

Driving Forces for Digital Transformation – Case Studies of Q-Commerce

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ABSTRACT

Companies want to leverage emerging technologies to achieve digital transformation, but most of them are reluctant to take action. This study investigates the driving forces behind digital transformation investment by studying how HKTVMall and Pandamart have invested in new digital technologies to enable q-commerce in Hong Kong, China. Though Pandamart follows a modular approach and HKTVMall follows a staged approach to achieve digital transformation, we have found that in both cases, digital transformation has been driven by economic factors (cost reduction and revenue generation), social factors (changing demographic characteristics and changing customer behavior), and technological factors (proprietary technology advantages and new digital technology capabilities).

Keywords: Digital transformation, q-commerce, IT investment, innovation, IT infrastructure.

INTRODUCTION

Digital transformation has attracted a lot of interest from academics and industrial practitioners due to its profound impact on organizational and industrial transformation. It can change the way individuals and organizations perceive, seize and transform opportunities brought by new digitalization, causing deep changes at multiple levels and creating new ways of innovation (Appio *et al.*, 2021). A recent survey suggests that companies that use new digital technologies or have invested more in such technologies are twice more likely to have a higher revenue growth than their peers (LaBerge *et al.*, 2020).

The outbreak of the COVID-19 pandemic has further increased the urgency for studying digital transformation. A large percentage of the working population has to work remotely due to mandatory government restrictions or voluntary precautions against the pandemic (Nagel, 2020). The need for social distancing has forced a lot of customers to rapidly move to use online channels, leading to many companies' rapid shift toward interacting with customers through digital channels (LaBerge *et al.*, 2020).

The outbreak of the pandemic has also changed executives' views of IT investment. According to McKinsey's survey results, in 2017, half of the executives put cost savings as the priority for their digital strategies, but only 10 percent view technology in this way in 2020. Thirty percent of respondents aimed to modernize core technology capabilities, such as keeping up with competitors, 38 percent aimed to make IT a competitive advantage, and 19 percent aimed to rebuild the entire business around digital technologies. This mindset shift is most common among executives whose organizations were losing revenue before the crisis began. (LaBerge *et al.*, 2020).

Though companies are aware that digitalization will disrupt their industries and are willing to prioritize investment to obtain new opportunities, most of them do not know or are not ready to use such opportunities to achieve innovation and value creation (Appio *et al.*, 2021). How the alignment of business and IT strategies can improve firm performance has been an important research topic for many years (e.g., Sabherwal *et al.*, 2019), but the findings are inconclusive. This is further complicated by socio-technical factors. For example, well-established companies have found their ability to compete digitally is hidden by legacy systems and ways of working instead of the lack of strategic thinking (Ross, 2020). Therefore, new digital systems can improve performance, but there is still a lack of understanding of how and under what conditions firms leverage these new digital systems (Anand *et al.*, 2020).

To address this issue, our study investigates the driving forces behind two companies' investments in digital technologies in Hong Kong. With one of the highest mobile penetration rates in the world, HK has a well-established infrastructure suitable for e-commerce development. E-commerce has grown rapidly in HK in recent years and is expected to grow further. According to Euromonitor (2020), the compounded annual growth rate (CAGR) was 10% between 2014 and 2019, which is expected to reach 12.6% between 2019 and 2024. The e-commerce market value will reach HKD5.5 billion by the end of 2024. The two companies under research are HKTVMall and Pandamart. Both companies are committed to using new digital technologies to develop q-commerce businesses in HK in recent years.

The rest of the paper will be organized as follows: In the next section, we will first review the literature on digital transformation and discuss the incentives behind IT investments from the financial, social, and technological perspectives.

Then, we will move on to discuss the two case studies, HKTVmall and Pandamart. This is followed by an analysis and discussion of the driving forces behind their IT investment decisions. The last section will conclude this study.

LITERATURE REVIEW

Digital Transformation

Digital transformation is defined as “organizational change that is triggered and shaped by the widespread diffusion of digital technologies” (Hanelt et al., 2020) in order to “develop a new digital business model that helps to create and appropriate more value for the firm.” (Verhoef *et al.*, 2021)

Digital transformation is driven by the advent of new digital technologies, changing customer behavior, and the competitive landscape (Verhoef *et al.*, 2021). Emerging digital technologies create new opportunities for companies. Robotics replace humans to save costs in service delivery, and AI and blockchain are used to optimize logistics streams and reduce supply chain costs. Customers have benefited from the on-demand economy enabled by new digital technologies. New social media tools and search capabilities allow information sharing among customers so that customers become more connected and informed than before. With the support of the new digital technologies, customers can participate in designing and customizing the products they buy, completing the last-mile delivery activities, and sharing their user experiences. New digital technologies have also blurred industry boundaries, enabling IT-enabled companies to enter the competitive landscape of other industries.

Digital transformation is a multidisciplinary issue that has an impact on a company’s IT infrastructure, corporate strategy, supply chain management, and marketing strategy. New digital technologies have changed a company’s relationships with its stakeholders. Customers can become co-creators of new products and services, competitors can become collaborators, and suppliers can be bypassed or acquired through vertical integration.

