that the goal of computer vision is not finding fault with individual workers but ensuring their safety and optimizing the workplace experience by assessing workflows, mapping out areas of high incidences, and triggering process change.

Asset Tracking

Millions of dollars are lost every year across sectors due to tools, equipment, and other assets going missing, and many hours are spent by workers searching for them. Computer vision technology can provide useful solutions to help track such assets and save time and money.

When a worker picks up a wrench and walks around a facility with it, a computer that processes connected visual feeds can locate where the wrench was last put down, while also tracking dozens of other tools at the same time. Vehicles like forklifts in a warehouse or trucks in a yard can also be tracked; this data can be used to determine if vehicle movements are performed in an optimal way. Furthermore, visual AI software can follow pallets of goods in inventory sections and keep accurate records of shelf vacancies and how long a pallet has remained on a shelf, in addition to tracking any falling or shifting parcels in the back of courier vans.

In implementing computer vision solutions in their facilities, logistics providers can avoid wasting time searching for misplaced assets and manually confirming asset locations. They can also use the analyses from visual AI to further optimize operations and accurately determine inventory stock levels.

Trouble-Free Operations

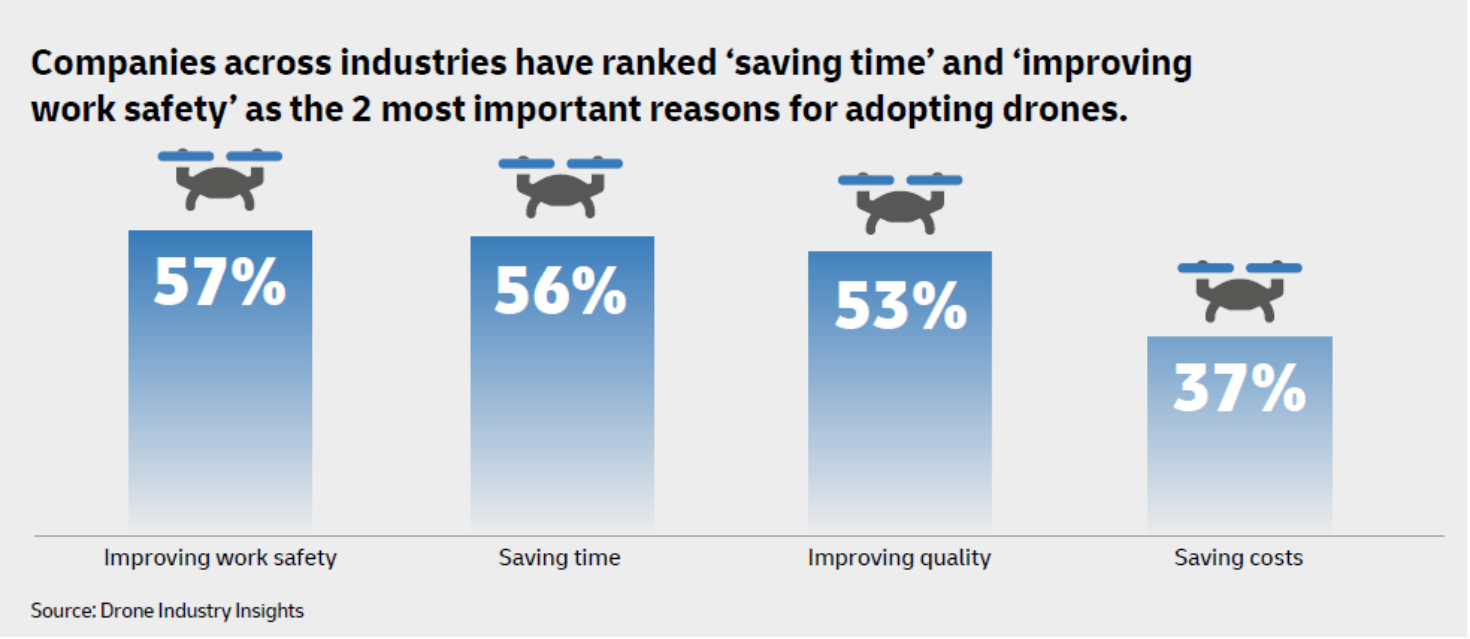
With today's global supply chain networks strained and under immense pressure, logistics operations must remain functional and unhampered by incidents and broken-down equipment. Computer vision can help with this.

Digital side mirrors like those designed by Israeli startup Brodmann17 can highlight nearby vehicles, especially those in blind spots, to truck drivers, enabling safer lane changes and turns while also reducing incident risk. Meanwhile, visual AI via cameras, whether on gates or drones, can detect irregularities in various objects like airplane wings, shipping containers, and warehouse rooftops, initiating predictive maintenance procedures to assess any potential damage or need for repair. Computer vision can also be applied to repair or emergency stocks, keeping inventory count, flagging items like lubricants and spare wheels that are running low, and triggering timely replenishment.

With computer vision as a preventative tool, logistics organizations can better protect supply chains from avoidable delays.

DRONES

- **The trend of Drones, otherwise known as ‘unmanned aerial vehicles’ (UAVs), refers to the development and utilization of variously shaped aircraft without a human pilot or crew on board. Enabled by embedded sensors and transceivers to navigate, drones are often controlled remotely by a human pilot, but advanced versions can fly autonomously beyond visual line of sight (BVLOS) using software-controlled flight plans.**



INDOOR MOBILE ROBOTS

- **The trend of Indoor Mobile Robots encompasses the various types of portable robot that fulfill tasks primarily inside facilities without direct input from human operators. Automated guided vehicles (AGVs) follow predetermined visible or invisible paths, while their next-generation successors, autonomous mobile robots (AMRs), use real-time path planning and can more freely move around obstacles.**

Relevance to the Future of Logistics

Point-to-Point Transportation

Moving goods between predefined locations within a warehouse is an essential yet highly repetitive process that takes up a lot of warehouse staff time. Using indoor mobile robots is an effective way to save resources, with just one employee overseeing a fleet of transport indoor mobile robots while the rest of the workforce is free to perform more value-adding tasks.

When selecting the appropriate autonomous solution for point-to-point transportation, there is a distinction between three-dimensional (such as an autonomous forklift) and two-dimensional (such as autonomous pallet jacks and bin-pulling robots) devices. Furthermore, with deployments in 3 different regions, DHL has already deployed several of these autonomous forklift fleets. Fleets of autonomous high reach robots that take over the full pallet picking and put away tasks, lifting up to 11m high while also performing double-deep activities.

In addition, there are solutions such as the EffiBOT, a fully autonomous handling robot from the French company Effidence, which also has follow-me mode to follow humans and carry loads of up to 300 kg. This allows the system to be utilized in environments that may still be too complex or dynamic for most AMR technology today.

These examples show there are already many solutions on the market for point-to-point transportation, each capable of significantly reducing the repetitive workload, walking distances, and time of logistics staff.

Order Fulfillment & Assisted Picking

In the unautomated warehouse environment, workers can sometimes be required to walk up to 9 miles each day. This puts an enormous physical burden on workers and at the same time presents an opportunity and a strong argument for the introduction of indoor mobile robots. Assisted picking robots can drive efficiency in the overall order fulfillment process by shortening the distance walked by humans and reducing the time between picks.

There are two main types of order fulfillment solution: goods-to-person AMRs and solutions that fall into a zone picking category. A classic goods-to-person AMR solution comes from Geek+ with robots able to pick up and transport inventory shelves to the required picking or pack station where an employee prepares the order for fulfillment without having to walk anywhere.

In zone picking, on the other hand, workers are assigned to a specific predefined warehouse area in which they operate. A prime example of a direct zone picking solution is from Locus Robotics, and DHL recently celebrated its 100 millionth pick using Locus robots. In this Locus solution, totes are placed on robots that travel to pickers in various work zones and then visually indicate the closest pick option for each tote via a screen.

Using AMRs to support order fulfillment allows workers to focus on the accuracy of their picking and significantly diminishes the distance they must cover each day and the required travel time.

Loading & Unloading

Loading and unloading containers and trucks with loose load is one of the most physically demanding activities in logistics. Workers are exposed to extreme weather conditions and must repeatedly move heavy goods in confined spaces as quickly as possible to ensure downstream operations can continue uninterrupted.

More and more companies are exploring ways to automate these tasks. To unload pallets from a trailer, Fox Robotics has developed the Automated Trailer Unloading solution. It offers simple implementation, with no need for warehouse management system integration, and simple user interfaces – just one operator can control several robots simultaneously via a tablet.

Boston Dynamics is developing the Stretch robot for a range of different warehouse tasks but initially this indoor mobile robot will enable autonomous unloading of floor-loaded containers and trucks. Stretch consists of three components: a lightweight robotic arm that can lift cartons of up to 50 lb (22.7 kg), a relatively small mobile base designed to easily fit inside trailers and containers, and the perception arm that includes depth sensors and 2D cameras to help the robot identify cartons of different shapes and sizes and provide insights into helping Stretch perceive the environment in which it operates. Future models may be capable of loading, building up pallets, and depalletization.

Today's deployed solutions are typically for unloading cartons or pallets. However, with advances in robotic software and computer vision capabilities, indoor mobile robots will eventually achieve additional autonomous capabilities such as mobile case picking. Nevertheless, loading and unloading of mixed cases are complex tasks and it will take further research and development before scalable autonomous solutions comes to market.

Facility Support

According to a study by the European Parliament, more than 8.34 billion USD (8.2 billion EUR) is lost annually in Europe due to cargo crime alone. Globally, 25% of all cargo crimes take place within warehouses.

With increasing sprawl and the resulting higher requirements for security infrastructure, today's warehouses are at risk. Companies can integrate autonomous security robots (ASRs) to better monitor and control these facilities. Use cases range from automatic license plate recognition to the detection of blacklisted mobile devices or suspicious devices and video surveillance.

The four-legged mobile robot Spot, from Boston Dynamics, can be used as an ASR, equipped with additional cameras and night-vision technology. Designed to walk stairs and uneven terrain, this robot can live monitor different levels in a warehouse or operations facility, and can be operated remotely via a tablet or follow pre-mapped routes.

