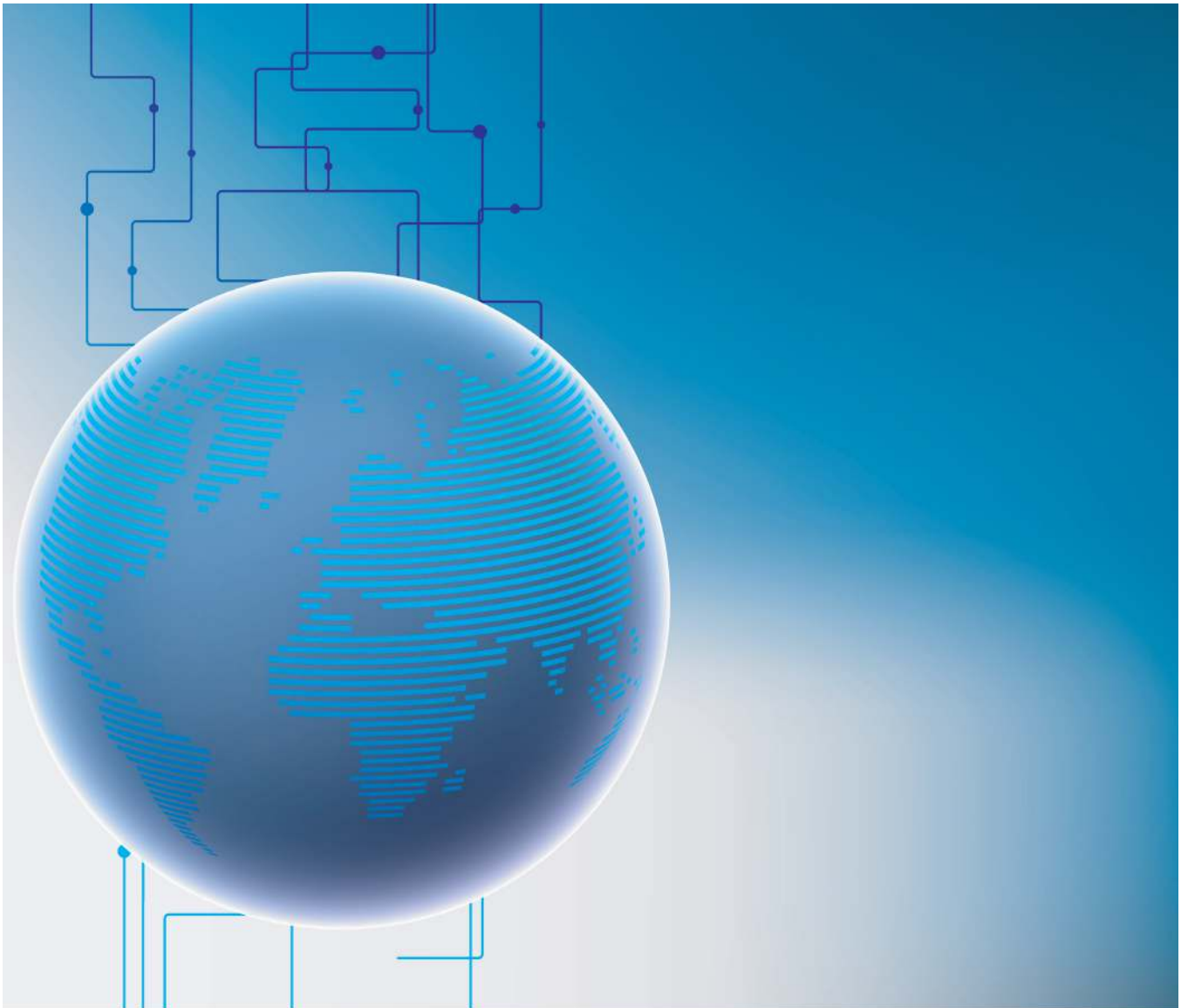# THE DIGITAL COMMERCE INFRASTRUCTURE

EQUINIX

PREPARING FOR DIGITAL TRANSFORMATION

PENELOPE ODY
Editor

Estimates may vary from 2 to 4 seconds but if a webpage takes longer than that to load then most likely at least half of the would-be visitors to the site will have clicked away to something faster. Today's shoppers are not only impatient and demanding, they expect the same sort of digital interactions that they experience on their own tablets and mobiles to be available on the websites and stores they visit.

For long-established retailers now trading in an omnichannel world, that can be challenging. Adding the necessary digital technology to legacy enterprise systems hosted in on-premise data centres can be both expensive and time-consuming. In a rapidly changing retail marketplace any delay in implementing the new services consumers expect – from augmented reality enhancing product information to precisely-timed deliveries – can prove detrimental. Equally, ensuring a seamless customer journey and consistent customer experience in whichever channel the shopper travels through is vital.

As IT systems – and IT departments – struggle to cope, the "business", desperate for a much-needed solution, typically opts for a standalone application to supply the latest "must have" and the integration issues proliferate: especially if this latest piece of clever software happens to reside in a cloud. Add the ever expanding "internet of things" (IoT) with a growing assortment of "smart" consumer devices which shoppers expect retailers to understand and use, and it is hardly surprising that many respondents of RetailX's survey, conducted for this whitepaper, expressed frustration with their corporate technology.

In this whitepaper we look at some of the digital transformation models companies are developing in order to create a flexible infrastructure that can cope with both legacy applications, assorted data centres and numerous cloud service providers (CSPs). Digital transformation and IoT devices not only move processing power closer to the customer but can also deliver the "smart" services and enhanced experience that customers expect to find in-store. Following sections cover "meeting digital expectations", and "delivering the digital experience in-store", as well as focusing on the practicalities of implementation in "embracing digital infrastructure" with a case study reviewing how the Co-op has moved from a fragmented IT base with "one of everything" to a fully integrated hybrid platform. Finally, we summarise the results of the RetailX attitudinal survey providing current retail and e-commerce views of digital infrastructure development and progress. ■

Internet Retailing   www.internetretailing.net

ENABLING TODAY'S RETAIL ENTERPRISE

There is no better place than the "High Street'" to observe where digital transformation is having a significant effect. In the last 18 months many household names including Maplins, Toys 'R' Us, Homebase and House of Fraser have fallen into administration or CVAs, and retailers are now having to rapidly shift their business models to support the increasing demands and expectations of the digital-savvy consumer.