But the use of new digital technologies is not always associated with a positive impact on firm performance. Cappa et al. (2021) study the impacts of big data analytics on firm performance, i.e., using mobile apps to collect private data from customers. They suggest that big data need to be reliable and rich enough to provide insightful information. Otherwise, the costs and risks of collecting, storing, and using the data can harm firm performance.

Therefore, how companies can invest in new digital technologies to leverage existing resources to gain a sustainable competitive advantage (Verhoef *et al.*, 2021) remains unanswered. Appio *et al.* (2021) also call for theoretical and empirical research on how companies innovate and compete in the digital world and how digital technologies have changed the development processes of new products and services.

IT Investment Decisions

Firms choose IT investment to either conform to or deviate from industry norms as a response to competitive pressure or to support their value creation activities (Xue *et al.*, 2012). When making IT investment decisions, companies have a sense-making structure that is made up of a technical structure based on their technical foundations and a social structure built on their behavioral norms and relational ties (Tan *et al.*, 2020). The expected value of IT investments can be understood from economic, technical, and social analysis because the value is a dynamic negotiation process between the theoretical understanding of “value” proposed and supported by science and the application of “value” proposed by the industry and perceived by end-users (Nicolescu *et al.*, 2018).

Financial factors

IT investment can be driven by financial performance shortfalls. IT-enabled problemist search can improve problem-solving capabilities and support product innovation by enhancing knowledge management and facilitating knowledge sharing with business partners (Dong *et al.*, 2021). Business intelligence and analytics systems have been used for problemist searches when there are sustained failures in financial performance and/or operational performance (Anand *et al.*, 2020).

Xue et al. (2012) have found a negative co-relation between firms’ engagement in real earnings management (REM) and the extent of commitment to planned investments in IT infrastructure. They find that IT decentralization weakens the negative association between REM and IT investment commitment, and other corporate governance mechanisms, such as institutional ownership and takeover threats, can complement IT decentralization to further mitigate the negative association.

Additionally, the first-mover advantages of IT investment are found to be related to the industry features. The declining costs of IT investments will lower the average price per unit quality and benefit consumers, but whether the lower costs of IT investments can benefit companies depend on whether they are service quality- or price-sensitive markets (Demirhan &., 2005).

Social factors

IT investment decisions should take into account the hidden social costs and benefits, such as employees’ expertise, task interdependencies, and the degree of change caused by workflow innovation (Ryan & Harrison, 2000). Sabherwal et al. (2019) suggest the positive effect of IT investment on firm performance depends on the social environment. Compared to a stable, simple, and munificent environment, the positive effect of IT investment on firm performance is more significant in a dynamic,

complex, and hostile environment. On the individual level, Park et al. (2016) find that emotional response, like regret, is an important element of the sense-making process when making an IT investment decision.

Technological factors

IT systems can help companies to improve efficiency and develop R&D capabilities. Xue et al. (2012) categorize IT investments into exploitation IT investments and exploration IT investments. Exploitation IT investments enhance operational efficiency, while exploration IT investments enhance innovation by accelerating new product and process innovations.

Investments into different types of IT investments are determined by corporate strategies, for instance, to achieve cost leadership or innovation leadership (Aral & Weill, 2007). Aral and Weill (2007) show that different strategic purposes will determine their IT investment allocations and their IT capabilities in specific IT assets, leading to performance differences. Xue *et al.* (2012) find that IT investment often aims to increase efficiency if the industry and its revenue grow steadily in a relatively stable business environment. If the industry's business environment is dynamic, IT investment often aims to improve innovative capabilities, such as new product and service development and exploration of growth opportunities.

Investment Decision-Making in Digital Transformation

To achieve digital transformation, Li (2020) has identified three innovation approaches emerging in leading organizations, including (1) experimental innovation using experiments to evaluate and recalibrate strategy and guide implementation, (2) radical transformation by taking out a series of incremental interlocked steps and (3) dynamic sustainable advantages through an evolving portfolio of temporary advantages. A further review of the literature suggests two general approaches to achieve digital transformation, the staged approach, and the modular approach.

The staged approach

Companies adopting this strategy believe that they need to go through different stages to achieve digital transformation. They need to first develop the necessary technical and social structures to acquire the necessary capabilities, processes, and routines to accommodate digital transformation (Appio *et al.*, 2021).

Dremel et al. (2017) have identified three stages that a traditional auto manufacturer, AUDI AG, has created big data analytics capabilities by undergoing substantial organizational transformation and developing new organizational structures and business processes. The first stage is to develop big data analytics capabilities by recruiting talents and analyzing customer data. Then the next stage is to adjust existing organizational structures and IT infrastructures in order to develop key digital capabilities, providing data-driven insights for decision making. The final stage allows the company to centrally and strategically exploit big data analytics in a scalable and professional way, leading to new market offerings.

Digitization, digitalization, and digital transformation are other staged approaches suggested by Verhoef *et al.* (2021). They argue that digitization and digitalization should be carried out before digital transformation. Companies should first encode analog information into a digital format to allow computers to use the data. Then, companies should use the technologies to alter existing business processes. Finally, to achieve digital transformation, companies should have digital assets and develop capabilities related to digital agility, digital networking, and big data analytics.