The use of ASRs in warehouse security and surveillance remains limited but, in future, it is likely that security robots will be used as a deterrent, forming a minor part of a comprehensive security concept.

In addition to security robots, autonomous cleaning robots are increasingly used to support facilities. One example is the Liberty SC60 from the Danish company Nilfisk, a robot specifically designed for cleaning large areas which features a 5 hour maximum run time and utilizes BrainOS, one of the leading AI platforms for autonomous mobile indoor robots, for its navigation.

OUTDOOR AUTONOMOUS VEHICLES

- **The trend of Outdoor Autonomous Vehicles encapsulates the variety of self-driving robots operating primarily outside on land or water, both within private property and on public rights of way. This trend focuses on vehicles that are either completely driverless or at least highly automated with occasional control by a human driver**

INTERACTIVE AI

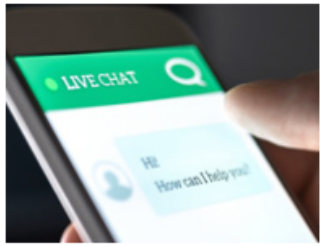
- **The trend of Interactive AI involves artificial intelligence (AI) algorithms that can process human user input, like text and speech, and provide a reasonable response. Advanced forms of this technology can interpret various writing styles and accents, hold complex conversations, perform complex tasks beyond simple commands, and mimic a sense of empathy with human users.**

Relevance to the Future of Logistics

Customer Experience Automation

With customer experience at the core of business success in logistics, customer service departments are very important to logistics companies. These departments are the first touchpoint when issues arise. Chatbots can help logistics companies handle low to medium-volume call center queries about, for example, requesting deliveries, editing orders, shipment tracking, and responding to FAQs.

Chatbots can also facilitate valuable analytics metrics, enabling the company to better understand customer needs and enhance the customer experience. As a result, chatbots represent today's fastest-growing brand communication channel with a handling rate of chat completion from start to finish at 68.9% in 2020 (an increase of 260% in end-to-end resolution over 2017), with the contribution to e-commerce transactions predicted to reach 112 billion USD by 2023. With Interactive AI, customer service automation also extends to user input processing through other commonly used communication channels such as immediate email responses, automated phone services, and integration with most widespread used text messaging platforms. This extends the realms within which customers can obtain immediate and satisfactory responses to enquiries.



Chatbots In The Workplace

In the context of digital workplaces, chatbots are commonly used in just about all sectors, most significantly in the healthcare industry when Covid-19 hit, to handle the massive influx of questions from the public. In all sectors, AI chatbots can enable workers to access the information needed to complete their work.

According to Gartner, 70% of white-collar workers will interact with chatbot platforms daily by the end of 2022. Similar to customer service applications, these platforms can provide immediate information and answers to office workers, helping the organization disseminate details about change management, human resources, helpdesk support, general services, anomaly reporting, and organizing meetings.

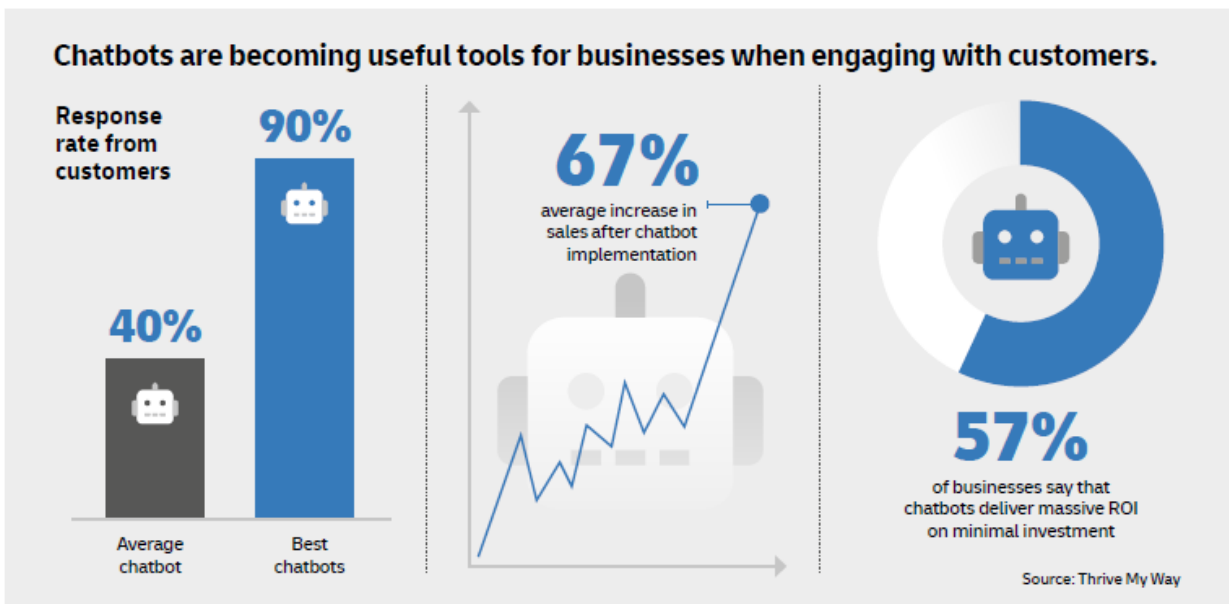
For logistics operations, chatbots can streamline inventory handling and management, cargo tracking, and delivery schedules, as well as customer relationship management (CRM) and warehouse management system (WMS) updates. The adoption of interactive AI technology within the supply chain automates workflows and order management, freeing up operations employees to focus on more complex and value-adding tasks. In the event of a chatbot being unable to complete an enquiry, it assigns the task to a human for further action while notifying the requestor about this status.

AI-Assisted Sales & Marketing Employee Experience Automation

Analytics of data captured on an interactive AI platform can provide valuable insights to the business. For example, companies may better understand customer pain points and consumer behavior patterns, enabling more effective marketing campaigns to attract potential leads. Data analytics can help with price optimization and – for retailers – better in-store and web-based layout mapping based on behavioral data. It can also help retailers and e-commerce businesses efficiently manage the supply chain while ensuring supply and demand are met at operational level.

Start-up vendors delivering sales and marketing intelligence as well as acceleration software tools like Groove and UpLead enable companies to reach their full potential through interactive AI. In recent years, we've all become familiar with AI assistants – for example, Amazon's Alexa which provides consumers with an AI-powered cloud-based voice service accessing hundreds of millions of devices including third-party device manufacturers.

Data captured through Alexa and similar devices enables more individually targeted marketing, with algorithms to analyze consumer behavior. Meta's chatbot BlenderBot accumulates user data to tailor its responses in accordance with the user's history, tapping into the vast library of human thought on the internet. The device is trained on large language datasets, allowing it to generate with factual accuracy passably human responses to questions. In the long term, the purpose and goal of this chatbot is a virtual assistant capable of responding to a wide variety of topics with factual intelligence.



QUICK COMMERCE

- **The trend of Quick Commerce, sometimes referred to as on-demand delivery, is the next generation of e-commerce, involving convenient online ordering, accurate order fulfillment, and speedy delivery within an hour of order placement.**

Relevance to the Future of Logistics

Expansion of Dark Stores

The hallmark of quick commerce is super-fast fulfillment and delivery. With last-mile delivery being the most expensive segment of a fulfillment supply chain, large, traditional warehouses – set up to achieve economies of scale – are usually a barrier as they are typically located on the edge of a city, far from the primary customer base.

As a result, many quick commerce providers are opening and operating so-called 'dark stores' (micro-fulfillment centers housed in what used to be retail space) in central neighborhoods or at the back of large suburban retail stores. By opening many dark stores, a quick commerce provider gets closer to customers and ensures promised delivery times. This significant shift towards decentralization is reflected in the growth of a dark store ecosystem offering specialized services specifically for these facilities. For example, Mapbox helps companies pinpoint the perfect location for their next dark store.

Overall, dark stores allow for faster picking and delivery, as well as lower costs per pick and delivery, with their more specialized product assortment and closer proximities than larger traditional warehouses. While dark stores may have higher fixed costs when renting these centrally located properties, their savings can make all the difference in last-mile delivery.

Everything & Anything Delivered Quickly

Quick commerce providers currently specialize in delivering food and groceries, but some are expanding into other fast-moving consumer goods (FMCG) like beauty products, clothes, and office supplies.

Japanese fashion and home goods company MUJI, for instance, is a frontrunner in this space, partnering in 2022 with Meituan, China's leading food delivery shopping platform, to offer instant delivery services within China for its product line, from fashion items to kitchen appliances.

We here at DHL anticipate a future where most FMCG retailers and even companies providing many luxury and specialized goods, like expensive handbags and large furniture, will offer quick commerce options to customers. With this rising trend, retailers will have two possible strategies to stay competitive. They can either follow MUJI's example and partner with an existing quick commerce provider or create their own in-house fast-delivery solution. In both scenarios, as more and more different product types are offered for delivery in shorter time spans, supply chain teams must anticipate how their supply chains will change not just in the last-mile, but also in upstream supply chain segments as well, to accommodate quick commerce.

Meeting New Customer Expectations

E-commerce surveys consistently find that repeat customers are closely associated with positive delivery experiences, which shows how logistics providers now act as key differentiators among online marketplaces and platforms. Therefore, supply chain teams must analyze customer expectations and adjust strategies and operations to meet them. That is why quick commerce is the ultimate discipline for designing an outstanding end-to-end customer experience.

An analysis of end-customer data by instant-delivery startup Ohi found that orders delivered within 2 hours had a 61% higher repurchase rate than standard shipping and even 24% higher than same-day delivery. Implementing a seamless, hassle-free online shopping experience within a time span of one hour from order to delivery helps companies build customer retention and loyalty. The switch to quick commerce, however, carries risk that should not be underestimated. The transition is costly and, once a company promises to meet the customer expectation of hassle-free delivery within an hour, failure to deliver on that promise risks loss of business, competitiveness, and relevance.