Customers are looking for different omnichannel experiences that legacy bricks-and-mortar retailer infrastructures cannot provide. Supply chains require agile, dynamic integration with retailers for fast reaction to inventory and pricing changes. In-store experiences must be more connected to online consumers. Data capture and analytics around customer buying habits must be updated to include online and social interactions and integrated with online advertising

Today's retailers need to embrace a modernised IT strategy supported by infrastructure designed for the "digital edge" – reducing costs and latency while dramatically improving speed, user experience and capacity. Their IT estate cannot be siloed but needs to be distributed. This way they have direct access to their customers, the partners they need to connect with, and can guarantee the fast, secure, low-latency exchange of information needed to be competitive and deliver great service.

Equinix's global interconnection platform of more than 200 data centre locations in 52 metros spanning 24 countries enables this. By creating points of presence (PoPs) within an Equinix location, both regional and global retail operations can seamlessly reach everywhere, interconnect everyone and integrate everything. They can connect privately to multiple networks, internet service providers (ISPs), content delivery networks (CDNs) and cloud providers, and move data and analytics nearer to the customer to offer a better quality of service.

In addition, the specific nature of retail requires a platform with bandwidth and connectivity that can flex up and down according to demand, as well as analytics that give them end-to-end visibility and control. Retailers can localise traffic and services according to which market they want to reach, as well as locate hubs near to stores, suppliers and distributors.

There has also never been such a richness of technologies and tools to call on for business success – from data analytics, automation and artificial intelligence, to cloud-based systems, software-defined infrastructure, and the Internet of Things (IoT). Greater opportunity is there, but the retail industry needs to be ready to make the most of it.

Whether the use case is improving customer experience via mobile devices, connecting supply chains and payment partners or on-demand multi-cloud access, Equinix enables the modern retail enterprise to be agile, remain competitive and to navigate the disruptive changes that confront them. ■

MATT GEORGE
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MOVING TO A DIGITAL WORLD

From around 19% of total UK retail sales today, online is expected to account for more than a quarter of retail spending within three or four years. For many omnichannel retailers that proportion is already significantly higher – and all the time websites are becoming ever more content rich, customers more demanding, and the assortment of digital devices to be connected increasingly varied. Add the peaks and troughs of seasonal retailing, the vagaries of global trade, a need for real-time connectivity, voice-activated assistants, or artificial intelligence (AI) and it is hardly surprising that traditional IT systems often struggle to cope.

In the past, persuading a retail Board to invest in a major IT infrastructure change was often a CIOs greatest challenge. Such projects were generally regarded as high-risk, time-consuming and delivering little – if any – perceived benefit to the "business". Far better, would argue the Board, to spend the money on opening a new store or updating the EPoS system. Times change. Today, those retail Boards are more likely to be discussing store closures than new openings, while becoming a digital-native business may be high on the strategic priorities list.

Large retailers have always operated in a widely distributed environment and appreciated the necessity of good connections.

Over the years numerous systems emerged to facilitate these needs: the use of electronic data interchange (EDI), for example, goes back to the 1980s, virtual private networks (VPN) were providing flexibility in the 1990s, while enterprise-wide systems have been breaking down departmental silos for decades. Since 2000, cloud computing has also helped, delivering flexibility and capacity to this distributed model by providing rapid access to centralised customer or product data from anywhere in the retail estate. Today, in our connected digital world, all this is no longer enough. The imperative now is the ability to reach everyone – customers, trading partners, staff, service providers – from anywhere, using whichever application or device is suitable and all in near real time.

INFORMATION AND SERVICE DEMANDS

Today's in-store shopper wants not only to know the table or chair she rather likes is in stock, but also to see a virtual representation of what it will look like in her home, to have evidence that it is made from traceable, sustainable materials, and not just the day but also the hour when it could be delivered – and all before she pays, probably via her smartphone. Online, a customer may be leaving Alexa to place her order, she could have accessed the site from social media or a smart television, expect a highly personalised offer, or perhaps she's on the other side of the world and wants precise information on relevant tariffs and delivery.

AI – Artificial intelligence (or machine learning) describes systems able to perform tasks normally requiring human intelligence, such as problem solving and pattern recognition.

Edge computing – refers to a distributed and decentralised architecture where data analytics and processing are computed in real-time closer to source origins or on-device.

FaaS – "Function as a Service" – goes one step further and provides an environment where users can develop, run and manage application code without having to worry about provisioning or managing servers or scaling the infrastructure. And importantly, the user only pays for the compute time consumed – there is no charge when code is not running. FaaS is typically used when building microservices and IoT applications.

Fog computing – a technology that extends cloud computing and services to the edge of the network. While edge computing is typically referred to the location where services occur, fog computing implies distribution of the communication, computation, and storage resources and services on or close to devices and systems in the control of end-users.

HIP – allows on-premise solutions to seamlessly and securely integrate with cloud-based applications. This also allows an IT team to fast-track innovation and enhance efficiency as well as lower the risk factors in accomplishing integration.

IaaS – "Infrastructure as a Service" – refers to the pool of physical or virtual infrastructure that a cloud provider can deliver f from its data centres. The components that IaaS provides include the data centres, the servers, storage, networking as well as the virtualisation layer if required.

PaaS – "Platform as a Service" or Application Platform as a Service (aPaaS) is the next logical link in the chain and provides a platform allowing users to develop, run, and manage applications without the need to build and maintain the infrastructure typically associated with developing and launching an app.

Point of Presence (PoP) – an artificial demarcation point or interface point between communicating entities.

SaaS – "Software as a Service" is where a software provider hosts and delivers software functionality and applications to users over the internet. Typical applications include CRM, Salesforce, Dropbox, Gmail and Microsoft Dynamics.
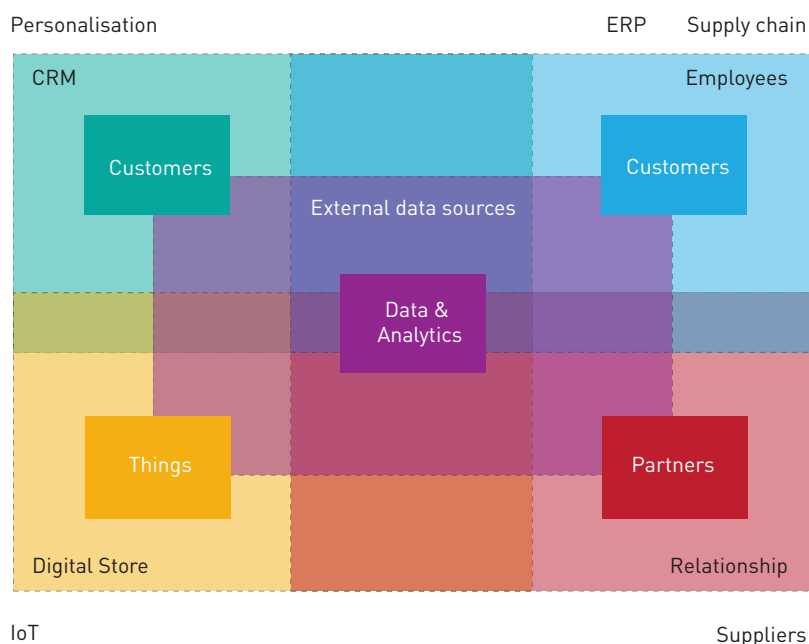
Digital infrastructure models put data and analytics at the core with connections to both internal and external ecosystems which may also be interconnected.

