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Case Study: Cainiao and JD.com Leading Sustainability Packaging in China

(Full Paper)

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ABSTRACT

This case looks at the packaging waste problems created by increasing e-commerce in China and its development of recycling policies. This case introduces the concept of Green supply chain, sustainable packaging in particular and discuss the development of sustainable packaging in China. We also look at best practices implemented by other companies and countries. The case is for the purpose to compare advantages, disadvantages and limitations of sustainable packaging and traditional packaging, to evaluate the impact of sustainable packaging, and to recommend ways for businesses to implement sustainable packaging without increasing the cost for long term.

Keywords: Sustainability, packaging, logistics, case study.

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INTRODUCTION

Already the world's largest, China's online retailing marketing was expected to more than double in size, from US\$750 billion in 2016 to US\$1.7 trillion by 2020. The number of online shoppers in China was also expected to grow from 460 million in 2016 to 660 million users in 2020 (Erickson, 2019). The surging online business required lots of packaging materials.. In 2016, over 31 billion parcels were delivered, which equaled to 23 parcels per capita according to China's State Post Bureau. For each parcel, retailers and delivery companies could use up to seven types of packaging material such as cardboard, plastic bags and bubble wrap. Often, the amount of packaging used to protect goods was in excess of what was needed to reduce the risk of damage during transport. Most of this packaging went straight to landfills.

Whilst both paper and plastic could be recycled, less than 10 per cent of the paper and plastic packaging material ended up being recycled, and overall, less than 20 per cent all packaging materials in China were recycled. Instead most of this packaging went straight to landfills. Many of the materials were not biodegradable, and some even contain chemicals such as plasticizers and fire retardants that could present risks to human health.

The Chinese Government did not regulate the environmental impacts and recycling of e-commerce packaging. The State Post Bureau actively promoted green packaging in the delivery industry, and aimed to "build a recycling system and eliminate all harmful materials from packaging by 2020", but the lack of relevant legislation, regulation or strong policies was still one of the major barriers to tackling the mounting packaging waste. The cost of packaging to the environment and human health has yet to be factored in the market pricing mechanisms, which meant that companies did not have financial incentives to choose more sustainable options (Luo, 2017).

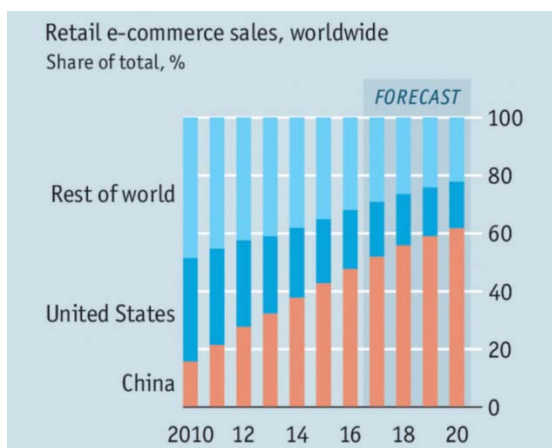
E-COMMERCE GROWTH IN CHINA

China led the world in e-commerce. More than 40% of the world's e-commerce transactions currently took place in China, up from only 1% about a decade ago. Tech champions such as Alibaba Group, Tencent and JD dominated the rapidly growing Chinese e-commerce ecosystem. They together occupied more than 85% of China's e-commerce market. China's online retail market was expected to reach USD1.8tn in 2022, thanks to local tech titans Alibaba and JD.com, according to a report by Forrester. The report revealed the Chinese online retail market would reach USD713bn in 2022, more than double the US and 10 times bigger than Japan at \$159 bn. With 38% of China's total population shopping online there was plenty of room for growth and it was expected China's e-commerce market would reach \$1.1 trillion in 2018, making it the world's first trillion-dollar e-commerce market in the world.

Statistics showed 76% of all e-commerce in China happened via mobile devices and mobile payments remained the most popular choice for online purchase with 80% of metro Chinese shoppers using Alipay and 66% using Tencent's WeChat Pay to pay in the last three months. What was surprising is Chinese consumers were found "the most demanding, advancing, and innovation-hungry digital shoppers", with 72% ranked as Progressive Pioneers compared to just 25% of US consumers (Long, 2018).