In addition to fast, on-time delivery, most customers today also demand live shipment status tracking and updates. The ability to track the path of the quick commerce delivery from goods packing in the dark store to the mapped delivery destination adds to a positive customer experience, involving the recipient virtually with their order in the supply chain. Logistics providers can facilitate this through efficient inventory control, effective demand forecasting, optimized delivery routes, the installation of sensors, and other digitalization tactics.

The new baseline for deliveries may be 2-3 days, but food delivery apps may be cultivating new future expectations from customers with their instant delivery services.

90%
of consumers now see 2 or 3-day delivery as the baseline.

30%
of consumers expect same-day delivery.

40 minutes
- average maximum waiting time expected by customers on food delivery apps.

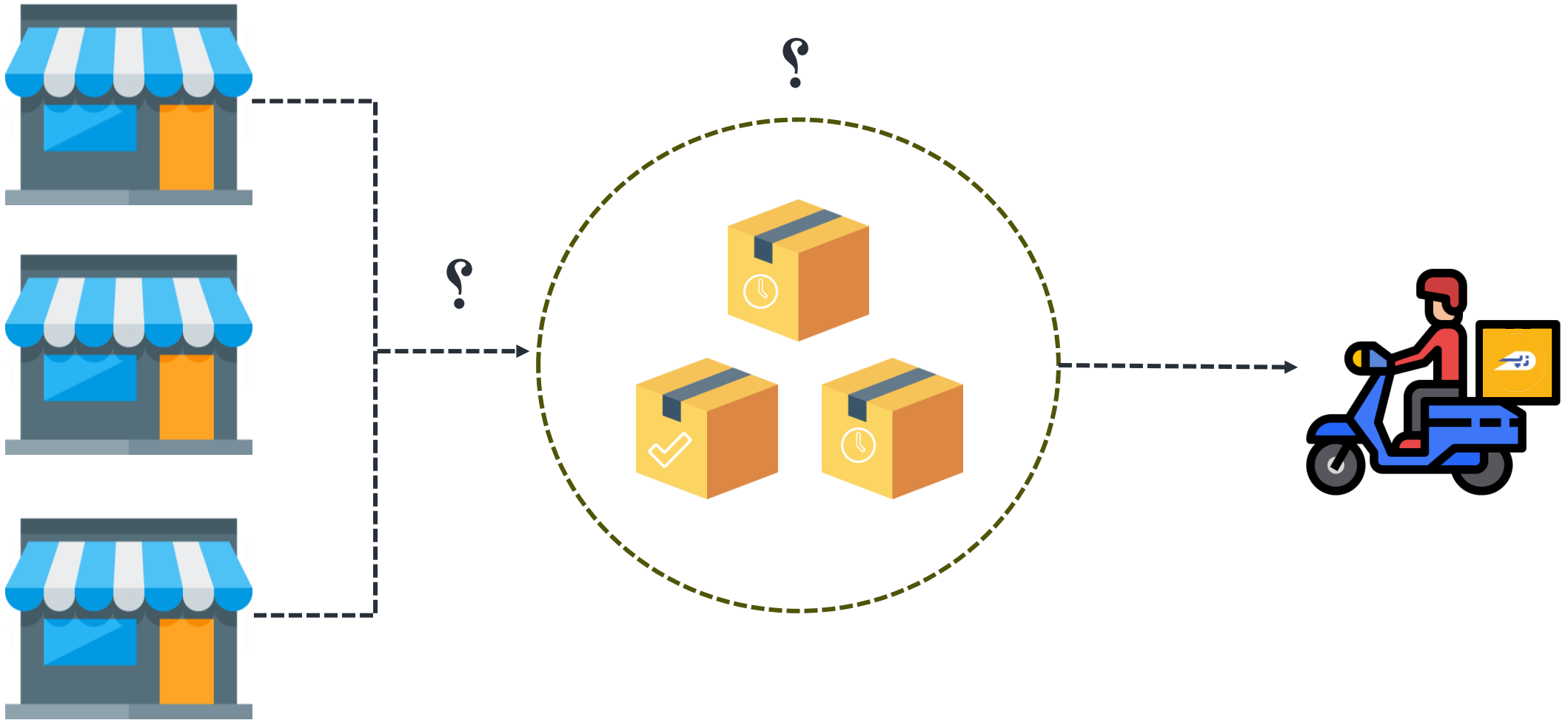
45%
of customers abandon carts if they discover they need to wait longer than expected for delivery.