Such scenarios – and a great many more that retailers encounter every day – demand a new type of infrastructure: a fully integrated and distributed digital platform with data and analytics at its core and with interconnections both within the organisation and beyond, encompassing everything from mobile, IoT, AI tools and bots, to employees, CRM and suppliers. Such platforms are not the preserve of IT but underpin the entire business operation and strategy enabling other parts of the business to experiment and develop relevant applications using the newest technologies – such as integrating the online shopping cart with IoT products.

Analysts and consultants have produced numerous variations of this digital business model: Gartner, for example, links five key components in its version: "IT systems, customers, ecosystems, things and intelligence". IDC has an "intelligent core" to its digital transformation (DX) model, with internal and external processes connecting all aspects of the enterprise with the wider ecosystem: it also suggests that in the immediate future almost a third (32%) "of new technology investments will be driven by digital transformation".

For many long-established retailers digital transformation may be daunting. Business-critical applications may still run on ageing legacy systems, which can act as a constraint to offering the fast and flexible digital services that customers increasingly expect. Upgrading the entire infrastructure may be expensive and disruptive, but not to grasp that digital nettle can be suicidal.

MOVING TO THE EDGE

Gartner is among those who argue the case for a "hybrid integration platform" (HIP) and predicts that by 2022 at least two-thirds of large organisations will have implemented one. While an HIP can provide a long-term infrastructure solution it can also be regarded as a stepping stone to a fully digital platform by combining existing enterprise technologies run at a data centre with cloud-based systems and securely connecting the two. The traditional corporate data centre, instead of being the hub for all enterprise systems, becomes a repository for legacy applications and those that can most economically and efficiently remain on site, while secure and flexible interconnection services – as well as cloud providers, PaaS, FaaS, fog and edge computing – deliver the digital capability to meet ever changing needs. By also linking widely dispersed data centres, the hybrid model can provide a solution to differing data handling legislation in various geographies, which can restrict the export of domestically generated data, as well as cope with peaks in demand and deliver resilient back-up for disaster recovery.

Such distributed digital models also bring data and processing power closer to the customer helping to deliver a more consistent and personalised customer experience. In stores, for example, edge computing supports such devices as "magic" mirrors and smart shelves, and can help to analyse and predict customer behaviour in real time, while fog computing tools help with the growing numbers of IoT devices and extend cloud computing and services to the edge of the network.

Some of these developments are explored more fully in the following pages. ■

MEETING DIGITAL EXPECTATIONS

Blending digital and physical worlds to create a seamless customer experience across multiple touch points can be challenging, given the mix of legacy systems, disparate store IT and tech-savvy shoppers.

In theory, cloud computing and store staff equipped with tablets can help with clientelling by delivering insights from central CRM databases, so enabling sales staff to suggest appropriate purchases. In practice the complex customer journey can be difficult to track while artificial intelligence, rather than a harassed sales assistant, may be needed to interpret the amounts of data involved. In a digital environment, customers can be identified from mobile apps or facial recognition; fog computing can provide the communications and processing needed to make appropriate product suggestions – to sales staff or IoT devices – so delivering a more personalised experience to the customer.

At the same time real-time sales, inventory and customer data can be harvested and made available across the network enabling fulfilment from store, accurate replenishment and fully integrated physical and digital worlds. Good connections and a resilient network are essential. A distributed digital platform can link both internal and external ecosystems enabling instant access to supply chain and logistics data as well as centralised legacy systems, while "as a service" facilities accessed via the cloud – SaaS, PaaS, FaaS – can provide the necessary resilience to cope with peaks and unexpected downtime.

MATCHING EXPERIENCE TO MARKET

The ideal customer experience varies considerably by product sector, target democratic, and store segment. For grocery shoppers, high availability with minimal stock-outs, clear product information and a fast checkout may be key. In contrast for high-end fashion shoppers, a good experience may depend on personal service and a sales assistant who has extensive knowledge of their previous purchases.

For Sandrine Deveaux, managing director of Farfetch's "Store of the Future" at Brown's in London, customer identification is essential – as she says high-spending customers "want to be recognised" as such. Hence the development of the "Farfetch Pass" which uses several edge and digital technologies to link a customer's smartphone with store systems in order to alert staff when a valued shopper enters so that she can be greeted by name and instantly made to feel valued and special. Having made their purchases, Deveaux argues that customers really don't want to queue up to pay and then carry their parcels home. Instead at the "Store of the Future" they confirm the selection of items and pay via a digital changing room mirror – then simply walk out while the goods are packed for home delivery.

In the grocery environment smart shelves can help maintain stock levels by alerting staff when the assortment hits a critical threshold, while a shopper's smartphone can connect via a store app and the cloud to product information databases to check, for example, on allergens or traceability rather than having to study the carton small print. Widespread adoption of an Amazon Go style environment to obviate the need for a checkout is probably still some years away, but as and when RFID source marking becomes universal, it would be quite possible for customers to simply push their loaded shopping trolleys past sensors which read the contents and then pay with a contactless card or fingerprint as they leave the store.

While most supermarkets have long used space planning systems to improve layouts and product assortment to match the local customer demographic, the Co-op's 3,500 convenience stores are only now able to benefit from such technology thanks to its recent adoption of cloud computing and in-store wi-fi. Each store manager can now decide on space allocation and store-specific ranges for their individual outlet and is able to introduce a much wider selection of locally-sourced products delivering customer benefits and enhancing the shopping experience.