Another important trend to note about China's e-commerce growth lied in the potential users in the rural areas. Recent researches have shown a sign of urban market saturation but they have revealed the older demographic of China's population, typically living in the Western rural areas of China, presents immense growth potential for e-commerce retailers, with 241 million of people aged over 60 were accounted for nearly 20 percent of China's total population. These untouched older

demographic with the potential for infrastructure development and government-backed initiatives made the rural areas the next growth sector with huge potential.



Source: <https://www.weforum.org/agenda/2018/09/five-trends-shaping-the-future-of-e-commerce-in-china/>

Figure 1: Retail e-commerce sales figures worldwide

Rural Western-based users made up only 27 percent of all internet users in China with the majority of infrastructure developments were focused on China’s Eastern areas. Alibaba’s Taobao shopping app has recognized only recently this fact and started to shape their marketing strategies to target those 50 and older (Harsono, 2018).

Cainiao Network and JD Logistics, which were the logistics arms of Alibaba and JD.com, the two largest e-commerce firms in China. Their approaches and development on sustainable packaging were always the role models not only the logistics industry but also the e-commerce industry.



Source: <https://seekingalpha.com/article/4132604-jd-com-vs-alibaba-comparative-study?page=2>

Figure 2: JD’s national warehouse network and last-mile reach

Cainiao Establishment

Cainiao Network was the logistics alliance launched by Chinese e-commerce giant Alibaba Group in 2013. It provided a logistics information platform that linked a network of delivery partners, warehouses, and merchants to make package deliveries faster and more efficient. Cainiao’s business covered express delivery, warehouse fulfillment, last-mile delivery, rural logistics and cross-border logistics. Cainiao Network connected 6.1 million delivery routes, 2 million couriers, over 40,000 pick-up stations, 3,000 transportation companies, 30,000 rural villages, and 15 leading express delivery companies (CIW, 2017). In 2018, daily processed package volume was 100 million and exceeded 1 billion weekly.

JD Logistics Establishment

JD.com, China's largest online retailer to provide smart supply chain established JD Logistics on April 25, 2017 and logistics served by using the company's advanced technology and logistics expertise. Leveraging the unparalleled access to data from every step of the e-commerce process, from ordering to delivery and after-sales service, JD Logistics stated it would use AI, big data and automation to redefine the potential of e-commerce logistics. It aimed to provide business partners with comprehensive supply chain solutions, including warehousing, transportation, delivery, after-sales service, as well as logistics services, including smart and cross-border logistics. JD.com had one of the largest fulfillment infrastructures of any e-commerce company in the world. JD.com operates 256 warehouses, as well as 6,906 delivery stations and pickup stations across China, which were staffed by its professionally trained employees, providing nationwide last-mile delivery service (JD, 2017). In October 2018, JD.com launched a parcel delivery service in China to enable consumers in Beijing, Shanghai, and Guangzhou to send packages inter-city and across mainland China via the JD.com mobile app. The service includes various timing, for example same-day or two-day delivery, and high-value items such as luxury products and high-end consumer electronics. It aimed to expand the courier service to any residential and business customer in Mainland China (Yu, 2018). JD built the world's first fully automated warehouse in Shanghai, and they currently were developing their own drones delivery and automatic delivery robots (JD, 2019).

E-COMMERCE IMPACT ON ENVIRONMENT

China's Singles' Day online discount sales bonanza on Saturday saw bargain-hungry buyers spend over 254 billion yuan (\$\$52 billion), flooding the postal and courier businesses with around 331 million packages - and leaving an estimated 160,000 tonnes of packaging waste including plastic, cardboard and tape. The annual Nov 11 buying frenzy was a regular fillip for giant online retailers like Alibaba and JD.com.

China's State Post Bureau (SPB) said postal and courier companies were having to deal with at least 331 million packages, up 31.5 per cent from last year. Greenpeace described the annual promotion as a "catastrophe for the environment" that not only creates waste, but leads to a surge in carbon emissions from manufacturing, packaging and shipping. In a report published last week, it estimated that total orders last year produced 52,400 tonnes of additional climate-warming carbon dioxide. Official data showed China's courier firms delivered around 20 billion orders in 2015, using 8.27 billion plastic bags, 9.92 billion packing boxes and enough sticky tape to go around the globe more than 400 times. Overall deliveries continued to surge, with the number of packages expected to hit 50 billion next year, up from 30 billion in 2016, according to forecasts by the SPB (The Straits Times, 2017).