Sources: McKinsey & Company; US Foods

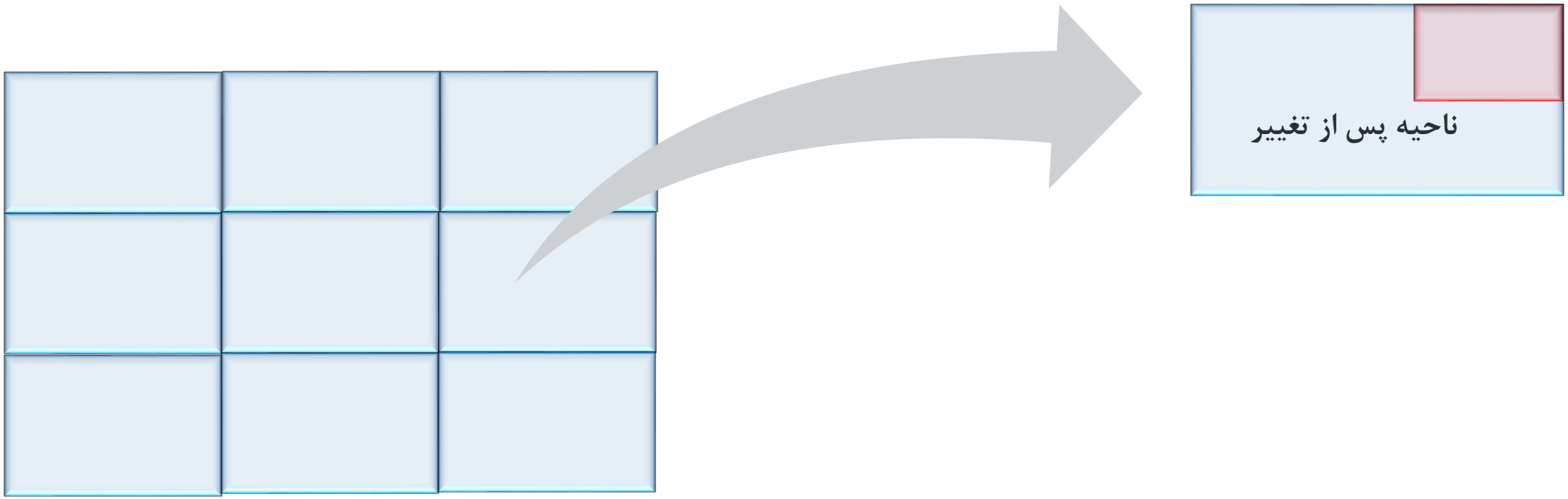
پرسش و طرح مسئله

جوایز نقدی نفرات منتخب داوری

پرسش اول: نحوه تخصیص سفارش به سفیر



پرسش دوم: طراحی ناحیه



ناحیه اولیه

تفاهم‌نامه همکاری

سخنرانان

دکتر یاسر صمیمی

ریاست دانشکده مهندسی صنایع

خوش آمدگویی و آغاز همایش

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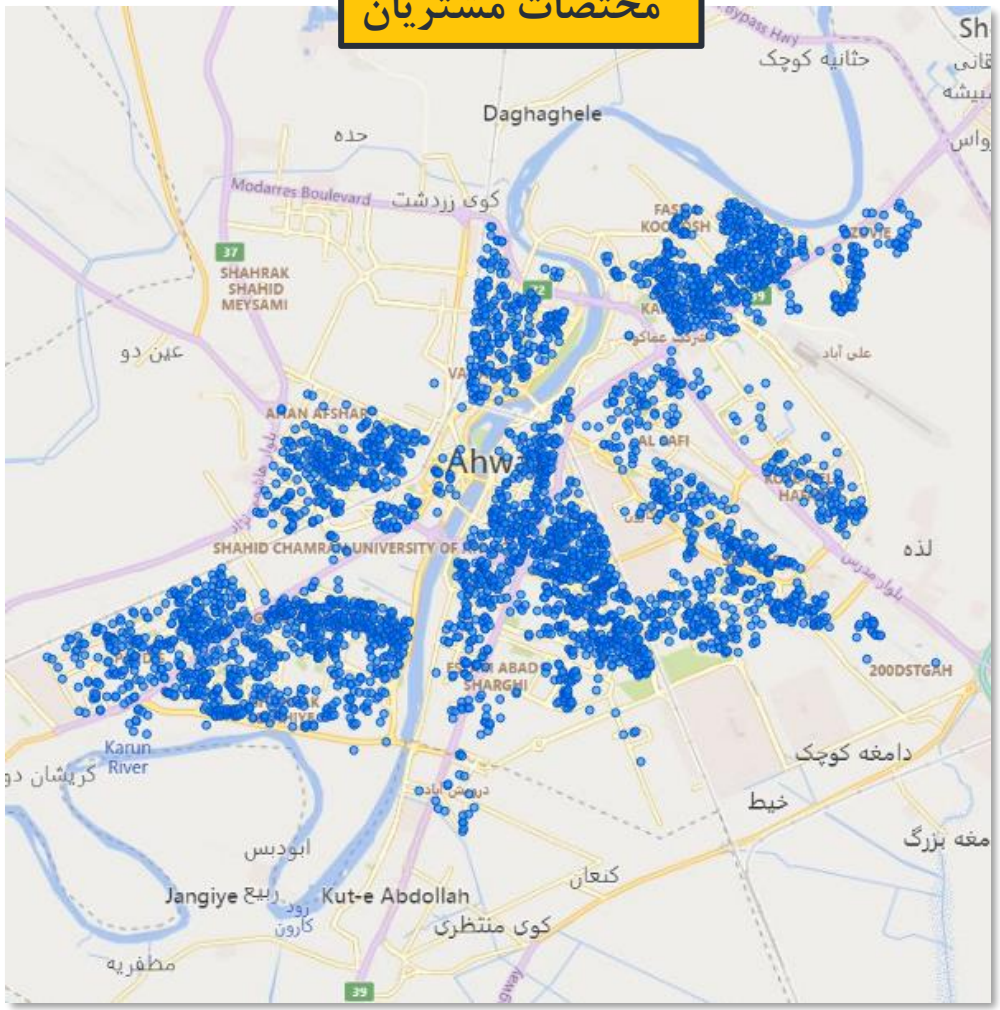
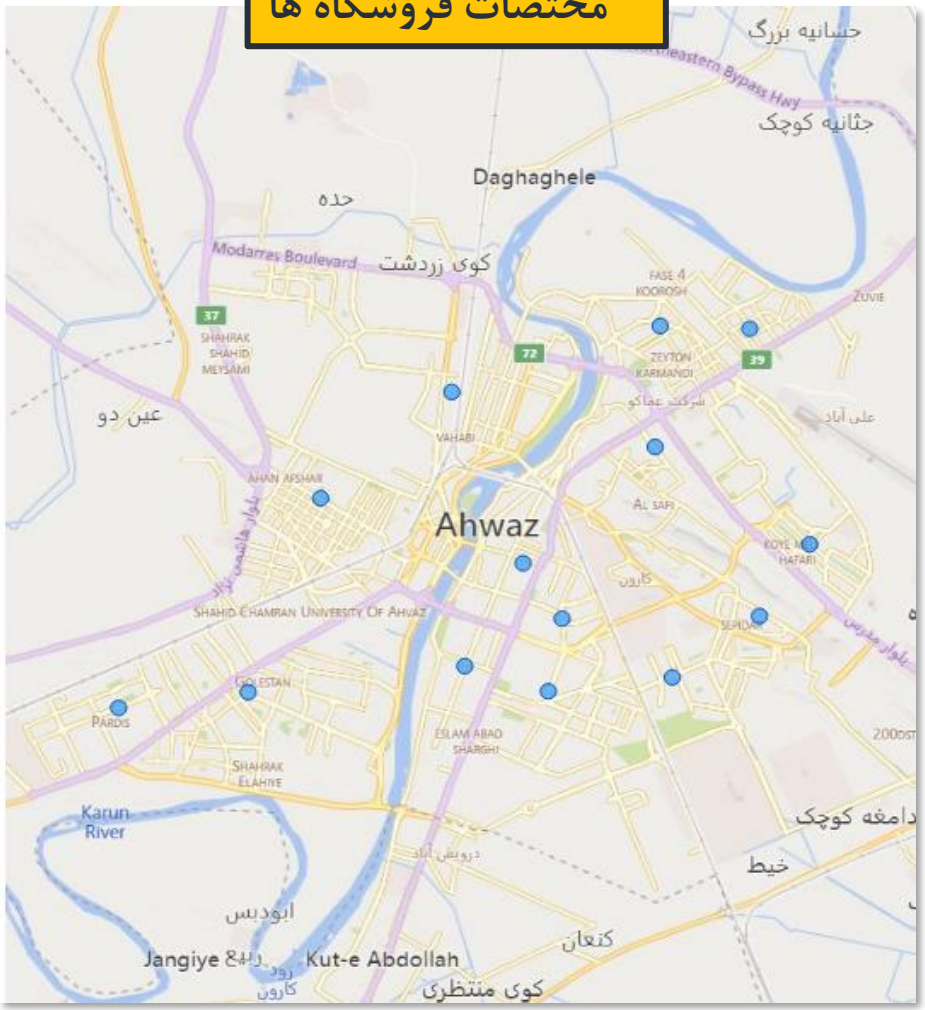
تحلیل و بررسی یک مسئله در زپ

طرح مسئله

مختصات مشتریان



مختصات فروشگاه ها

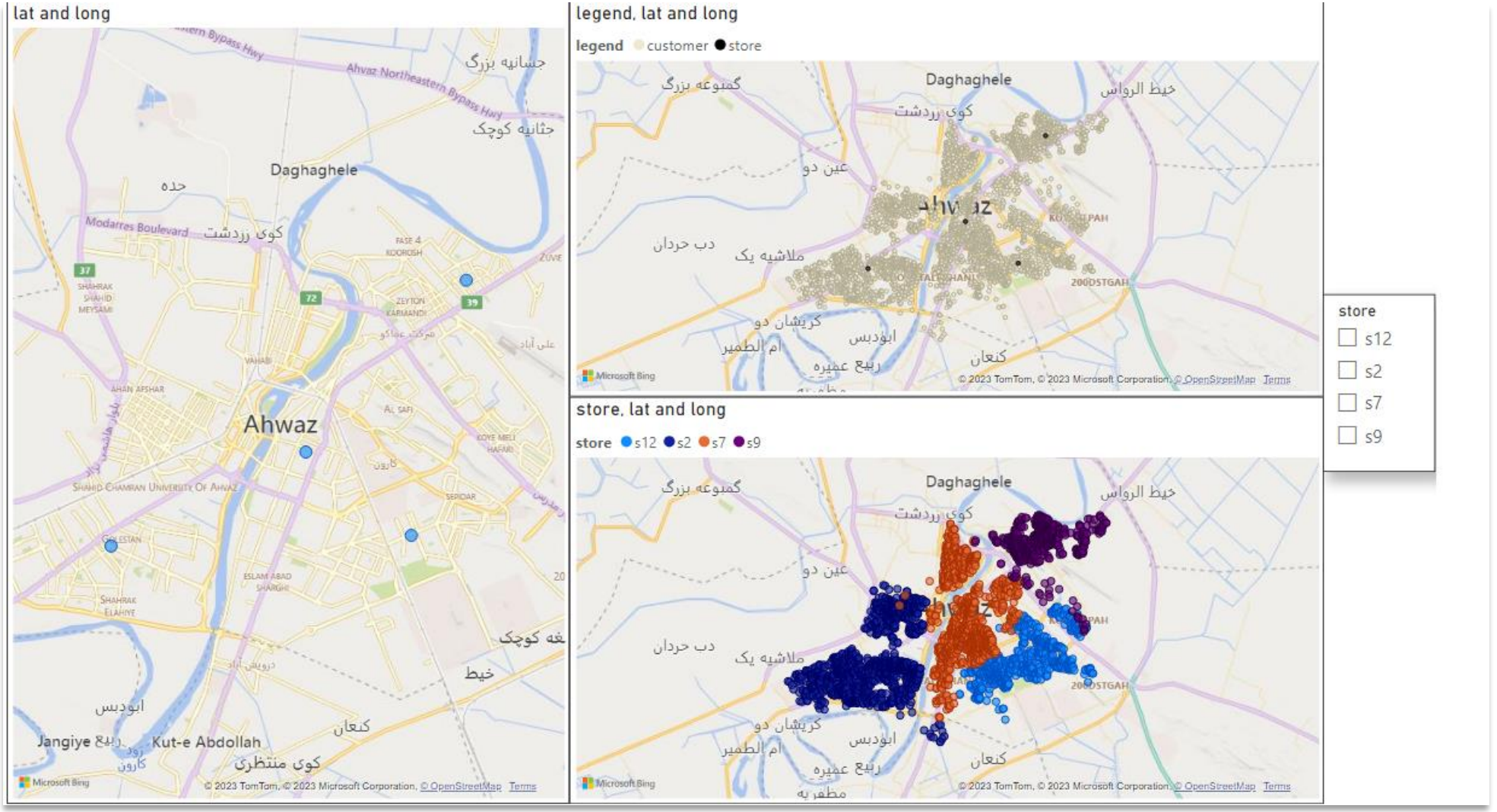


مدل پیشنهادی و مفروضات

- ✓ حداکثر فاصله یک مشتری تا فروشگاه ۵ کیلومتر است؛
- ✓ هر مشتری حداکثر به یک فروشگاه تخصیص می‌یابد؛
- ✓ تعداد فروشگاه‌های قابل احداث محدود است؛
- ✓ حداقل آلفا درصد از مشتریان تحت پوشش قرار بگیرند؛
- ✓ چانچه یک فروشگاه احداث گردید در شعاع مشخصی از آن، فروشگاه دیگری احداث نشود.

$Min\ Z = \sum_s \sum_c d_{cs}\, X_{cs}$	(1)
$d_{cs}\, X_{cs} \le 5000\, Y_s \qquad \forall c \in C, s \in S$	(2)
$\sum_s X_{cs} \le 1 \qquad \forall c \in C$	(3)
$\sum_s Y_s \ge \alpha$	(4)
$\sum_s Y_s \le \beta$	(5)
$\sum_c \sum_s X_{cs} \ge \theta * \lvert C \rvert$	(6)
$\sum_c X_{cs} \ge Y_s \qquad \forall s \in S$	(7)
$Y_{s'} \le p_{ss'}\, Y_s + (1 - Y_s) \quad \forall s, s', s \ne s', s' > s$	(8)
$Y_s \in \{0,1\} \qquad \forall s, s'$	(9)
$X_{cs} \in \{0,1\} \qquad \forall c \in C, s \in S$	(10)