CROSS-CHANNEL INTEGRATION

A digital infrastructure also makes achieving that seamless cross-channel customer experience rather easier, since information from any touchpoint or device can be shared across the network in near real time and analysed using AI to make relevant insights rapidly available. So, a customer journey that begins at home on a tablet or smart TV can be linked to each subsequent contact, via an office desktop PC, smartphone, or call centre contact, and be available when the shopper is identified to staff in store from a smartphone app when she arrives to collect her item.

While the customer journey may involve numerous touchpoints, a new generation of hybrid outlets is already emerging which bridge the channel divide and to create a seamless and enhanced experience. In the USA, for example, high-end department store Nordstrom has launched a "Local" model with small stores containing a nail bar, access to a personal stylist, a selection of refreshments, a seamstress

Equinix © case study
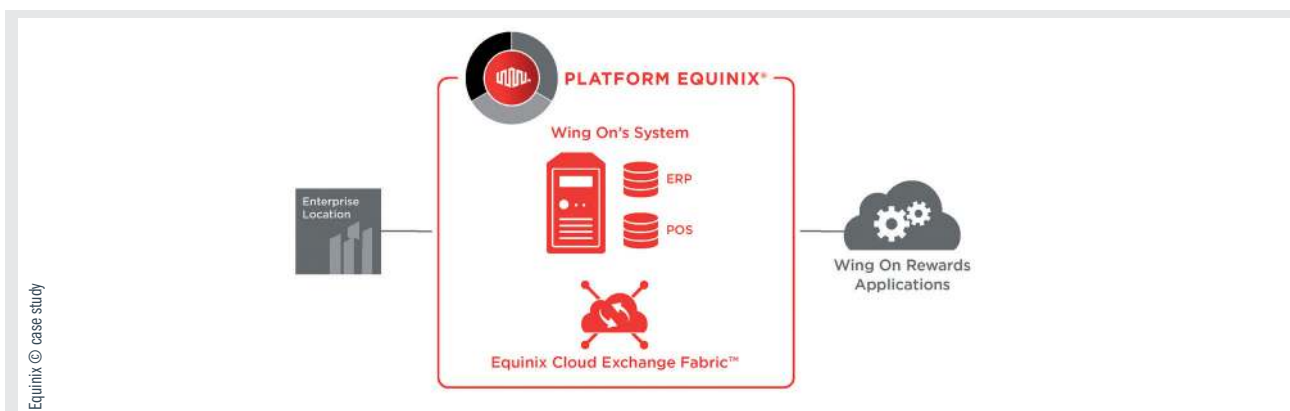
Wing On takes to the cloud

Founded in 1907, Hong Kong's four Wing On department stores have a strong tradition for customer service – and, like many traditional retailers, the company was faced with an ageing IT system and legacy applications.

Last year, it completed a three-year transformation programme refreshing all of its core and customer-facing applications using a hybrid cloud approach. At the same time it launched its Wing On Rewards loyalty app which gives shoppers ePoints, for every purchase exchangeable for discount coupons, as well as other promotional incentives such as advance information about new lines and offers.

The hybrid solution has core enterprise systems hosted at an Equinix data centre while customer-facing applications are located in the cloud with Equinix Cloud Exchange used to handle connections with whichever cloud service provider (CSP) Wing On is using. This makes it easy to

deploy workloads to CSPs according to capability, cost and performance, so that it can select the appropriate service for customers as needed bringing the point of presence (PoP) closer to the customers so giving greater efficiency, speed of service and improving the customer experience. In future it will also enable Wing On to adapt to new technologies, including new and emerging IoT. developments.

Thanks to the hybrid architecture the Rewards loyalty programme was easily integrated with both point-of-sale and the company's "NetShop" so that customers can be sure to collect their ePoints wherever they choose to shop.

"We needed to modernise our business and keep pace in a highly competitive market," says Kendrick Kwok, Wing On's assistant general manager. "Our digital transformation journey is enabling us to optimise our infrastructure costs effectively and allows us to focus on our core mission of servicing our customers."

and ample fitting rooms. Shoppers can collect their online orders from a neighbourhood store or see a collection curated for them by the personal stylist; they can try on the garments, and have them altered while they have their nails done and enjoy a glass of wine with the garments home delivered the same day. As president of stores, James Nordstrom says "One of our goals with Nordstrom Local is to help provide our customers with a seamless and convenient experience, bringing services like in-store pick up of online orders, alterations, personal styling and more right to their neighbourhood."

Such developments are not confined to the world of fashion. Delhaize in Belgium launched its "Fresh Atelier" concept in October 2018. These small format convenience outlets offer lunchtime snacks and sandwiches, but also act as an ordering and collection point for its full grocery range. Delhaize plans to open 200 such outlets over the next three years with CEO, Xavier Piesvaux, declaring the format "an example of 'instant retail', in which offline and online shopping and 'on the go' are combined for the first time in this way".

PUTTING POWER WHERE IT IS NEEDED

As retailers expand internationally – with both physical and digital offerings – it is important to deliver consistent experiences wherever and whenever the customer chooses to shop. interlinked global data centres and a multi-cloud network can ensure that the same product and customer information is available throughout.

Edge computing puts the processing power precisely where it is needed close to the customer, cutting out any delays in updating purchasing or loyalty data and picking up new metrics and behaviour insights no matter in which channel – or geography – the customer chooses to shop.

Customers expect their retail experiences to be personalised, convenient, and trouble-free at all times – including during those seasonal trading peaks which can challenge processing capability. With a digital infrastructure, connected ecosystems and access to multiple data centres as needed, delivering that ideal experience can become the norm. ■

TECHNOLOGY AT THE EDGE

Those reports a few years back of shoppers checking out prices or responding to promotional offers via their smartphones while in or near stores were just the start: as we move to a connected world and the Internet of Things (IoT) the boundaries between the physical and digital continue to blur.

Tomorrow's shoppers will not only expect to use their smartphones to manage their shopping lists, check on product availability, make in-app purchases, obtain help in navigating the store or make contactless payments, they will want additional functions: using the phone as a checkout replacement, perhaps, to capture images of items in store to add to a wish list, to gain augmented reality (AR) insights into product performance, or maybe to access remote experts for advice in the absence of store staff. Use of virtual techniques is also increasing with several furniture retailers, including DFS and Ikea, for example, already providing apps that allow shoppers to incorporate furniture images into a screen shot of their own rooms settings.