The modular approach

The modular approach divides the overall task into small modules, using new digital technologies to develop temporary advantages. Relying on successive temporary advantages, companies can develop an evolving IT portfolio to create sustainable advantages dynamically and cumulatively (Li, 2020). Unlike the staged approach, the modular approach invests more in R&D than in developing the social and technical infrastructures.

Markins (2017) argues that the plan-then-do approach, such as the staged approach, is dangerous and obsolete because 40% of the strategy's potential value was found to be lost during strategy implementation. Companies should view strategy as a direction or agenda for making investment decisions instead of a plan. The strategy should be considered as a portfolio of options, instead of bonds, which managers should make decisions based on today's tumultuous environment and value flexibility in choosing the way to achieve the strategic objectives. With effective response mechanisms in place, companies can adopt agile planning, learning by testing. Webvan was the world's first online grocery delivery business established in 1996 and ceased operations by 2001, which is used by Markins (2017) to illustrate the deviation between plan and reality. After promising to provide customers with the best quality groceries at the cheapest price, Webvan made a substantial capital investment in developing a nationwide system of distribution centers equipped with stock-picking robots. To justify its investment, Webvan made a bold forecast of future usage, order sizes, and costs without using any reliable proxies. Eventually, it turned out that usage and order volumes were much lower than expected, while capital investments were much higher than expected.

Companies with adaptability, agility, and ambidexterity are found in a better position to use new digital technologies to sustain their innovativeness than their counterparts (Scuotto *et al.*, 2021). They can adapt their structure to market changes and have an open mind to balance infrastructure investments and R&D investments when operating in an uncertain and complex environment.

CASE STUDIES

To understand the driving forces behind companies' investment to achieve digital transformation, we will describe two HK-based q-commerce case studies which have used different approaches: HKTVMall adopts the staged approach, and Pandamart follows the modular approach. These two cases are chosen because they are operating in the same industry in the same city while adopting different approaches to use new digital technologies to achieve q-commerce. Moreover, q-commerce is an emerging phenomenon in HK, so both companies can be regarded as the pioneers in this area. Therefore, it is interesting to study the driving forces behind their investment decisions.

Q-Commerce

To differentiate from traditional brick-and-mortar supermarkets and traditional e-commerce models, as shown in Table 1, we define quick commerce (q-commerce) as “a fast form of on-demand delivery which can deliver goods ordered online by customers to customers in less than one hour.”

Compared to traditional e-commerce models, q-commerce highlights speed. In traditional business models, cost-saving is a priority, so companies need to handle large volumes of products, use large warehouses and optimize load. In q-commerce, as delivery time is a key consideration of customers when making purchase decisions, response time is a priority, so companies use micro-hubs and rely on couriers specialized in last-mile deliveries (Villa & Monzón, 2021).

The demand for speedy delivery is driven by busy urban lifestyles, small families, an aging population, and q-commerce is enabled by the on-demand economy and the capability of instant deliveries (Villa & Monzón, 2021). Besides speed, convenience, consistency, friendliness, and human touch have been identified as the most aspects of customer experience (PWC, 2018).

Table 1: Different Generations of E-Commerce.

	Brick-and-mortar Supermarkets	E-Commerce	Q-Commerce
Way of shopping	In-store self-service	Online order and delivery within a few days	Online order and delivery within one hour
Method of delivery	Delivery truck	Delivery truck	Two-wheeled vehicle
Presence	Megastore	Mega warehouse	Small local store or micro-hub
Target customers	Three or more people households	Three or more people households	Single-person and two people households
Customer preferences	Price sensitive and discount matters	Price sensitive and discount matters	Time-sensitive and speed matters

Source: This study.

The COVID-19 pandemic has also encouraged new customers to purchase online for the first time. Due to social distancing measures, more and more customers have realized the convenience of online shopping and reduced their concerns about security and privacy. Research shows that customers have not rushed back to physical stores in China even after the lockdown ended. Even after the pandemic is over, online sales in the four main consumer categories, including food and beverages, pharmaceutical and medical suppliers, personal care, and pet products, are expected to continue to grow (Escudero *et al.*, 2020).

But the development of q-commerce is facing similar challenges to urban e-commerce distribution, such as small volumes, high resupply frequencies, complex delivery addresses, low stock levels, and timely deliveries. Therefore, companies have used new methods in urban logistics, such as lockers, collection points, and mobile warehouses, to reduce the number of vehicles, trips, and failed deliveries (Villa & Monzón, 2021).

The HKTVMall Case

(We embrace a clear goal to build a large scale “infrastructure” for online shopping platform in Hong Kong, to build an “infrastructure” that competitors have to spend a long time to catch up with, to build an “infrastructure” that our Hong Kong retailers have not been trying to develop with science and technology over the past decades. These “infrastructures” include a system that handles and combines the order, picking, return, exchange, and payment for our 2,000+ merchants; automated warehousing, pick & pack system that keeps 20,000 to 30,000 products and processes more than 30,000 orders daily; and a logistics and delivery system that collects and disseminates products from multiple merchants and consolidates into one single order. While you may not be able to imagine the difficulties and complications, this explains why there is no large-scale online shopping platform in Hong Kong until today.