نتایج مدل:۴ ناحیه



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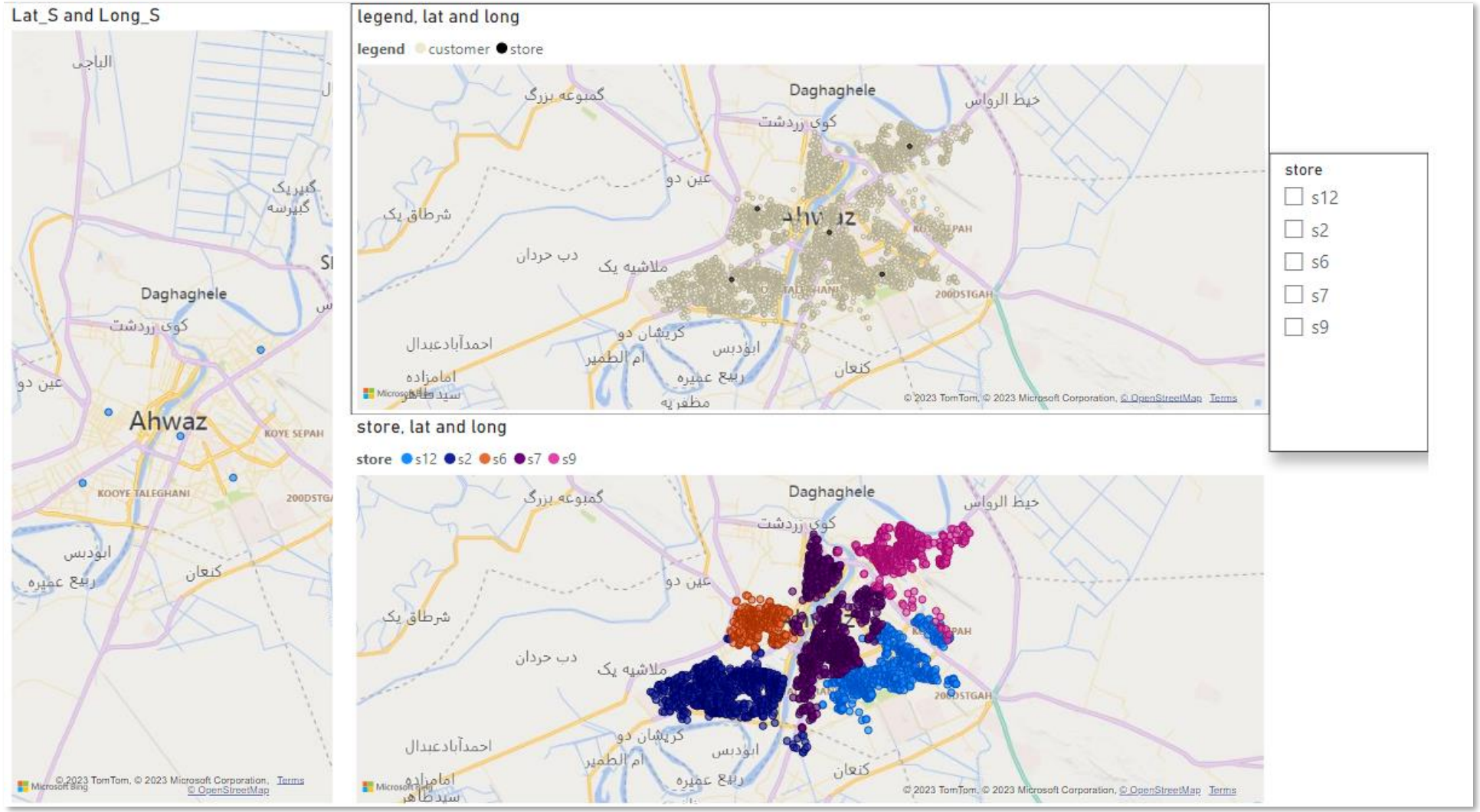

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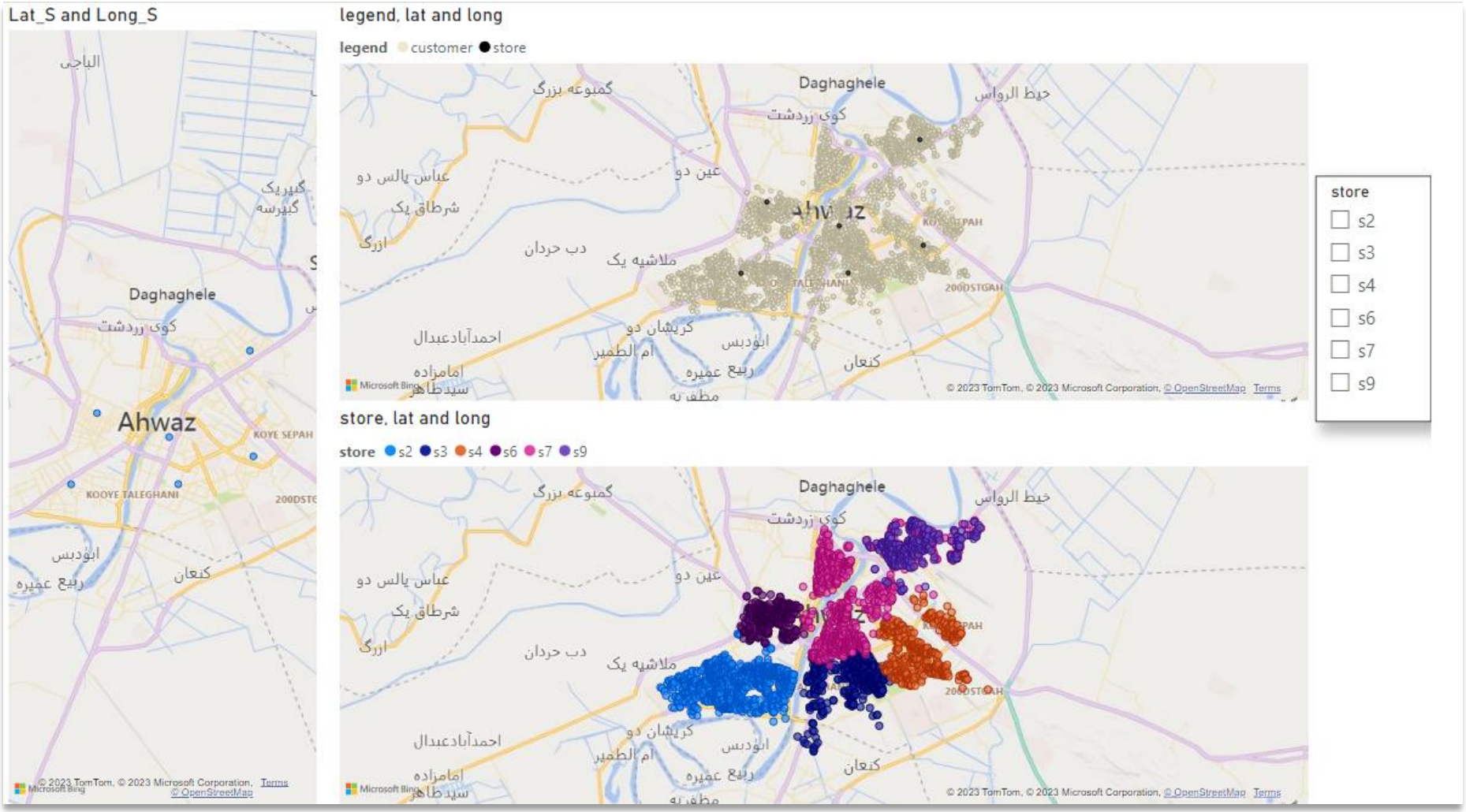

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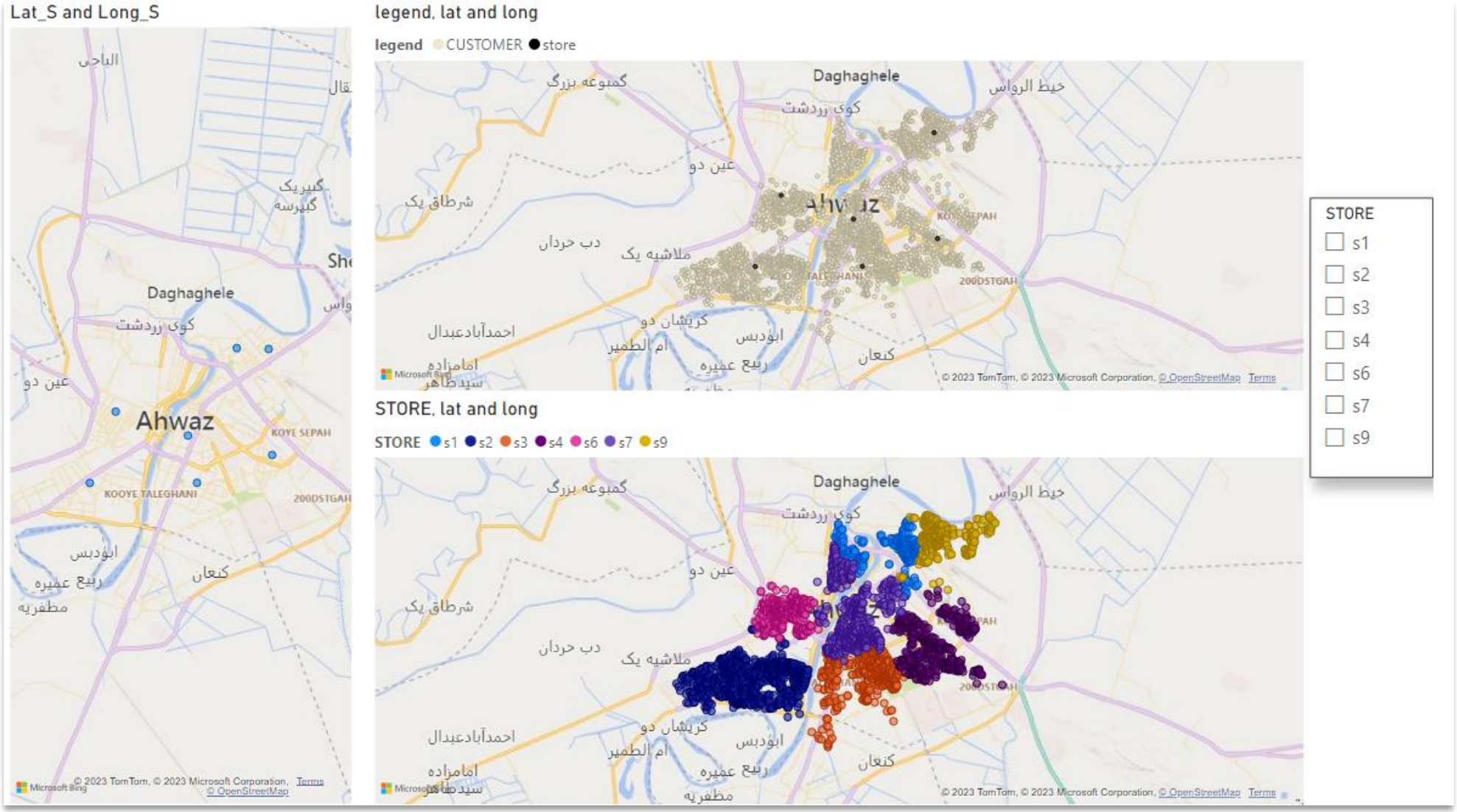
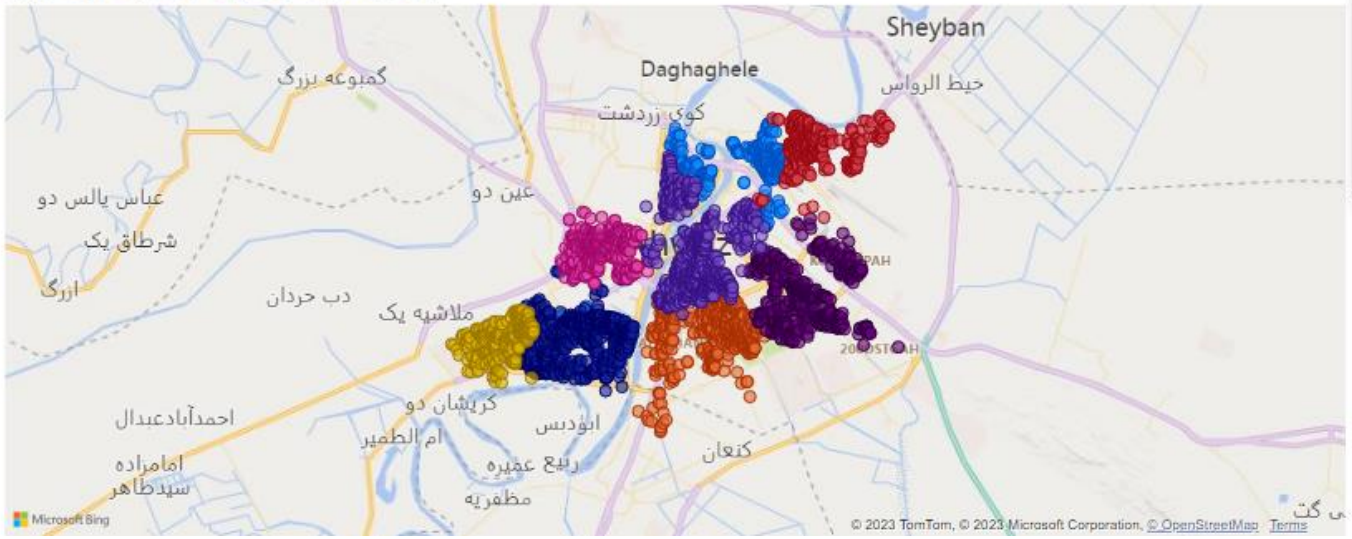