MAKING THE MOST OF IoT

For retailers the smartphone already provides shopper tracking and a means of delivering contextual marketing; in future we can expect more opportunities for personalisation to deliver an enhanced customer experience. Together retail apps and tracking can identify shoppers as they browse the store, while AI and edge computing can deliver appropriate product push in real time based on a customer's previous purchases and known preferences via such in-store mechanisms as digital signage. While the customer browses a garment rail, for example, the same items can be modelled on an adjacent screen.

Use of face recognition is also set to increase, not only for targeted promotions, but to monitor dwell times and thus gain more insights into products that interest specific customers. While there are still doubts over the potential of iBeacons, images are being captured by in-store cameras adding information to customer analytics and integrating with shopper specific data obtained from their web browsing.

Amazon's Go is using this type of technology to monitor customer behaviour in its growing chain of checkout-less convenience stores. The system combines a smartphone app, facial recognition, camera tracking systems, AI, and RFID with Amazon reported to be planning 3,000 such outlets worldwide by 2021 – a move that could set a new bar when it comes to rapid and efficient service and seamless customer experience.

Edge computing and IoT bring processing power to the point of delivery close to the customer. Prototype smart shelves – as at Amazon Go – along with "magic rails" have been trialled by various retailers off-and-on for a decade or more; early experiments were helped by cloud computing and good connectivity, but it is only now with processing power and analytics embedded in a growing variety of "things" that such concepts become a commercial reality.

Farfetch's "Store of the Future", for example, includes a "connected rail" which uses a combination of RFID to track garments and ultrasound to monitor movements, so that an image of any garment a shopper takes from a rail to examine is instantly sent to her smartphone to create a wish list or remind her of the styles she looked at.

"Magic" IoT mirrors in changing rooms are also proliferating with trials by Ralph Lauren, Tommy Hilfiger, Alibaba, Farfetch and many others. These generally have touch screen capability allowing shoppers to send requests for differently sized or additional garments to be brought to the changing room or to add items to a personal wish list. Sales staff can also send images of possible add-on purchases direct to the customer in the changing room, while some mirrors can also take card payments. Other systems, such as Memory Mirror from Memomi – shortlisted in 2019 for John Lewis' JLab Innovation programme – use AI and AR to provide shoppers with a 360° view of whatever they happen to be trying on. It can then change the colour of the garment to any other in the particular product range to give a reflection of the customer wearing a differently coloured outfit without them having to physically change their clothes.

LINKING TO THE CLOUD

Collection of online orders from stores is now standard for many omnichannel retailers, but often those orders will have been picked centrally and delivered overnight to the relevant outlet, largely due to a lack of insight into actual store stock levels. Fulfilment from store is regarded as a more cost effective option, cutting down the need to transport individually packed products around the country and also helping to make full use of local store stock.
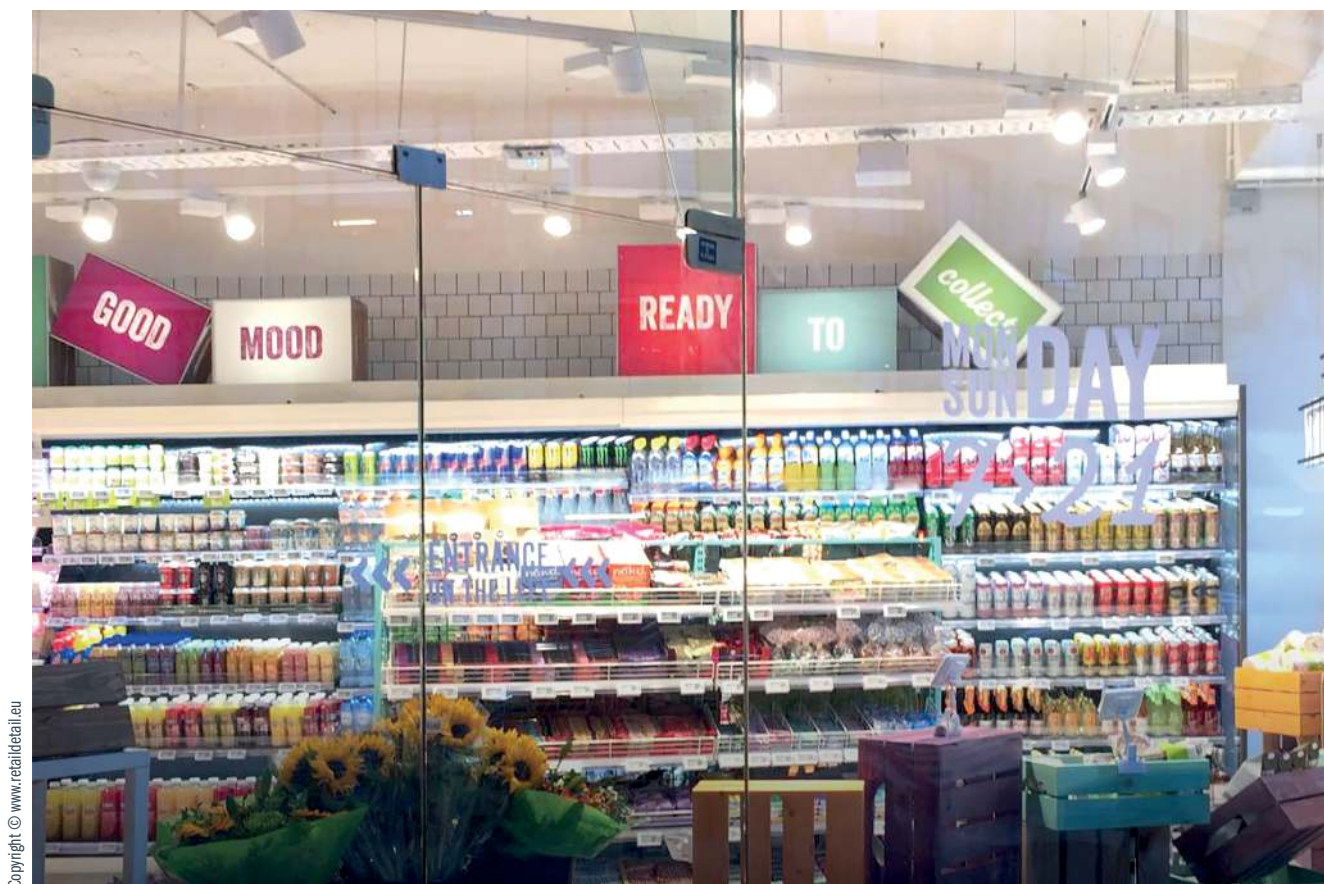
Real-time accurate inventory information has been difficult to achieve – items can be in shopping trolleys heading for the checkout or languishing in changing rooms; they may also still be listed as in stock when they have disappeared from the store in the pocket of a light-fingered customer bypassing the till. After several years of trials and experiment, by early 2019 RFID in fashion and apparel retailing was considered to have reached the "early majority" phase according to a study by the University of Parma, delivering accurate inventory and total stock visibility. Add a digital infrastructure and connectivity then real-time information about store stock can be made available to online shoppers making fulfilment from store a reality and streamlining order management.