—Ricky Wong, Founder, HKTV (Wong, 2018)

HKTVmall is the largest e-commerce platform in Hong Kong, operating 24 hours to provide a “one-stop-shop” platform to local customers.

After a trial operation in December 2014, HKTVmall was formally launched in February 2015 under the slogan “We Sell Whatever You Can Imagine.” In 2018, HKTVmall decided to use technologies to reshape retail patterns in Hong Kong after observing the changes in consumer behaviors in HK. The total retail sales in HK dropped from HKD493 billion in 2014 to HKD446 billion in 2017, and HK consumers were increasingly using overseas online platforms. Customers paid fewer visits to physical retail stores but bought goods online and received them from courier trucks or pick-up centers. In HK’s major commercial centers, Tsim Sha Tsui and Causeway Bay, the number of local consumers and high-spending China mainland visitors from top-tier cities had dropped (HKTV, 2018a).

From the start, HKTV set the objective to build long-term capacity by investing a large proportion of capital in logistics infrastructure. With its own infrastructure, HKTV can maintain its independence and make it difficult for its competitors to replicate its business model. Their mission is “to build an Ecosystem to transform Hong Kong business operation, trading, retail, finance, and daily life onto a digital online platform” (HKTV, 2018b).

In 2018, HKTV planned a four-stage operational model in order to break even and become profitable. Stage one started with the cost control for warehousing, packaging, and delivery services; Stage two was to lower the operation costs of HKTVmall, covering merchandising, marketing, new customer acquisition, and customer services; Stage three focused on supporting functions, including finance, administration, and talent management; and finally Stage four focused on research and development, including information technology and new service development (Wong, 2018).

The company became profitable for the first time in 2020, partly due to the outbreak of the pandemic. Now the company has partnered with over 4,200 merchants, providing more than 500,000 products on its website. The products on offer include groceries, beauty products, electrical appliances, houseware, toys, books, and insurance. The number of orders processed monthly is more than 580,000 on average now (HKTV, 2021). In 2020, HKTVmall ranked first in Top Trending Shopping Sites and second in Top Trending Keywords of Google Hong Kong Year in Search 2020.

HKTV Shopping Network Co. Ltd. and HKTVexpress – Online shopping malls

As HKTVmall’s online shopping malls, HKTV Shopping Network Co. Ltd. and HKTVexpress are featured with an online-to-offline approach and one-click purchase. Adopting an online to offline (O2O) approach, HKTVmall has physical stores, or so-called concept stores, so customers can choose to have the goods delivered to their homes or pick up from concept stores. In 2016, HKTVmall opened the first concept shop in North Point on HK Island to provide an offline customer experience. The size of the store is 200 square feet with fewer than five salespeople. Salespeople can use the 50 tablets available in-store to help customers shop on HKTVmall.com. They opened the second one in Ap Lei Chau in June 2017. These concept stores are developed mainly for promotion and pick-up services, but they have also helped to boost sales. With the opening of the second concept store, for instance, the sales of Ap Lei Chau increased from HKD0.3 million to HKD1.3 million in one month’s time (Cui, 2017).

HKTVmall also hopes concept stores can improve customer experience by giving customers more choices. Customers can place orders anytime online and pick them up in stores, and they can also directly buy the goods onsite. The number of O2O concept stores reached 64 in 2020, selling groceries, beauty and health products, electronics, mother and baby products, and homeware (HKTV, 2021). Since February 2020, HKTVmall has added a total of 115 pick-up points to its network by partnering with well-known chain retailers, including Hung Fook Tang, Baleno, GIORDANO, CATALO, and Foodwise. HKTVmall customers can choose these retailers’ outlets to pick their orders.

Self-pickup of goods can reduce transportation costs and speed up delivery, which enables the company to sell even frozen meat and fresh vegetables. In 2017, HKTVmall delivered seafood directly from Japan, bringing hairy crabs from Hokkaido. In January 2021, HKTVmall launched its first Online Flower Market to support local florists by offering a special commission rate. This broke the traditional limitation for retail to have live streamlining on both HKTVmall Live Shopping Channel and social media page for promotion. By partnering with merchants, HKTVmall is able to offer more varieties of products. In 2018, for example, compared to the traditional online supermarkets offering 40,000 different product items (or SKUs), HKTVmall was able to offer nearly 180,000 SKUs, including 20,000 from its own warehouses and 160,000 from merchants’ warehouses (HKTV, 2018b).

Leveraging HK’s high mobile penetration rate, HKTV has developed one-click purchasing features, personalized homepages, and filters to enhance mobile-optimized applications for customers (Chan *et al.*, 2020). The one-click purchasing function has simplified the order process by saving users’ payment details, and the personalized filters allow users to set their own filters like product price or producer when searching for goods.

HKTVMall also makes online payment easy. In April 2018, the first Open API partnership with Citibank to launch Citi Pay with Points on HKTVMall, and in June, it partnered with PayMe to launch seamless, secure mobile payments on the HKTVMall app. In July 2020, HKTVMall partners with Citibank to launch the first HKTVMall co-branded credit card. In October, HKTVMall launched eWallet, HKTVPay, to be used in all HKTVMall O2O shops and physical stores of merchant partners

In April 2021, HKTVexpress was launched. Operating 24 hours, HKTVexpress promises to deliver the ordered goods within one hour. The goods HKTVexpress delivers include food, grocery products, and fresh produce. The delivery fee for orders of HK\$200 or above is HK\$10. Otherwise, it is HK\$20. Customers can also choose to pick up their goods from HKTVMall's concept stores. HKTVexpress provides services from 70 shops, each serving customers within 2 kilometers (Magramo, 2021).