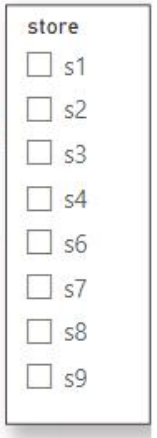
نتایج مدل:۸ ناحیه

Column3 and Column2

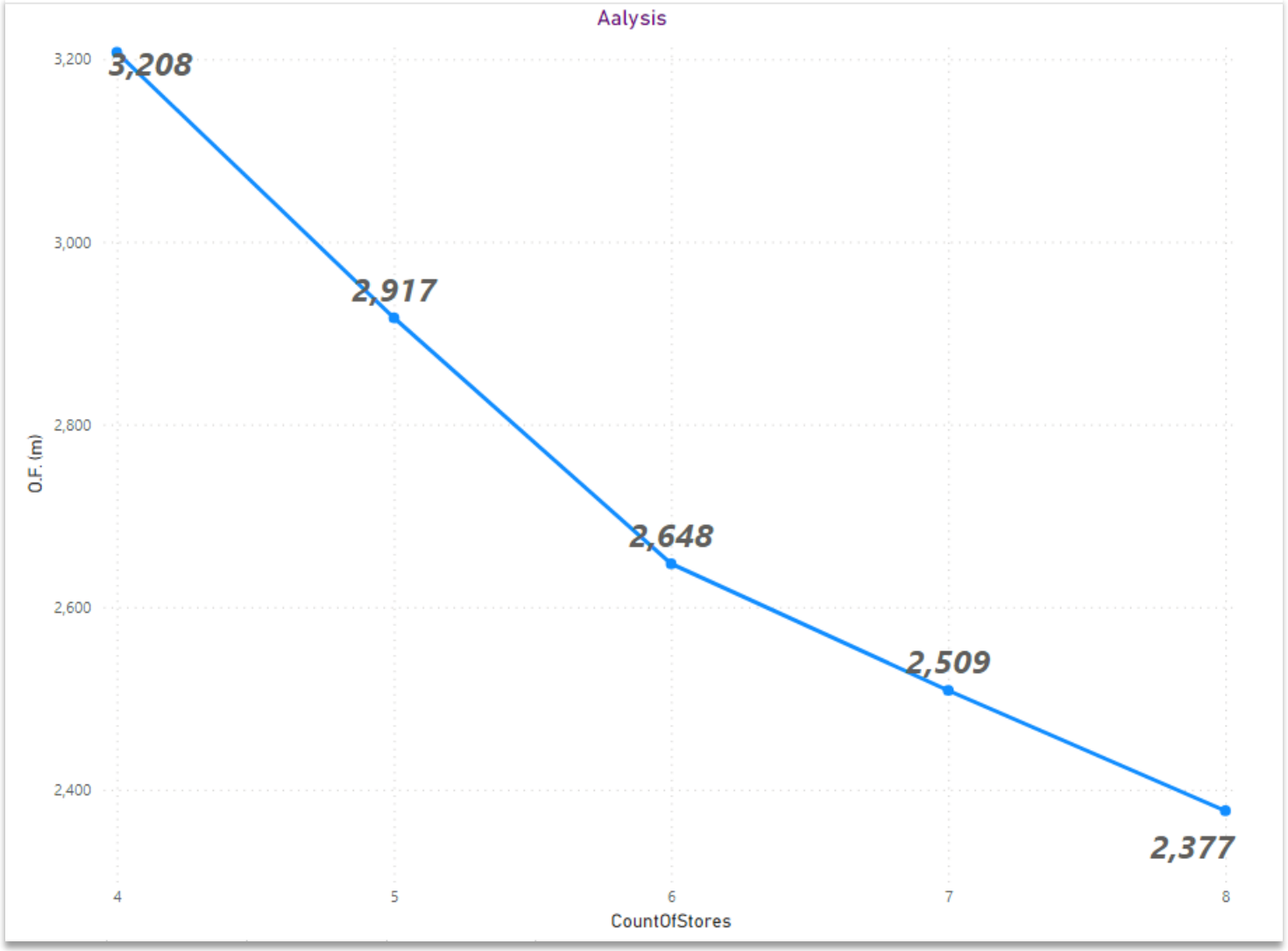
legend, lat and long

store, lat and long





تحلیل حساسیت مدل



میانگین مسافت مشتری از فروشگاه

تعداد فروشگاه

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An integer linear programming approach for a location-allocation problem i

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An integer linear programming approach for a location-allocation problem in online stores industry: A real world case study

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CHRONICLE

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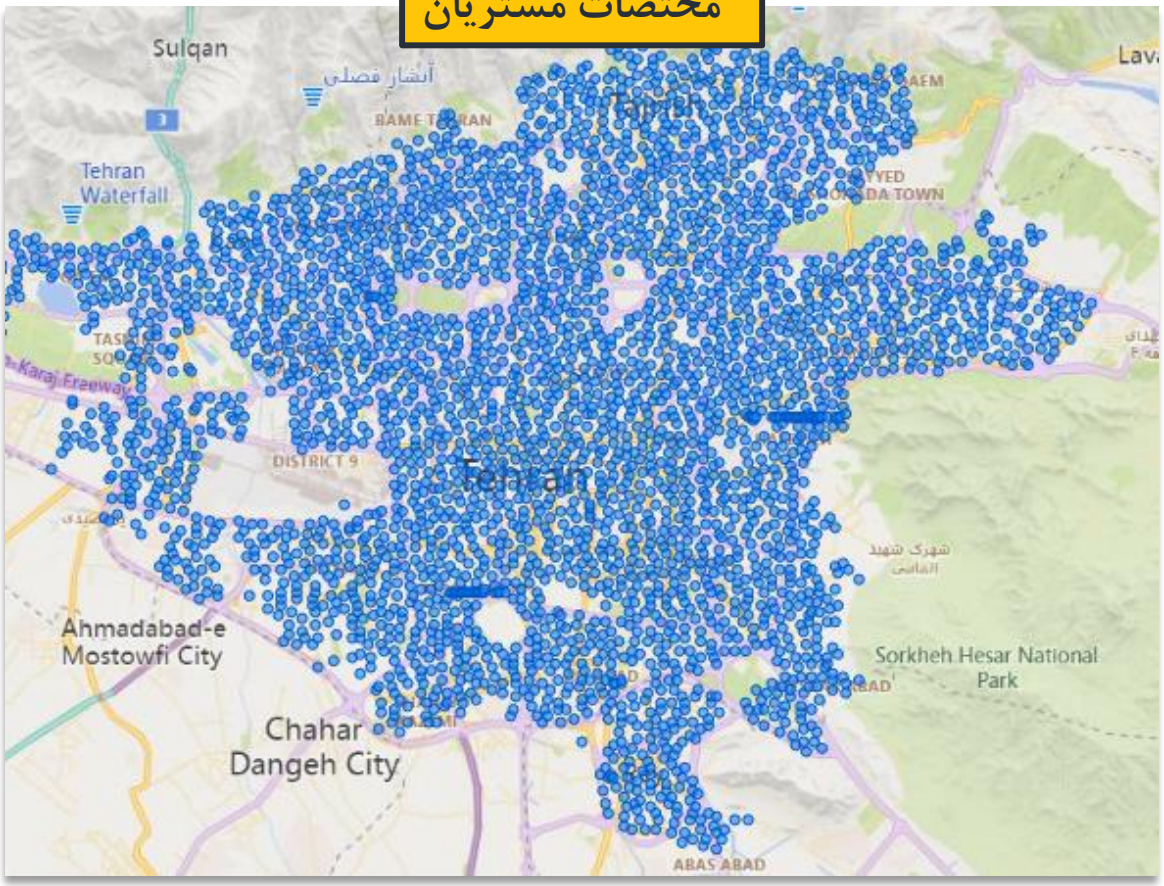
Chain stores

ABSTRACT

As the population grows and demand increases, cities have seen a rise in the number of chain stores. To remain competitive, these companies must reduce costs and attract more customers. A key factor in achieving this is the strategic placement of store branches, which reduces the distance between stores and customers, instilling trust and increasing their appeal while also cutting costs by reducing the need for employees to navigate longer distances. In this study, an integer linear programming model is presented with the goal of dividing a zone in Ahvaz city into several scenarios to determine the optimal number of stores while maintaining control over the distance between active stores. This research is the first to include this specific limitation in the mathematical model of the problem. The results of the study demonstrate a significant reduction in the distance between customers and stores.