A digital infrastructure could also help to streamline the collection process with shoppers able to notify a store by SMS or e-mail when they plan to collect their online order and, using AI, be automatically reassured that the item will be ready for them or advised that a queue is likely and an alternative time be suggested.

With a digital infrastructure based on service-oriented architecture peaks in demand simply mean additional use of IaaS facilities as and when needed, so coping with seasonal peaks – such as Black Friday and clearance sales – can greatly reduce pressure on staff as well as deliver a better experience for shoppers. ■

CREATING A CONNECTED ENTERPRISE

Retailers have been investing in IT for decades and, as a result, have their fair share of legacy systems. Moving from these old warhorses to a digital infrastructure may be daunting – but as both Wing-On and the Co-op's experiences demonstrates – it can act as a vital catalyst for engaging the business and generating new, and potentially transformative, ideas.

Traditional systems tended to be centralised with the on-premises data centre at its heart and a network likely to resemble a hub and spokes. That may have been ideal when retailing was predominantly uni-channel, but in today's digital world the connections needed are significantly more complex and the ideal network is more likely to resemble an interlinked web where each element can interact with any other – and possibly extend across multiple geographies as well. Traditional enterprise systems also tended to be managed within IT, so that business either had to join the queue for IT to produce a solution to its latest problem, or unilaterally buy an appropriate application and present IT with yet another integration issue.

Change arrived with the online channel and the need to adopt cloud-based systems: among them Amazon launched its Web Services (AWS) in 2006; Microsoft released Azure in 2008; IBM's SmartCloud appeared in 2011 and Oracle Cloud in 2012. Such clouds were accompanied by on-demand services, which reduced capital investment and helped to alleviate the capacity issues with pay-as-you-go models – "as a service" – easily scaleable to match changing demand, both at peak and during downturns.

Proprietary applications often come with a vendor-specific cloud, so retailers can end up with a poorly integrated hybrid infrastructure of legacy data centre and assorted cloud-based applications none of which can communicate satisfactorily with other corporate IT components. The result is a system that limits access to real-time insights into customer behaviour, is incapable of integrating store and online activity, and may offer only limited views of the total supply chain with no insight, for example, into in-transit inventory.

Instead, what is needed is sometimes described as "converged" or "unified" commerce with a fully integrated platform covering all channels using a common data source to deliver a single version of the truth and ensure a consistent customer experience. Achieving the "holy grail" of a single view of the customer – including such parameters as purchasing history, current orders and preferences – in order to personalise the offer is certainly challenging; as is achieving real-time transparency of enterprise data across all channels.

Moving enterprise systems into the cloud or to dispersed but connected data centres using applications such as Equinix Cloud Exchange to link them all together, can deliver the necessary digital infrastructure to achieve real-time connectivity, track complex customer journeys and deliver essential insights. Adding AI and edge computing for IoT devices puts processing closer to the customer, and can deliver a consistent experience as well as rapid response to any changes in customer behaviour.

With some FaaS functionality it is also possible to develop new applications quickly with minimal investment making IT departments far more responsive to changing operational needs, which in turn can encourage the business to come up with new ideas that can be tested quickly and easily: if they prove ineffective they can just as easily be abandoned with no concerns over loss of capital investment.

CSP – cloud service provider: a company that offers some component of cloud computing, -typically infrastructure as a service (IaaS), software as a service (SaaS) or platform as a service (PaaS), to other businesses or individuals.

HYBRID CLOUD – is made up of two or more clouds (private and at least one public) that remain distinct entities but are bound together and managed as a single, policy-based environment. Hybrid cloud can also mean the ability to connect colocation, managed and/or dedicated services with cloud resources. A common reason for using a hybrid environment is as a transition to a full cloud deployment.

MULTI-CLOUD – is the use of multiple cloud computing and storage services in a single heterogeneous architecture. A multi-cloud environment aims to eliminate the reliance on any single cloud provider but requires a good interconnection strategy to connect clouds to people, locations and data securely and quickly.

PRIVATE CLOUD – is cloud infrastructure operated solely for a single organisation, whether managed internally or by a third party, and hosted either internally or externally.

Public cloud – is where the services are provided over a network that is open for public use. Public cloud service providers, such as Amazon Web Services (AWS), Oracle, Microsoft and Google, own and operate the infrastructure at their data centres and access is generally via the Internet.
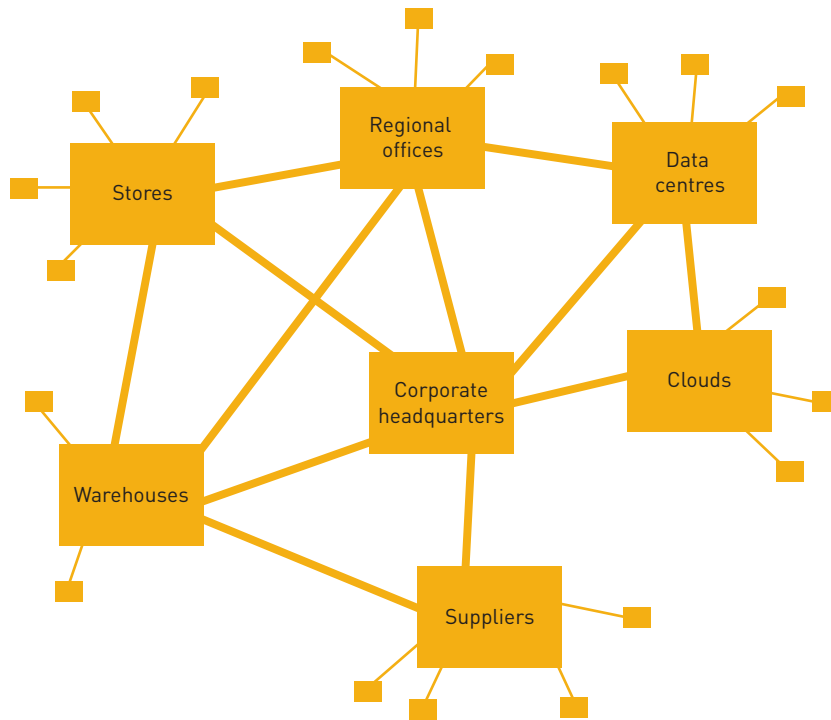
Complex web-style networks replace the traditional hub and spoke.