As we have seen the tremendous growth of e-commerce in China and the expeditiously growing parcel volume, excessive packaging and actual delivery from the logistics hub to the end-users, namely last-mile delivery created many environmental problems, just to name a few such as traffic congestions, waste problems and air pollution. All E-commerce companies around the world were facing the same issues and they have been working hard to come up with innovative ideas and adopting latest technologies to achieve sustainability.

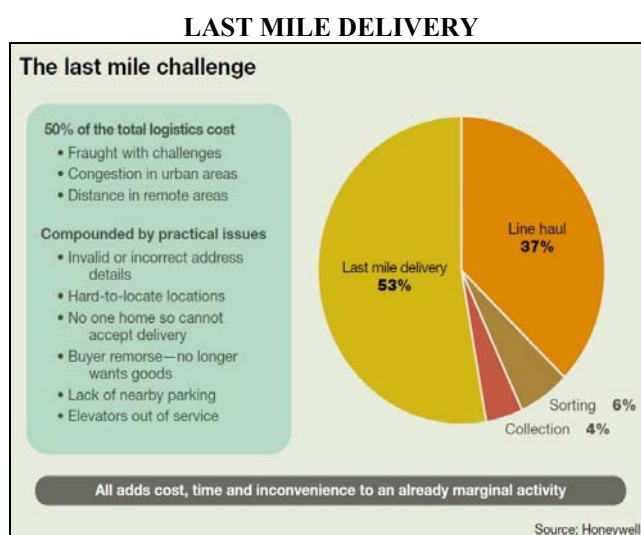
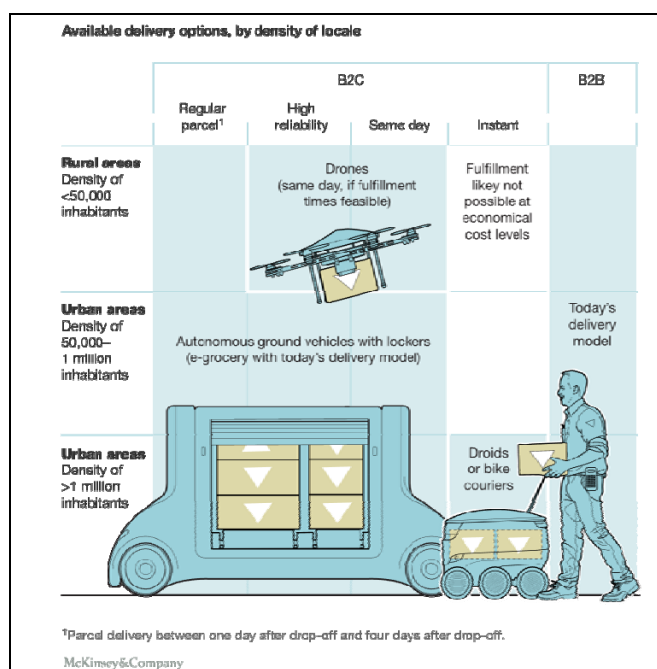


Figure 3: From DC to Final Destination: Last Mile Dilemma

According to Business Insider, Last mile delivery was defined as "In a product's journey from warehouse shelf to customer doorstep, the "last mile" of delivery is the final step of the process — the point at which the package finally arrives at the buyer's door. In addition to being a key to customer satisfaction, last mile delivery was both the most expensive and time-consuming part of the shipping process" (Dolan, 2018).

Rising labor costs and other overheads would provide challenging headwinds for the sector in the coming years. But so much of the infrastructure, such as fulfillment centers and parcel lockers, was already in place (Sololongom *et al.*, 2019).



Source: <https://medium.com/@miccowang/delivery-robots-as-last-mile-solution-aebebe557ad4>

Figure 4: Various models were likely to dominate last-mile delivery, given available product options density, and customer preferences.