HKTV e-Commerce Fulfillment Co. Ltd., HKTV Logistics Network Co. Ltd., and HKTVexpress – The supply chain

With HKTV e-Commerce Fulfillment Co. Ltd. and HKTV Logistics Network Co. Ltd., HKTVMall runs its own supply chain. HKTVMall's extensive fulfillment and logistics network have several automated warehouses, fulfillment centers, and delivery fleet, which are enabled and supported by big data and sophisticated systems. The company sources products, builds its own warehouses, automates the pick and pack process, designs and acquires its own delivery trucks, and designs and builds its apps, websites, and backend support systems.

Between 2015 and 2020, HKTVMall invested about HKD949.8 million in its supply chain to develop the cross-belt sorter system, add more delivery trucks, renovate fulfillment centers and enhance system capacity (HKTVMall, 2021). In 2016, HKTV expanded its warehouse and logistics center to Tsing Yi for an additional 144,000 square feet and launched the first Online Electronic Product Warehouse. In 2017, the company developed a robotic picking system and a conveying system in its Tsing Yi center to increase the fulfillment capacity. In 2018, the automated picking and warehousing system at Tsing Yi logistics center started full operation in March. In 2019, an automated picking & warehousing system at the logistics center of Tseung Kwan O headquarters commenced operation in March and later opened a new logistics center in Tuen Mun in July. In February 2020, a cross-belt sorter system commenced operation at the logistics center in Tuen Mun. At the same time, HKTVMall started working with individual drivers and companies to increase the number of trucks in operation, and the highest number of trucks available for use reaches 350 a day.

The fulfillment network and logistics systems have matured now and become an important part of HKTVMall. The systems not only handle and deliver customer orders for HKTVMall but also support third-party warehouse management and delivery services, mainly serving HKTVMall's merchant partners. The systems have enabled its merchants to focus on merchandising, digital marketing, and sales, strengthening the bonds and relationships between merchants and HKTVMall (HKTV, 2021). Moreover, for HKTVMall, the more orders received, the lower the distribution costs because the higher the distribution density in each region, the shorter the delivery distance.

In 2021, HKTVexpress was launched by HKTVMall in partnership with Zeek, a smart logistic platform, to improve the capacity of its existing fulfillment system. Over the years, HKTVMall has established a loyal customer base, the expertise in logistics and delivery through learning by doing, developed the infrastructure based on automation and possessed a large amount of customer consumption data to enable big data analytics (Chan *et al.*, 2020). With years of experience in handling instant delivery, Zeek specializes in providing B2B Q-commerce solutions, using its own order and courier management system and a delivery fleet in HK. Therefore, HKTVMall and Zeek have complementary advantages to jointly deliver q-commerce.

Shoalter Technology Ltd. – A technological solution provider

In November 2020, the company set up Shoalter Technology to benefit from the well-established online platform of HKTVMall. HKTVMall's platform covers every stage of customers' entire purchase journey, from placing purchase orders, arranging delivery through HKTVMall's self-operated logistics centers or its merchants for pick and pack to receiving goods enabled by its last-mile delivery. Particularly, as the only customer contact point, HKTVMall's logistics and delivery require very precise calculations and the full support of automated robotic systems. Building on HKTVMall's accumulated skills, know-how, and experiences, Shoalter provides technology solutions using robotic systems, cloud platforms, and big data to assist local and overseas companies in transforming traditional retail and e-commerce models to q-commerce models. By providing end-to-end e-commerce solutions locally and globally, Shoalter can share HKTVMall's unique knowledge, experiences, and technical skills in e-commerce.

The name, Shoalter, combines the word "Shoal," which means small fishes cooperate against external enemies, and the word "alter" means making the changes. Shoalter, therefore, indicates the unity of different retailers to change and to search for a new direction for the retail industry (HKTV, 2021). HKTVMall believes that no single online shopping platform can monopolize the markets because every retailer has its own preposition to target customers of different types and age groups, and Shoalter's business partners will become the leader of their specific market segments to be mutually complementary to HKTVMall's leading position in an online supermarket (HKTV, 2021). In HK, for example, Shoalter hopes to provide IT solutions to develop another two or three large-scale online shopping malls.

The company expects the actual return from Shoalter will be similar for HKTVmall to run its own online shopping mall. Besides the one-time implementation fee, Shoalter charges its business partners annual fees and sales turnover-based commission fees (HKTV, 2021). In December 2020, Shoalter entered into a definitive e-commerce solution agreement with an HK-based retail group. Shoalter provides hardware and software systems as a service to the retail group to support the setting up of its online shopping mall, which is expected to be launched in the third or fourth quarter of 2021 (HKTV, 2021).