High level interconnections between various CSPs and any number of strategically sited data centres can also maintain brand integrity for global players, with common data sources accessible everywhere giving a consistent message while also being close to the end customer – wherever he or she may be. And with those data centres also capable of managing the previously on-premise legacy applications, the model can provide a practicable and resilient answer to the infrastructure restrictions that still afflict so many retailers. ■

TRIVAGO GETS CLOSE TO THE CUSTOMER

While start-up hotel booking site Trivago, founded in 2005, is spared the legacy issues of established omnichannel retailers, its global ambitions meant that from day one it wanted to establish a global network that could deliver information quickly and accurately to customers, no matter their geography.

As head of data centre operations, Florian Schürfeld, says: "Our goal is to deliver the best possible experience for users so our sites need to be as fast as possible. Part of that involves getting as near as possible to the customer".

Getting "near to the customer" demands a distributed digital infrastructure and from its launch Trivago has used Equinix's platform with interconnected data centre sites in several geographies to deliver a consistent experience from a common data source in every country it serves – via 55 localised websites and apps in 33 languages– which also maintains a consistent brand equity and has helped facilitate global expansion.

"The corporate vision was always global," adds Schürfeld. "We needed to scale the business and needed a partner that could get us close to the markets we wanted to operate in. Equinix offers us the strategic locations we need to connect best to the end-user."

DELIVERING CUSTOMER BENEFITS FROM THE CLOUD

The Co-op has had its fair share of upheavals in recent years as it has restructured from an organisation that ranged from banking and travel to farming and funerals – a dozen or more different operations each with its own IT structure and strategy. Having shed its banking and farming operations, rationalised to five core businesses, and brought IT under the over-all control of a single CIO for the first time, the company's IT estate included, as Scott Robertson, lead architect – cloud and compute at Co-op IT, puts it "one of everything" and included what he terms "data centres sprawl" – all of them need of massive investment within five or six years.

"The business had been hamstrung in the past by how we delivered IT," says Robertson, "so rather than investing tens of millions of pounds in re-equipping the data centres, we wanted to empower and drive the business forward."

Moving to the cloud was an obvious choice with the Co-op opting for Microsoft's Azure platform and the IT teams began developing a few standalone applications within Azure. Meanwhile, the Co-op's retail business had embarked on a major supply chain transformation and there was a pressing need to replace around 40 legacy applications.

The result was a new SAP enterprise system hosted in Azure and creating a "data centre in the cloud". In the past the idea of moving enterprise systems to the cloud would have been regarded as high risk, but the infrastructure component of the project proved trouble free and was completed in nine months "which," says Robertson, "was half the time it would have taken if we'd gone for an on-premise solution".

STAFF AND CUSTOMERS BENEFIT

Joining SAP on Azure was JDA's Space Planning tool. With 3,500 convenience stores – all very different in size and customer demographics – the Co-op had previously found making store specific assortments and layouts challenging. Enabling its store managers to plan their own ranges and introduce more local produce was a key priority. "Offering a range of local produce will be a real benefit for our customers," says Robertson, "and stores now have the ability to interact directly with JDA in the cloud." During this year store specific layouts and range planning will be rolled out across the estate. "Stores are really starting to see the advantage of being able to access applications in the cloud."

With stores also equipped with wi-fi, a benefit for its 75,000 retail staff has been "Shifts" – an app they can access via their 'phones which gives them details of their weekly work patterns, loaded to the cloud by store managers. The system replaces the old paper time sheets and gives managers additional flexibility for contacting staff to cope with unexpected demand or absences.

CREATING A HYBRID SOLUTION

The Co-op already had HR applications running in Oracle Cloud and web applications using Amazon Web Services (AWS) so, with some legacy applications still at the physical data centres an "enterprise level network" was essential. "It's currently a hybrid infrastructure and we're using Equinix Cloud Exchange to make the connections," explains Scott Robertson. "We can also adopt software-defined networking which gives us greater flexibility so, for example, we can host applications in one cloud but put databases in another and exchange information as needed."

The Equinix system also works on a service-based model so network connections between clouds can be switched on and off as required, which makes developing and testing new applications very economical.

It's still early days but successfully hosting business critical enterprise systems in the cloud has increased confidence and encouraged more innovative ideas. "The stores are seeing how quickly and easily we can develop new applications in the cloud," says Robertson, "so we're expecting them to make many more requests for new tools in the coming months – that wouldn't have been possible with the old systems because of the expense. Now we can develop new applications very quickly in Azure with no need for capital investment and if they don't work they can be dropped with no significant financial impact – only IT time. It allows us to try out lots of ideas very quickly: you might have 100 ideas but only one of them might make a massive impact on the business. This way we can find that 'one' without tying up massive amounts of capital to do so." ■

# FINANCIAL CONSIDERATIONS OUTWEIGH CUSTOMER BENEFITS

Budget issues, other pressing priorities and the need to make a business case built around increasing sales, are the key stumbling blocks for many organisation in moving to a fully integrated digital infrastructure, according to the RetailX attitudinal survey conducted for this whitepaper.