ENVIRONMENTAL MEASURES OF EUROPEAN COUNTRIES

In year 2018, the European Commission published its new Plastic Strategy as part of the broader 2015 EU action plan for the circular economy and of the 2008 Waste Framework Directive, would also contribute to reaching the Sustainable Development Goals, the Paris Agreement and the EU's industrial policy objectives, which includes the following strategies:

- All plastic packaging in the EU marketplace must be either reusable or recyclable in a cost-effective manner by 2030,
- Recycle 55% of plastics by 2030,
- Develop strategies to integrate plastics value chains to promote market development (QC Polymers is a great example),
- Remove recycling-hampering substances from products,
- Develop standardized eco labeling criteria
- Consider policy tools to better manage marine litter

The commission aimed at ensuring that, by, 2030, all plastic packaging was reusable or recyclable in a cost effective manner (Davis 2018). In the US, Walmart issued recently a new set of waste reduction commitments around plastic packaging for its private brand program with the following commitments:

- Target at least 20% post-consumer recycled content in private brand packaging by 2025
- Seek to achieve 100% recyclable, reusable, or industrially compostable packaging for its private brand packaging by 2025
- Label 100% of food and consumable private brand packaging with the How2Recycle® label by 2022
- Work with suppliers to eliminate the non-recyclable PVC packaging material in its general merchandise packaging by 2020
- Reduce private brand plastic packaging when possible, optimizing the use to meet the need

Chinese government introduced measures to promote sustainable packaging in logistics industry including setting up green packaging guidelines, tax reduction and incentive programs. They suggested reducing parcel-packaging materials, using more electronic bills and increasing recycling efforts. The new guidelines were part of the country's 13th five-year plan for a cleaner and greener China. Government aimed to increase environmental protection efforts, cut carbon emission and develop cleaner technologies.

SUSTAINABILITY MEASURES OF CAINIAO AND JD.COM

The annual famous Nov 11 Singles' Day shopping festival was the most important date for online retailers like Alibaba and JD.com. Total sales hit 254 billion yuan with 1.38 billion orders placed. The mountain of trash produced from just one day have created serious concerns from environmentalists like Greenpeace. Nie Li, toxic campaigner at Greenpeace stated that 160,000 tonnes of packaging waste including plastic, cardboard and tape were produced. E-commerce firms have drawn up

measures aimed at solving the problem, and aim to replace cardboard boxes with reusable plastic ones that courier companies can share. They have also experimented with biodegradable delivery bags and tape-free boxes, but Nie said the efforts were still not enough (Stanway, 2017).

Cainiao Smart Packaging

Cainiao started a green logistics initiative in 2013 with 32 Chinese International partner, focusing on green solutions such as promoting the use of greener packaging and recycling, adopting electric delivery vehicles in nearly 20 cities, and applying big data to improve efficiency in logistics. In 2015 the project saved 1 billion packing boxes and delivered 0.5 million parcels packed in 100 percent bio-degradable materials to consumers. The project aimed to reduce 3.62 million tons of carbon emissions from the industry by 2020 (Luo, 2017). In 2016, Cainiao Network, Alibaba Foundation, China Environmental Protection Foundation, and the six largest logistics companies in China established the Cainiao Green Alliance Foundation. An investment of 300 million Yuan has been planned for research use to promote green logistics, consumption and supply chain management.

Investor	Speciality	Share	Role in Cainiao
Alibaba	Ecommerce	43%	Data platform, financial reconciliation
Yintai	Property	32%	Warehouse management
Fosun	Conglomerate/Investments	10%	Warehouse construction
FORCHN.com.cn	Conglomerate/Logistics	10%	Line-haul
YTO.net.cn	Logistics	1%	Last mile
SF	Logistics	1%	Last mile
STO.cn	Logistics	1%	Last mile
YundaEx.com	Logistics	1%	Last mile
ZTO.com	Logistics	1%	Last mile