The Pandamart Case

The parent company of Pandamart is the Delivery Hero Group based in Berlin, Germany. Delivery Hero is one of the largest food and grocery delivery companies in the world, using online platforms to provide customers with on-demand food and grocery delivery services. In April 2021, the group saw a 400% year-on-year (YoY) growth of its q-commerce orders, processing a daily average of 400,000 orders globally. In Asia, this YoY growth even reached 450%. Pandamart accounts for nearly 30% of the Group's global cloud store operations (Foodpanda, 2021).

Delivery Hero firmly believes that technology is useful to meet the demands of more informed, proactive, and demanding customers in a highly digitalized world (Delivery Hero, 2019). They believe that urbanization and small households have led to rising demand for the fast delivery of goods in small quantities instead of purchasing many goods in large quantities at a cheaper price (Nierynck, 2020).

With the largest IT team operating from its headquarters in Berlin, Delivery Hero has strong and agile regional IT teams in all its segments. While leveraging the group's global platform, its local operations often rely on local IT teams to develop local solutions. The group normally invested about 5% of its revenue in R&D. In 2020, Delivery Hero's R&D expenses increased from €65.0 million in 2019 to reach €129.3 million, about 5.2% of its total revenue (Delivery Hero, 2020).

Delivery Hero's R&D investment focuses on developing innovative technologies to address specific issues, and the group has outsourced its IT and communications infrastructures to third parties, including SAP and Salesforce. Third parties provide a wide range of services to the Group, such as data host services, marketing, and payment processing. The group has also used licensed technologies provided by third parties. For example, the technology used to design the system for securely transmitting customers' personal data is third-party licensed authentication technologies (Delivery Hero, 2020).

Pandamart was first introduced to HK as the online grocery division of Foodpanda in late 2019 to meet the changing demand of lifestyles changes in HK. The decision was made based on Foodpanda's sales data, which showed that due to more single families, smaller living spaces, and busier lifestyles, there is an increasing demand for faster and more convenient delivery (Yuen, 2020). Unlike traditional supermarkets or e-commerce providers, Pandamart targets those customers who need urgent top-up services. Pandamart promises to deliver the goods to all customers in their markets within 25 minutes by the end of 2022, regardless of the size of the order (Foodpanda, 2021).

Pandamart benefits a lot from Delivery Hero and Foodpanda HK. Delivery Hero's technological strengths and Foodpanda's process mechanism in HK enable Pandamart to have a strong technology base to run its business. Pandamart and Foodpanda share the same infrastructure and operating system in HK. As in the first quarter of 2021, Foodpanda led HK's food delivery market with a 51% market share, and the majority of these users (43%) used Foodpanda exclusively (Measureable AI, 2021).

Pandamart is using Foodpanda's delivery team, which allows Pandamart to enter the new businesses at a lower cost without affecting Foodpanda's existing core businesses. The thermal storage bags Foodpanda has been using can hold up to 20 SKUs, which is similar to the typical basket size of Pandamart. The only difference is that Pandamart focuses on grocery and electronic stores while Foodpanda focuses on restaurants.

Customer Recommendation System

Pandamart offers customers on-demand services with a wide variety of products. Customers can use its delivery app to get what they want 24 hours a day, seven days a week. Its service covers 80% of the total population in HK and aims to cover 100% by the end of 2020. The average delivery time is 25 minutes and as quick as within 15 minutes.

Pandamart offers more than 40,000 items online, including flowers, party supplies, pharmacy, cosmetics, snacks, electronics, fresh produce, home goods, and even alcoholic beverages. Pandamart is working directly with manufacturers and suppliers to offer a massive selection of brands. Customers can also use Pandamart's app to order a variety of products from local shops, including Circle K, Marks & Spencer, DS Groceries, and Muji. The fresh produce offered by Pandamart, such as dairy products, fruits, poultry, and vegetables, comes from small and medium enterprises and local grocers.

To improve customer experience, the company has collected big data and, based on data analysis to recommend meal and grocery products to customers even before customers make purchase decisions. It helps customer retention and future business growth by providing tailored customer service and detailed customer awareness. Additional revenues are generated from marketing services and cross-selling other products and services that match customer preferences (Delivery Hero, 2020). The ultimate goal set by Pandamart is to reach the point where they know exactly what each customer wants and when they want it. In December 2019 alone, the Delivery Hero Group possessed 22 billion data points following its data-driven approach. Big

data collection and analytics have simplified their ordering process and personalized their products. The order frequency increases after the company provides personalized recommendations, images of products, different payment options, convenient reorder facilities, and other subtle feature improvements (Delivery Hero, 2019).

Dark Stores (Dmarts)

The warehouses leverage our existing logistic network to provide efficiency and speed without the traditional geographical constraints. It also creates new distribution channels for small and local businesses with an additional window to sell their products.

—Arun Makhija, CEO, Foodpanda Hong Kong (Yuen, 2020)

Dmarts, also called dark stores or cloud stores, are Pandamart's warehouses. Their sizes are between 4,000 and 5,000 square feet, smaller than traditional supermarkets' warehouses. Dmarts have enabled the company to provide quick last-mile delivery services for convenience and grocery products. A significant number of Dmarts opening in 2020 and the early half of 2021 have accelerated the fast growth of q-commerce in Delivery Hero globally (Delivery Hero, 2021).