Almost two-thirds (64%) of those surveyed believed that buy-in from their Boards needed a business case built on the increased sales such investment could deliver while under half (48%) thought that "improving customer experience" could be either the prime driver for action or a significant factor to be considered. Reducing costs was cited by over a third of respondents (39%) and almost a quarter (23%) suggested increased loyalty. So, while improving aspects of the customer relationship were considered significant, financial issues – cutting costs and increasing sales – were viewed as more likely to persuade Boards to invest.
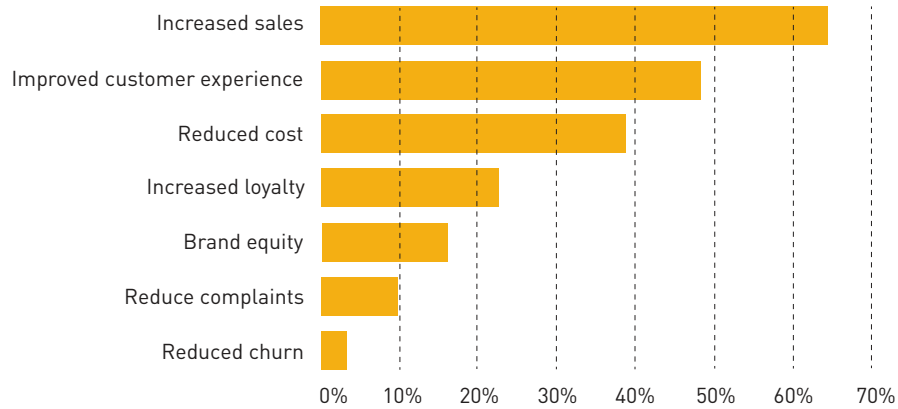
Almost half (46%) of respondents believed that, in general, the digital systems within their organisations were not well integrated, while slightly fewer (37%) – felt that they were, with a handful of respondents noting that they were "working on it". When compared with "admired brands" respondents were rather more confident with more than a third (37%) believing that when it came to delivering customer experience benefits from their digital infrastructure they were either "better" or "much better" than prestige brands – although around a third (34%) believed their systems were "worse". Almost half of respondents (49%) also felt that their digital systems were either "better" or "much better" than their direct competitors although one in five (20%) admitted they were "worse". Perhaps inevitably, when asked to suggest retailers which already have an excellent digital infrastructure Amazon was most frequently cited with one respondent suggesting that it also benefits from the "insights to consumer behaviour" it is able to achieve. Others in the "admired" category included Argos, ASOS and John Lewis.

While the majority of respondents suggested that their digital integration was certainly up to industry standards, the list of improvements they would wish for was long and varied. The solutions architect of one leading tier-1 retailer, longed to be "able to use seamlessly cloud and on-prem infrastructure" while another wanted a "single platform for execution and visibility". The digital business developer for a multinational fashion retailer clearly felt pressurised wanting "more resources, more delivery teams, more prioritisation" so that "everything doesn't need to happen all at once (which clogs up the system)".

Other often repeated pleas were to replace legacy systems, improve personalisation tools, increase global reach and future proof systems. "A new ERP platform which seamlessly inter-links to the web platform and is supported with an expansive product and image database" was on one wish list. "Implement AI algorithms in processing to automate procedures and provide instant data" was another. Comments also hinted at a skills shortage – "more data analysts" said one – and continuing problems with departmental silos – "the digital team and offline team need to be more integrated", said another.
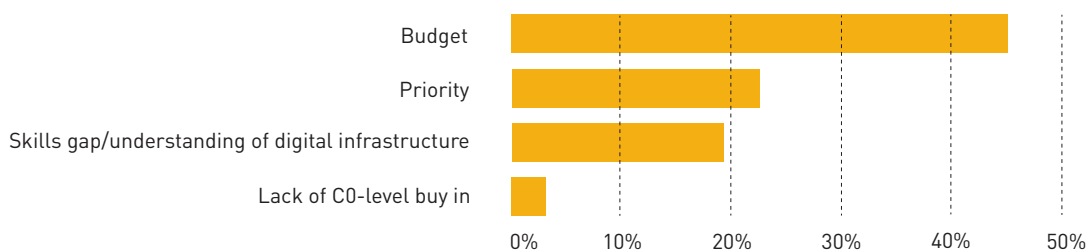
What holds you back from making the improvements to your digital infrastructure that you would ask of the Board or CIO.

Category	Value
Increased sales	~64%
Improved customer experience	~48%
Reduced cost	~39%
Increased loyalty	~23%
Brand equity	~16%
Reduce complaints	~9%
Reduced churn	~2%

What business case do you think would be persuasive to the board to invest in the improvements you envision?

Issues "holding back" implementation of these varied wish lists were predominantly budgetary with 45% of respondents citing finance as the key impediment. More than a fifth (22%) gave "priority issues" as the main cause of delay with one – who considered his company's digital systems worse than others – noting that the "group" had other priorities and his particular division had been told it must "wait for 2-3 years" before any improvements could be made. Lack of skills and problems in actually understanding the digital infrastructure concept bothered another 20% of respondents while only 3% mentioned lack of C-level buy-in.

interestingly, some who "lacked understanding" of a digital infrastructure thought they were doing as well or rather better in this field than their immediate competitors, often adding that they were either currently implementing such technology or were planning to – which rather suggests that retailers who did not respond to the survey may still have a considerable way to go to become digital-native businesses. ■

PREPARING FOR CHANGE

The IT resources of today's omnichannel retailers vary enormously. Many long-established companies in tier-1 run legacy systems that may include assorted in-house developments that only a few long-serving employees know how to nurture. Others will have made a clean sweep early in the "dot com" era and have all-singing-all-dancing enterprise applications which may or may not still reside on an ageing on-premise data centre.

In our digital age with fast-moving technologies and highly tech-savvy consumers many of these retailers are at risk of falling further behind as their systems infrastructure lacks the flexibility to adapt in a rapidly changing world. Comments from our survey suggest "lack of understanding" of the scope and opportunities of digital infrastructure transformation is widespread – as is lack of awareness of existing technologies which can ease the transition, via a hybrid solution, to becoming a digital-native business.

In-store the growing range of IoT devices – both provided as part of the fixtures and fittings and used by shoppers – mean that physical outlets, too, must also become "hybrids" combining the best of real-world service with seamless integration into the digital world. This, too, requires a supporting infrastructure with access to the multiple clouds that may be involved.

As the experience of retailers such as Wing On and the Co-op demonstrate, even the most traditional of companies can succeed in embracing this new digital world. benefits can include significant cost reduction – to satisfy even the most demanding Board – while enhancing that all important customer experience. ■

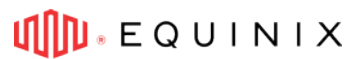**KEY LEARNINGS: THE PATH TO DIGITAL TRANSFORMATION**

- Consider all current interconnections within your IT infrastructure to identify weaknesses and impediments to achieving a consistent customer experience across all channels.
- Engage appropriate service providers to move towards a hybrid infrastructure platform connecting current data centres and any CSPs used.
- Evaluate on-going costs of maintaining on-premise data centres with a view to moving functions to a CSP and adopting a PaaS/FaaS approach.
- Achieve a digital commerce infrastructure – enabling real time data exchange, customer insights and supply chain intelligence.
- Keep a very open mind about where IoT will take us next.

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