پیاده سازی مدل برای شهر تهران

مختصات مشتریان



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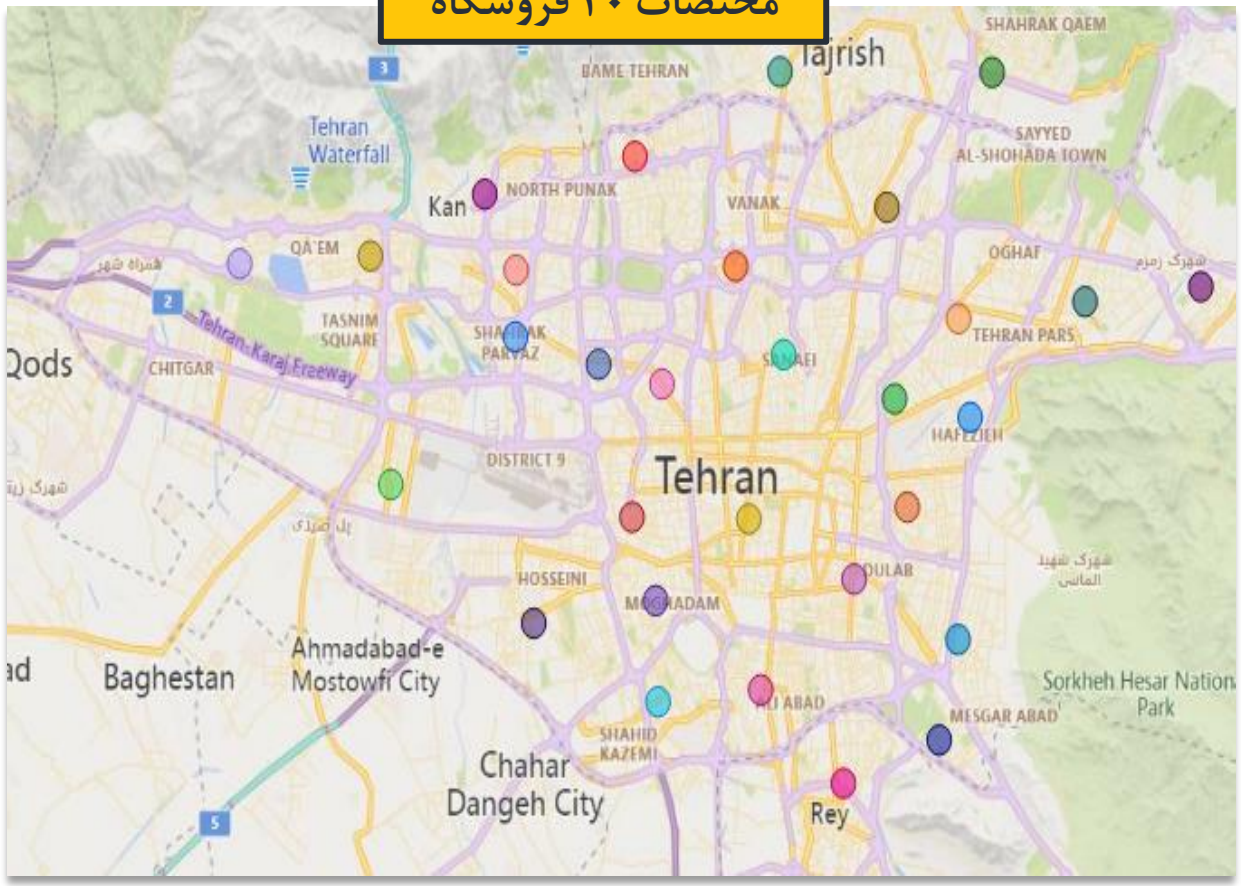
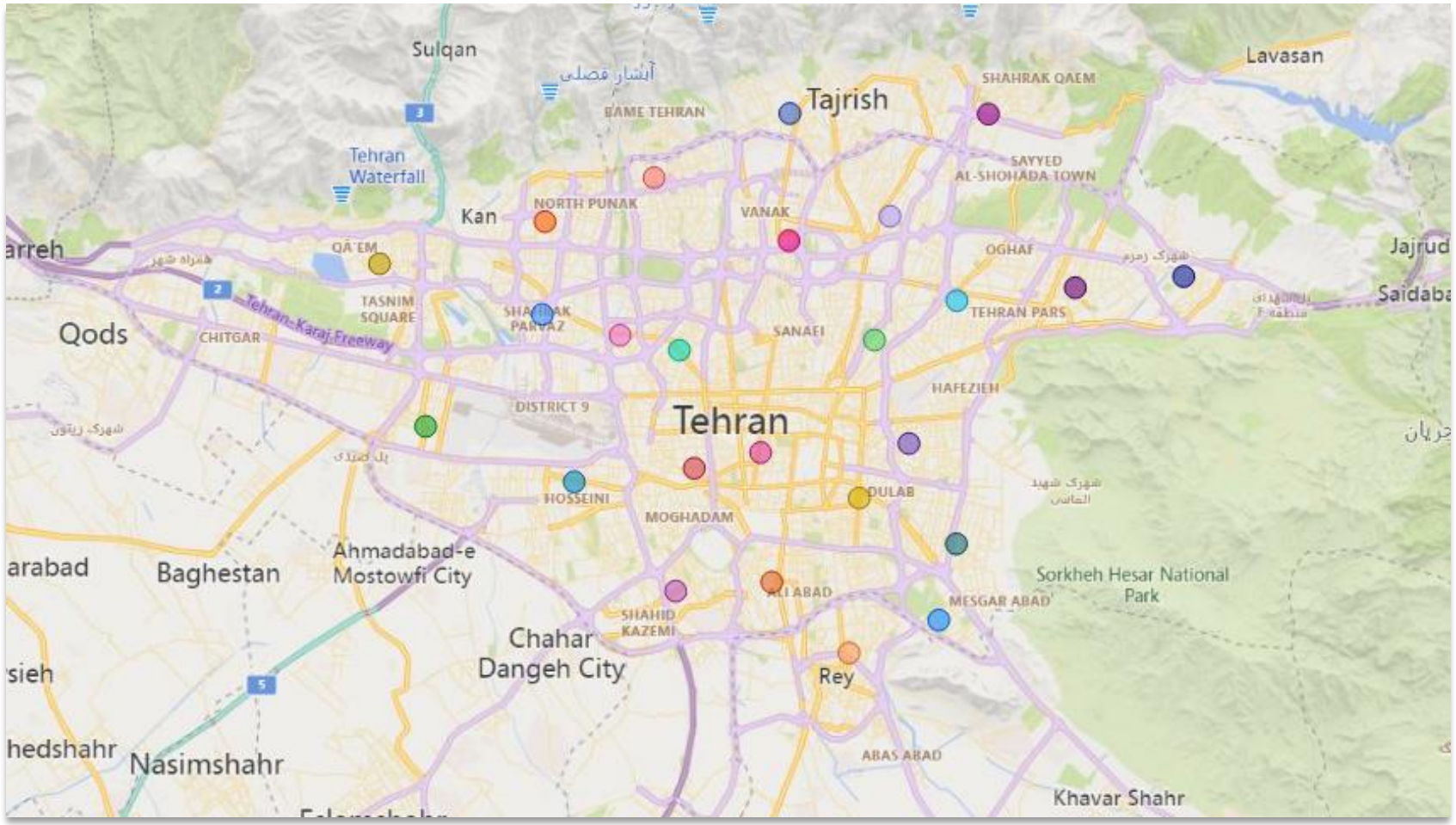
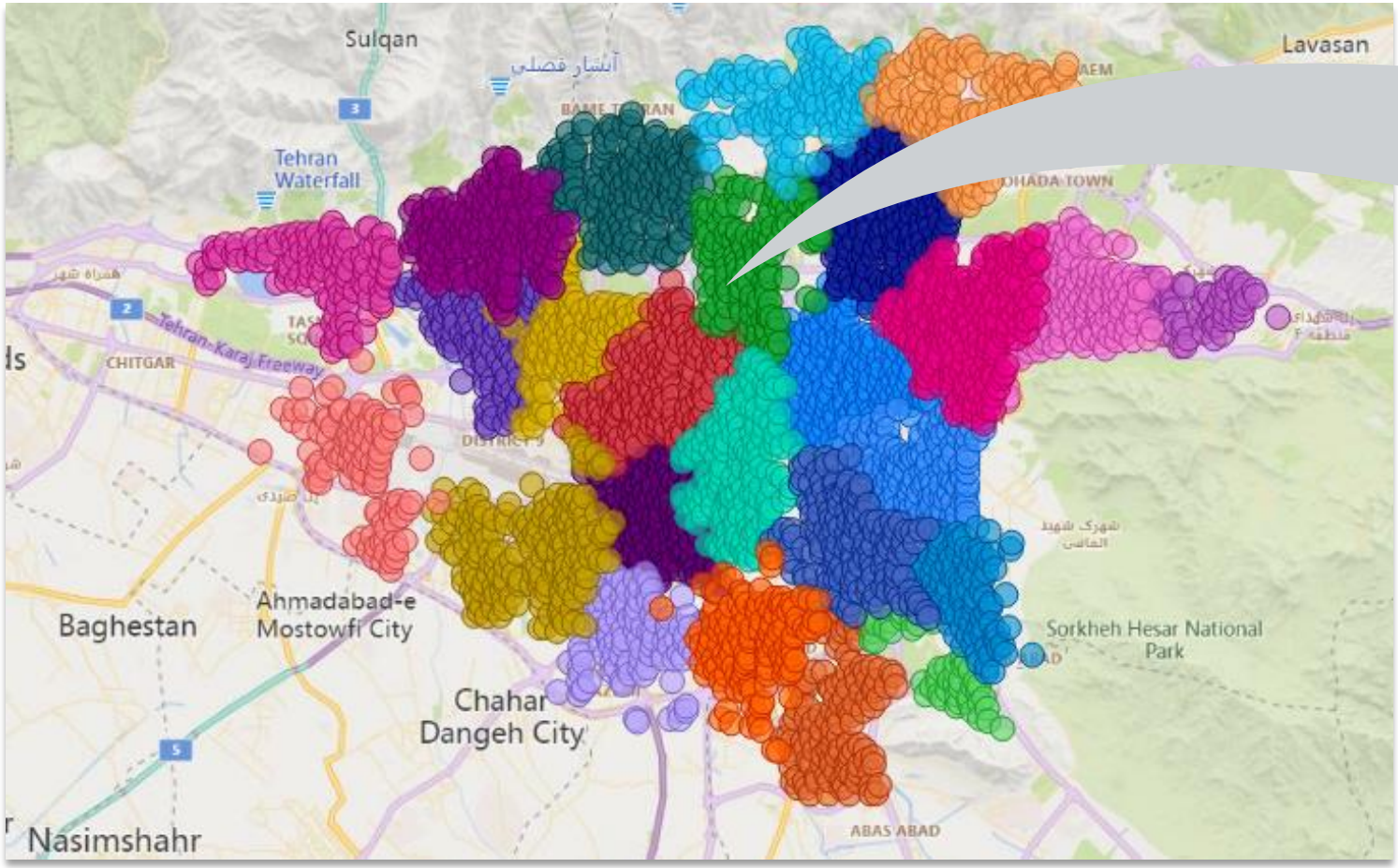