All Dmarts rely heavily on technologies and data intelligence, including location selection, the products on the shelves in each store, and the arrangement of inventory to maximize picking efficiency. Using location intelligence and data trend insights, Pandamart has located Dmarts strategically to make grocery deliveries accessible to local communities. Demart's location has an optimized delivery radius and shortened order time, and its average delivery radius is 2.2 kilometers. Using two-wheel delivery fleets, such as bicycles and motorcycles, instead of trucks or vans, Pandamart is able to meet the 25-minute delivery service commitment (Nierynck, 2020).

There are 17 Dmarts in Hong Kong, including highly populated neighborhoods such as Central, Mong Kok, North Point, Tsuen Wan, and Tseng Kwan O. Though the rentals are higher than those outside the city center, Pandamart considers these centrally located Dmarts as a geographical advantage which enables the company to reach more customer faster and smoother (Nierynck, 2020). They also have some dark stores in non-prime locations, such as Chai Wan and Siu Sai Wan, paying lower warehouse rentals. Its location selection is aligned with Pandamart's sales strategies which emphasize the market demand, demographic distribution, and income levels of the residents.

Dmarts are purpose-built for deliveries only, not open to the public. The company only allows authorized Pandamart staff to access these dark stores to make sure a smooth and quick operation. Normally it takes fewer than five minutes for staff to pick and pack products in the dark stores. Interestingly, this minimum store patronage and a touch of products in the dark stores help Pandamart to ensure a high level of hygiene and safety during the COVID-19 pandemic. Operating around the clock, Dmart is a competitive advantage of Pandamart, but the handling costs like labor costs and utility costs can be high.

Logistics and Delivery

Delivery Hero regards its existing logistics and delivery infrastructure as a competitive advantage, which enables the company to capture and satisfy customers' increasing demand for convenience (Delivery Hero, 2020). Logistics technologies, such as demand forecasting, fleet management, and route optimization, have reduced the cost per order and the delivery time as well as increased customer satisfaction and loyalty.

Delivery Hero is making considerable investments in delivery service, especially in the form of riders and delivery-related technology and capabilities (Delivery Hero, 2020). To improve unit economics and improve delivery efficiency, Delivery Hero has spent years building and refining its proprietary delivery area technologies. The technologies can not only define the delivery areas but also provide real-time optimization and delivery time estimates. The delivery time uses custom-built machine-learning algorithms based on the company's proprietary data. Its rider scheduling tool can continuously balance supply and demand and provide the riders with maximized flexibility. Using its proprietary data and algorithm, Foodpanda can estimate vendor preparation times based on the day of the week, the time of the day, and the size of the order to match the time a rider requires to reach the restaurant (Delivery Hero, 2019). This system can improve the food quality by reducing the time the food stays in the bag, which is also useful to assist Pandamart's operations.

In 2019, Delivery Hero developed and implemented its proprietary technology to provide innovative solutions, "Hurrier," to its restaurant partners. The solution not only enables restaurants to forecast demand and supply, manage the inventory and smoothen the delivery process but also improves the group's own delivery operations. Moreover, the company is able to provide live tracking or constant status updates to its customers, which has improved delivery accuracy (Delivery Hero, 2019).

Delivery Hero is also working to make use of innovative technology to improve operational efficiency to meet the growing demand for home delivery. In 2021, its autonomous robot will reach the testing stage in Sweden (Delivery Hero, 2021).

DISCUSSIONS

In this section, we will discuss the motivations behind HKTVmall and Foodpanda's IT investments from economic, social, and technological perspectives. The IT applications mentioned in the discussion reflect the features of new digital technologies which can differentiate q-commerce from traditional grocery retailing business models.

Economic Factors

Generally speaking, cost reduction and revenue generation are the two economic incentives behind HKTVmall and Pandamart's investments in new digital technologies.

First, both companies have invested in new digital technologies to improve the inventory process and lower the costs of inventory management. HKTVmall has used robotics in managing inventory in its warehouses to lower labor costs and improve the accuracy of inventory management. Pandamart has the system "Hurrier," developed by its parent company Delivery Hero, which can not only improve its own delivery operation but also help business partners to forecast supply and demand, manage the inventory and smoothen the delivery process.

Second, both companies have invested in new digital technologies to improve last-mile delivery and lower operational costs through partnerships. The use of new digital technologies makes collaboration with different business partnerships more convenient and efficient. As the number of orders increases, companies can optimize business operations and reduce costs by achieving an economy of scale. Besides home delivery, HKTVmall can use its concept stores and the retail network of its networks to offer pick-up services to its customers. HK's rent ranks among the highest in the world, and the average area of a traditional supermarket is thousands of square feet. An HKTVmall's concept store is about 200 square feet, which means the rental is a lot cheaper than a traditional supermarket. Moreover, HKTVmall has invested in developing an IT infrastructure for a number of years. When the number of orders increases, the company can lower the operational costs by automating the picking and packing and inventory management process and achieving the economy of scale.