ecommerce^{IQ}

Source: <https://ecommerceiq.asia/cainiao-logistics-southeast-asia/>

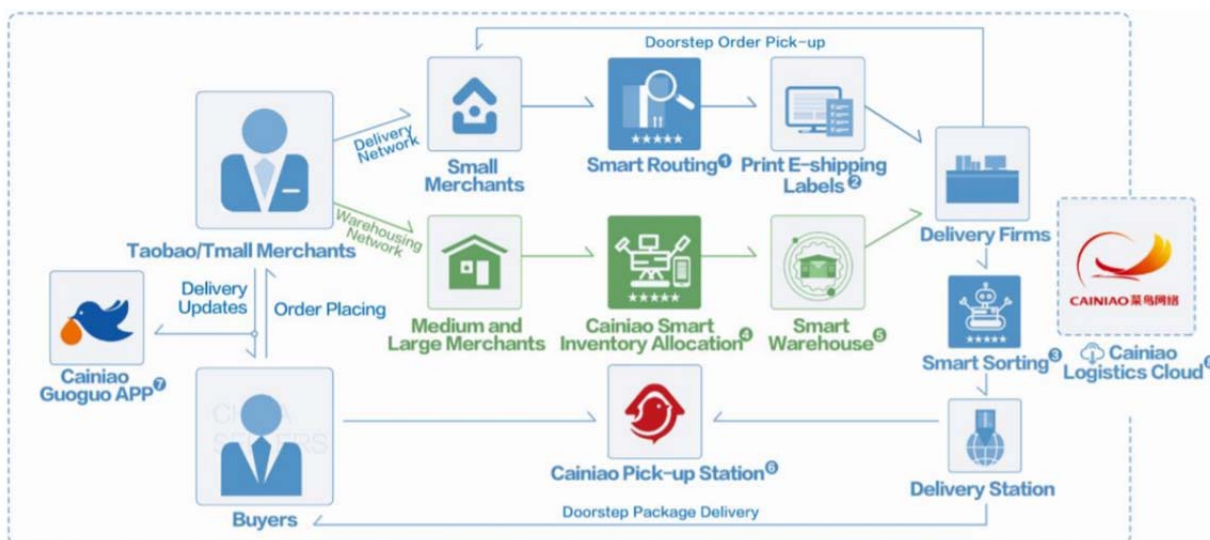
Figure 5: Cainiao Business Model

In the year of 2018, Cainiao adopted advanced technologies to increase its sustainability effort including its smart-packaging technology to reduce 15% of wasted materials and improved packaging efficiency for over 510 million parcels. Wang Pan, head of the Cainiao Logistics Cloud division, which provides enterprise solutions such as the smart-packaging algorithm said “All sellers have to do is to insert the length, height and width of their products and the order history, and the system will automatically recommend the right size,” “When a new order comes in, it will suggest a box that matches the area of the shipments, as well as the order in which the box should be packed and item combinations.”

- Real-time recommendation to merchants on the best delivery option;
- E-shipping labels for easy package identification and tracking;
- smart sorting provides delivery firms with the best route option;
- Based on past sales data, smart inventory allocation helps merchants stock up products in the nearest warehouse;
- Cainiao partners’ smart warehouses enhance efficiency in packaging and despatching;
- Cainiao pick-up stations provide the last-mile delivery solution;
- Cainiao Guoguo App provides one-stop order placing, package tracking and other logistics services;
- Cainiao collects data throughout the logistics chain and share it with partners on its cloud platform;

On top of smart packaging, Cainiao also set up “Cainiao Recycling Project” on Alibaba’s navigation app Amap to direct customers to the closest recycling stations, for every box recycled, they scanned a QR code via their Mobile Taobao, Cainiao or Alipay apps to received “green power” points on Ant Forest, a popular game inside the app that tracked users’ carbon footprints. 5,000 recycling stations to collect shipping boxes at different delivery points, schools and commercial buildings in 200 cities. It has collected over 3.5 million boxes for recycling.

For the B2B wholesale segment, Alibaba’s 1688.com featured sustainable-packaging vendors selling related items, ranging from biodegradable delivery bags to boxes that didn’t require sealing tape. Another subsidiary Tmall Supermarket also changed its duct tape to thinner plastic, with messages written on top to remind customers to separate the plastic tape from cardboard boxes. This would help recycling facilities time and energy spent on removing plastic from recyclable boxes. To take steps forward, Cainiao joined efforts with the Alibaba group in the Alibaba Green Logistics 2020 to improve recycling, packaging, route-planning and delivery methods to reduce waste and promote sustainability. Alibaba CEO Daniel Zhang stated it was very important to make products are close enough to customers before they get sold by reducing package numbers and innovating in new materials (Chou, 2018).