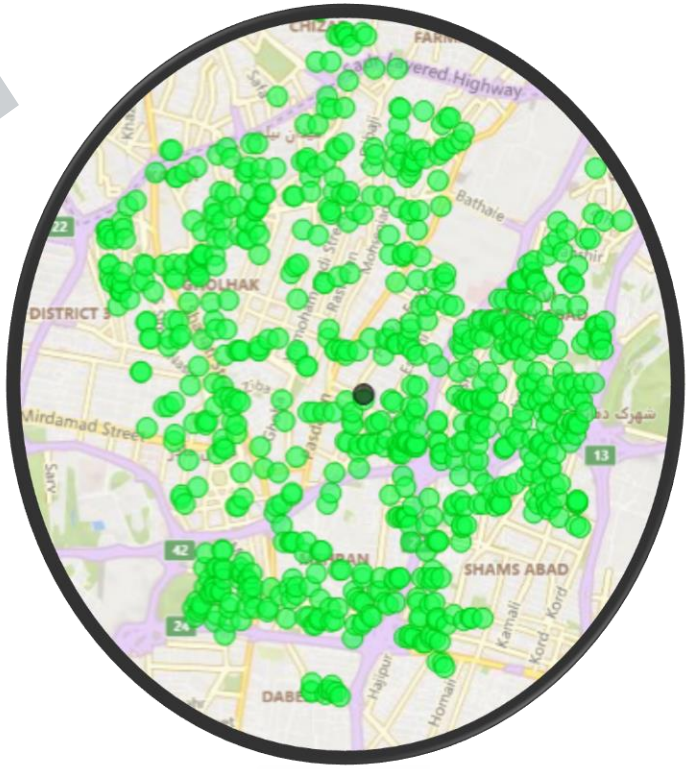
سناریو مورد بررسی: ۲۵ فروشگاه



25zone_5.5km_0.99_iter

نتایج حل مدل





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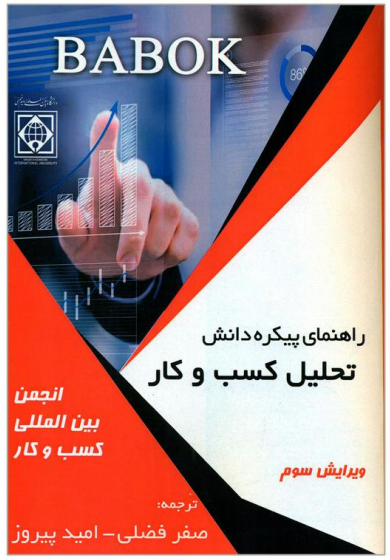
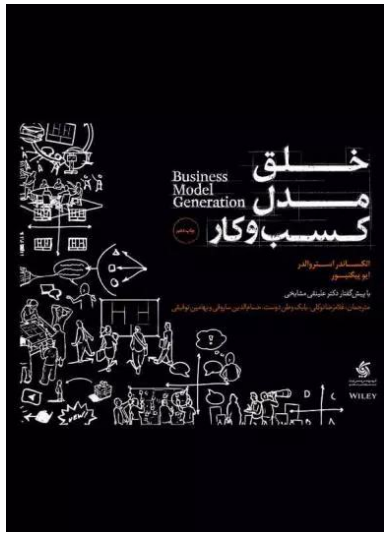
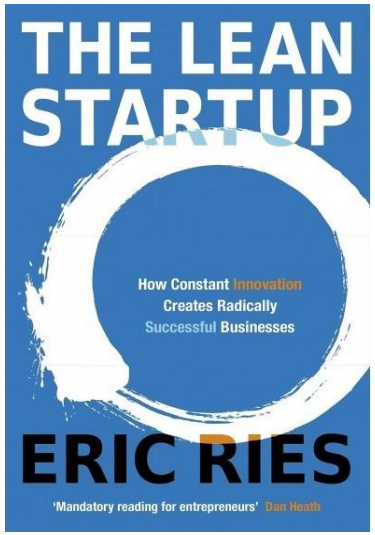
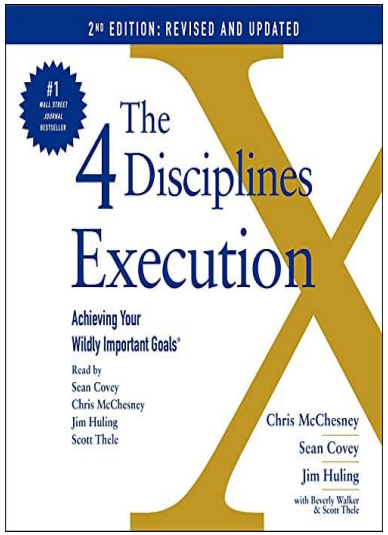
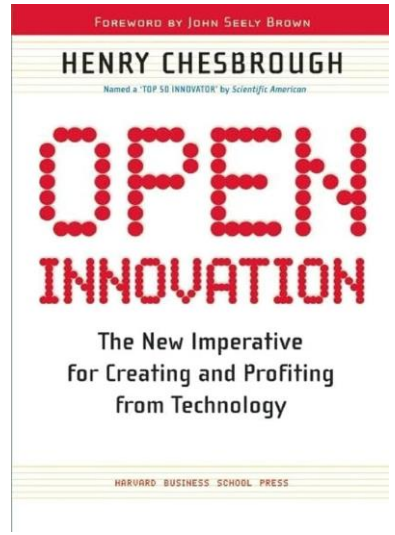


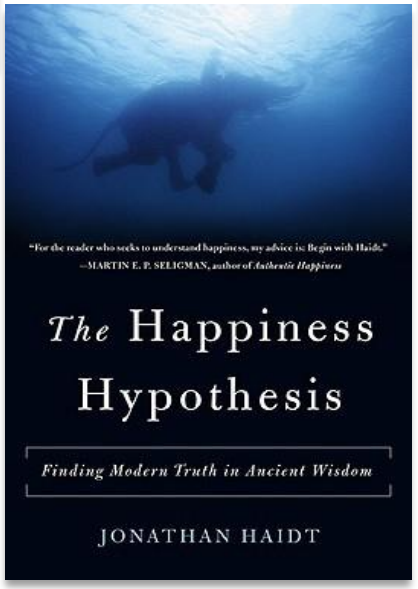


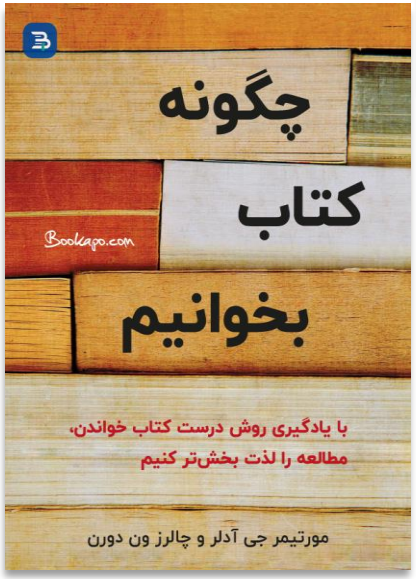


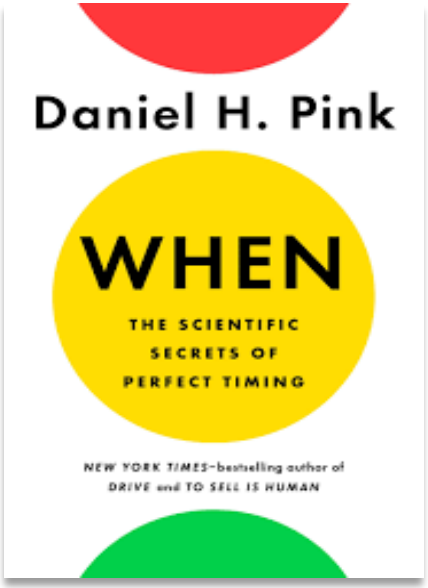




معرفی کتاب: در توسعه فردی







پرسش و پاسخ

Thanks!