Pandamart can save even more rentals because it does not have any physical stores. Different from HKTVmall, Pandamart is able to leverage Delivery Hero's technological innovations and HK Foodpanda's well-established network to lower operational costs and reduce the associated risks. Pandamart can share Foodpanda's infrastructure and rider team, reducing the cost of idle resources. While HKTVmall has developed its own infrastructure, Pandamart's outsourced its IT and communication infrastructure to third parties. Pandamart relies on individual technological innovations to achieve the economy of scale. For example, it has an optimized rider scheduling tool to balance supply and demand using big data analytics, which helps to shorten the delivery distance and time while giving its riders maximum flexibility.

Third, both companies used big data analytics to better understand customer preferences, which helps to accurately market products to the right target customers, thereby generating more revenue. For instance, Pandamart uses a customer recommendation system to make a recommendation to customers before they make a purchase decision. This not only targets the right customers but also promotes cross-selling.

Social Factors

Changing market demographic characteristics and changing consumer behaviors can motivate companies to invest in new digital technologies.

First, both HKTVmall and Pandamart have observed changing demographic characteristics in HK and decided to invest in new digital technologies to realize q-commerce. HKTVmall made the decision to invest and change the retail patterns in HK in 2018 when the company discovered the downward trend of traditional retailing. In the case of Pandamart, the decision to enter into the HK market was made when Foodpanda's business indicated the general trend of more single-person households, smaller living spaces, and busier lifestyles in HK.

Second, changing customer behavior is a key motivation behind both companies' investment decisions on digital transformation. In recent years, an increasing number of customers have purchased grocery products from online platforms, which was further triggered by the outbreak of the COVID-19 pandemic to maintain social distancing. After the pandemic broke out, those customers who made their first online purchase discovered the benefits of convenience and relieved their security and privacy worries. They will tend to buy more online. As more customers buy from online platforms, companies have the opportunity to use big data analytics to better understand customer demands and improve customer experiences. With more customer data available, big data analytics can be applied to improve customer experience by providing personalized customer services. It is also helpful to accurately identify target customers with the right marketing schemes. For example, Pandamart is able to base on big data analytics to make purchase recommendations to customers before customers make the decision. HKTVmall relies on big data analytics to decide on the location of its concept stores.

Technological Factors

Both companies have invested in new digital technologies to develop and sustain competitive advantages and minimize the risks of being imitated by their competitors. However, these two companies differ in their approaches to balancing IT infrastructure and innovation investments. In other words, HKTVmall's technological strength lies in its well-established IT

infrastructure to enable digital transformation, while Pandamart's technological strength lies in its proprietary technologies to meet the commitment of 25-minute fast delivery.

HKTVMall has adopted a staged approach, achieving radical digital transformation by making incremental, step-by-step changes. Now HKTVMall has developed a unique and comprehensive IT infrastructure, which is very difficult for other companies to imitate. Leveraging its well-established infrastructure and accumulated knowledge and experiences, HKTVMall not only runs its own operations but also set up a new company, Shoalter, to provide technological solutions to help e-commerce companies and retailers to go through digital transformation.

Pandamart has adopted a modular approach by creating dynamic, sustainable technologies through an evolving IT portfolio of temporary advantages. Instead of developing and maintaining its own IT infrastructure like HKTVMall, Delivery Hero, and hence Pandamart has outsourced its IT and telecommunication systems to third parties while focusing on developing its proprietary technologies. Delivery Hero has made a significant amount of investment in R&D to develop proprietary technologies to enable fast delivery. Its proprietary systems, such as Dmart's location intelligence, demand forecasting, fleet management, and route optimization, have enabled Pandamart to deliver the ordered goods to customers within half an hour, creating its competitive advantages.

Despite the differences in IT strengths, the availability and capabilities of new digital technologies have enabled both companies to achieve digital transformation. As a pioneer to build smart warehouses and logistics systems in HK, HKTVMall leverages big data analysis, using algorithms to help automate the entire e-commerce supply chain. Based on the customer data collection on their e-commerce website, the company has applied big data analytics to understand consumer behavior. This helps HKTVMall to have a more accurate target marketing strategy (Chen et al., 2020). Similarly, Pandamart uses big data analytics to decide the locations of Dmarts and to make product recommendations to customers before ordering, which helps to achieve q-commerce and improve customer experience.

CONCLUSIONS

This paper analyses the driving forces behind two HK-based q-commerce companies, HKTVMall and Pandamart, to invest in digital transformation. To achieve digital transformation, HKTVMall adopts a staged approach by taking out incremental, step-by-step changes with the focus on developing a unique IT infrastructure, while Pandamart adopts a dynamic, modular approach by developing an evolving portfolio of temporary advantages with the focus on R&D to develop key function innovation. Through adopting different approaches and investing and using new digital technologies in different ways, both companies' engagement in digital transformation is driven by economic factors (cost reduction and revenue generation), social factors (changing demographic characteristics and changing customer behavior), and technological factors (proprietary technology advantages and new digital technology capabilities).

While our research has addressed the driving forces behind digital transformation, future studies can investigate how corporate performance differs if two companies have adopted different digital transformation approaches in the same industry. Moreover, since the nature of the industry is an important determinant of IT investment (Xue *et al.*, 2012) and the two cases we studied belong to the same industry, it is an interesting topic to study how digital transformation decisions are influenced by industry-specific factors.

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