Source: <https://www.alizila.com/wp-content/uploads/2016/09/Cainiao-Factsheet.pdf?x95431>

Figure 6: Cainiao's Delivery and Warehouse Network

Alibaba's Cainiao logistics arm said in emailed comments that it had launched initiatives aimed at minimising its environmental impact. "We are committed to work closely with different stakeholders to protect the environment and contribute to the sustainable development of the industry," it said (The Straits Times, 2017).

JD.com's Green Actions

"China's online retail giants have taken few real steps to reduce delivery packaging waste," she said. "Ultimately, packaging that we throw out after one use is not a sustainable option." A spokesman for JD.com said it was "continually improving ways to better reduce waste and pollution" and, among other measures, aims to raise the proportion of biodegradable materials in its packaging materials to 80 per cent by 2020 (The Straits Times, 2017).

In 2018 JD.com launched its eco-friendly packaging programme which allowed customers to select the reusable packaging option on the billing page while placing orders and return the green box to the delivery personnel after receiving their order. Under this new programme, JD.com would deliver small and medium-sized parcels in reusable packaging and it was expected to save RMB32.5 million annually. It introduced the free service in Beijing, Shanghai, Guanzhou and Shenzhen and target to expand to 20 cities by the end of 2018 (Packaging Gateway, 2018).

Due to the problems of air pollution and traffic jams, JD.com has adopted advanced technology for solutions and it developed drones, AGVs and parcel lockers to increase efficiency and also lessen the impact on environment. JD was the first company in China to use drones to deliver parcels in rural areas in China. It obtained a license to operate drones on a provincial level for logistics purposes, the first company in China to do so. JD had setup logistics operations using drones in seven provinces, including Shaanxi, Jiangsu, Hainan, Qinghai, Guangdong, Fujian and Guangzi. They mainly delivered goods to rural areas that are hard to reach.

JD converted more than 5,000 of its delivery vehicles to new energy and it expected to reduce an estimated several million tons of CO2 emissions after it entire fleet go green. JD also encouraged its manufacturers to adopt more sustainable processes to reduce the impact on environment especially on natural resources. JD also educated its customers about sustainability through its partnership with green advocacy groups like the United Nations Development Programme to let people know how to change their consumption habits and launched a recycling program for used items sent to charities and non-profit organizations to reduce waste and help people living in poverty (Wang, 2019).

DISCUSSION AND SUMMARY

Comparison Of Traditional Packaging And Sustainable Packaging

	<i>Sustainable Packaging</i>	<i>Traditional Packaging</i>
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Advantages	<ul style="list-style-type: none"> – More environmental-friendly: reduce package material waste with greener packaging and make recycling easier. – Reduce carbon emissions significantly and improves packaging efficiency. – Save money by recycling materials and reduce the effort/time on recycling. 	<ul style="list-style-type: none"> – A mature supply chain with suppliers along the chain can work with each other easily. – Enough capacity to meet the fast demand of e-commerce. – Provide protection to goods with low initial cost
Disadvantages	<ul style="list-style-type: none"> – Require initial investment on green solutions (e.g. use biodegradable materials, set up recycling processes and adopt electric delivery vehicles) – R&D cost of new materials is high: need to re-design the original packaging, route-planning and delivery methods. – Require a high degree of information technology adoption. 	<ul style="list-style-type: none"> – Environmental issues: recovery rate is low, hazardous chemical waste risky to human health. – Non-biodegradable materials also cause various pollutions and excessive carbon emissions.
Limitations	<ul style="list-style-type: none"> – Regulation not to mature stage. – Companies have no incentive to adopt more sustainable options, especially SMEs who often face technical barriers such as IT adoption. – Challenges associated with changing consumer behaviors. 	<ul style="list-style-type: none"> – Most of the packaging materials available on the market are not biodegradable. – Most of the packages are thrown away after one use, even though they are still within their useful lifetime. – There lacks regulation to evaluate the environmental impact caused by non-recyclable materials.

Role Of Sustainable Packaging In Improving The Traditional Supply Chain Management

The adoption of sustainable packaging with advanced technologies can improve supply chain management and increase customer satisfaction. The following is one example from Cainiao. The last mile in the shipping process is the most time consuming and expensive part, where the excessive packaging problem always occurs if the last-mile delivery is long. In order to overcome this issue, Cainiao applied big data analysis to improve the delivery efficiency. For instance, it printed e-shipping labels for tracking and identification of the package. The delivery firm can use the information from the labels to sort packages and suggest optimized routes to customers, and there are no additional labels needed to identify packages.

Moreover, with the implementation of information technology, various firms along the supply chain can share data with the others. With such data sharing, the packaging algorithm not only can suggest the most suitable package to be used in delivery, but also facilitate effective forecasting and inventory building. In addition, the products can be shipped in bulk load to the warehouse and then dispatched to customers. This saves packaging materials as well as the last mile delivery cost.

Evaluation Of The Impact Of Sustainable Packaging

The implementation of sustainable packaging is certainly bringing impact to the environment, society and economy.

- *Environmental impact.* Prior to using biodegradable materials, the traditional packaging used many types of non-recyclable packaging materials which worsened issues such as plastic waste, carbon emissions and even traffic congestion. However, by implementing sustainable packaging, the pollution problems can be eased. Some examples include: 1) The adoption of smart-packaging technology by Cainiao in 2018, which reduced wasted materials by 15% to improve packaging efficiency for over 510 million parcels; and 2) Adoption of advanced technology (e.g., drones, parcel lockers) by JD.com, which helped increase delivery efficiency and relieve burden on the environment by converting more than 5,000 of its delivery vehicles to run on renewable energy.
- *Social impact.* In aligning with worldwide initiatives on sustainable development, companies which use sustainable packaging can gain public recognition on the effort it makes on environmental protection. By taking these actions, companies can also deliver on their corporate social responsibility commitment and create win-win situations. Examples here are: 1) In the “Cainiao Recycling Project”, Alibaba allowed its customers to find the nearest recycle station and earn “green points”. This initiative can change consumer habits and increase the cost-effectiveness of the recycle business; and 2) JD.com has a consumer education program focused on sustainability through its partnership with the United Nations Development Program. The initiative allows people to learn about how to change their consumption habits and launch recycling programs for used items sent to non-profit organizations.
- *Economic impact.* The adoption of sustainable packaging brings expansion opportunities for the recycle business. Sustainable packaging materials could be a new investment area for many venture capitals companies. The initial cost might be high, but in the long run when it matures, the entire supply chain should benefit in a cost-effective manner. JD.com showed a good example here, with the new eco-friendly packaging program, it delivered small and medium size parcels in reusable packaging, and it was expected to save RMB 32.5 million annually.

Recommendation For Implementation

In order to eliminate the waste of packaging materials throughout the entire supply chain and reduce the distance of last mile delivery to the consumers, there are many potential solutions that businesses can implement in terms of sustainable packaging without increasing costs for the long term.

- *Forming a Strategic Alliance* – partners within the alliance will share costs, professional skills, returns and most importantly information so a seamless reuse along the entire value chain is possible. Aligning their objectives, particularly reuse objectives, will help align their interests and in turn their operations. As an extension of this alliance, they will also find ways to encourage consumers to use durable packaging in the last mile delivery.
- *Providing policies and regulations that incentivize reuse and recycle* – the government can use policy tools such as more favorable taxes to help the private sector overcome the initial cost barrier before the abovementioned alliance can achieve long term cost competitiveness
- *Socializing the reuse concept both within and without the alliance/industry* – this could lead to more desirable behaviors by industry practitioners and consumers such as: improve package design with a focus to minimize life cycle cost throughout the entire value chain which would solve the redundant packaging that prevails in the industry now; standardize both packaging materials and the packaging process which could simultaneously reduce waste and lower costs, improve operational efficiency and increase reuse opportunities; automate the packaging process to reduce labor cost and minimize waste that is often inevitable in a manual operation.

ROAD AHEAD

With the ever changing e-commerce world and all companies were working hard to take the winning edge in the business, customers were also increasing their expectations in both online shopping experience and faster deliveries, therefore costs were also increasing for these e-commerce companies in terms of labor and adopting advance technologies, would Cainiao and JD.com be able to sustain its leading positions in the e-commerce market? Would the e-commerce companies in China be able to overcome the challenges with increasing number of delivery volume? Would China be able to take a lead in sustainable packaging globally?

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