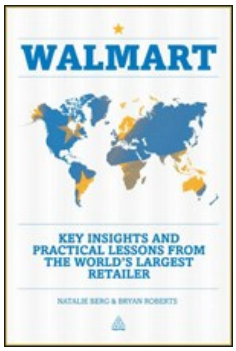

Walmart: Key Insights and Practical Lessons from the World's Largest Retailer

by Bryan Roberts and Natalie Berg

Chapter 9: The Surest Way to Predict the Future Is To Invent It

Overview

Alongside its sheer scale, the areas of supply chain and systems have been justifiably lauded as two of Walmart's key competitive advantages.

In the words of Don Soderquist:

> Technology has been an enabler and facilitator of change throughout Walmart. It has made it possible for us to dramatically change not only the way we do business, but also the way that business is conducted in the entire industry.
>
> As a result of the support of senior leadership, Walmart has consistently been on the leading edge of practical technological breakthroughs in equipment, software, and communications technology, a proactive approach that has kept us far ahead of all competitors in taking advantage of the opportunities that technology affords.[1]

This is a sentiment echoed by Bob Ortega, who notes that 'Men such as Jack Shewmaker and David Glass, who were quick to grasp the implications of these technologies, put Walmart at the forefront of this revolution; and it would be hard to overstate how crucial Walmart's head start would be to its success'.[2]

James Hoopes remarked in his excellent analysis of the role of 'growth through knowledge' in Walmart's rise to leadership: 'Information technology has made Walmart superbly efficient not in spite of but because of its gargantuan size and highly centralized organization. Fleeter of foot than the smaller forms with flattened hierarchies that are supposedly the nimblest competitors in the knowledge economy, Walmart shows that high technology is fostering its own form of the huge, highly centralized corporation run with ruthless, hierarchical efficiency.'[3]

When we asked a senior insider at Walmart if the retailer was still occupying its place at the bleeding edge of technology, they answered, 'Not really anymore. We obviously used to be the leader, but everyone else has caught up. Our biggest single advantage globally is our supply chain. We still kick ass in logistics.' So, while some, if not all, of Walmart's advantage in IT and systems has been eroded by competitors in a wide variety of retail sectors, it remains the case that Walmart's use of technology was one of the key underpinnings of its emergence into true global retail supremacy. In the words of one-time Senior Vice President and Chief Information Officer Randy Mott, 'The surest way to predict the future is to invent it.'

The retailer (which can translate as Sam Walton in the early years), as in many areas, grudgingly and almost resentfully embraced the need for investment in technology. That is not to say that Sam Walton did not appreciate the exciting potential afforded to the retailer – he most certainly did – but it is equally certain that he resented the large initial capital outlay on what was then relatively unproven technology. As with supply chain development, Walmart's adoption and implementation of technology, despite being a fairly ad hoc and relatively thrifty transformation, was one of the genuine enablers that propelled Walmart from being a backwoods discounter to become an epoch-making commercial powerhouse.

Many of those who worked for and with Walton in the 1960s, 70s and 80s recall – with a discernible level of fondness – how Walton would have to be badgered into making technology investments, or how some projects would be developed behind his back until such time as he could be presented with a compelling business case or a virtual fait accompli. As Walton himself acknowledged, 'Jack (Shewmaker) is absolutely right about me and systems, though. I rarely get excited about them.'[4]

Walton went on to admit that 'as Chairman of Walmart, I, of course, was the one who ultimately authorized all of those expenditures for technology, which proved absolutely crucial to our success. But truthfully, I never viewed computers as anything more than necessary overhead. A computer is not – and never will be – a substitute for getting out in your stores and learning what's going on. In other words, a computer can tell you down to the dime what you've sold. But it can never tell you what you could have sold.'[5] This statement was undoubtedly true at the time that Walton wrote it, but it should be noted that technology has moved on since. Modern predictive analytics is being used within retail to fill in the gaps in the demand curves that retailers build for forecasting, taking into account variables such as availability, assortment and shopper trends.

As with so many key developments in retailers' evolution, the advent of the computer-powered Walmart was fuelled by Sam Walton's thirst for knowledge and improvement and his proactive stance on meeting, and learning from, other key figures in

the US retail industry. In this case, it was a late 1960s meeting with Abe Marks, the head of department store chain Hartfield Zody's and first president of the National Mass Retailers' Institute. With a desire to learn about IBM computers, Walton travelled to an IBM school for retailers in Poughkeepsie, NY, and it was there that he met Marks, one of the speakers at the event.

The two struck up a friendship and Walton subsequently visited Marks to try to learn as much as possible about retail technology. As Marks recalls:

> He (Walton) has just been a master of taking the best out of everything and adapting it to his own needs... By being at that conference, he was absolutely in the right place at the right time. There were no such things in those days as minicomputers and microcomputers. He was really ten years away from the computer world coming. But he was preparing himself. And this is a very important point: without the computer, Sam Walton could not have done what he's done. He could not have built a retailing empire the size of what he's built, the way he built it. He's done a lot of other things right too, but he could not have done it without the computer. It would have been impossible.[6]

[1]Soderquist, D (2005) The Wal-Mart Way: The inside story of the success of the world's largest company, Thomas Nelson, Nashville, TN, pp 138–139

[2]Ortega, B (1999) In Sam We Trust: The untold story of Sam Walton and how Wal-Mart is devouring the world, Kogan Page, London, p 129

[3]Lichtenstein, N et al (2006) Wal-Mart: The face of twenty-first-century capitalism, The New Press, New York, p 91

[4]Walton, S with Huey, J (1992) Sam Walton: Made in America, Doubleday, New York, p 271

[5]Walton, p 285

[6]Walton, pp 109–111

Technology takes hold in the 1970s

By the early 1970s, Walmart was able to boast a Data Processing Department, and it was this department that installed a Singer System 10 network to communicate with stores. By the end of the year, the system was 'polling' (ie extracting data from) 22 outlets. The department also put the retailer's softlines DC 'on line', enabling it to review styles and create a shipping manifest. Other highlights at this time included the creation of a vendor system for DC rebuyers and the replacement of an IBM 360/20 mainframe with an IBM 370/125. It should be pointed out that both these models were mainframes rather than more modern servers, which had yet to be invented. Indeed, readers are likely to have more computing power in their iPhone than either of these mainframes had, but they were state of the art at the time and proved remarkably durable: even Tesco was still running some systems on very stable, very old mainframe infrastructure as recently as a few years ago.

By 1975, Walmart was leasing an IBM 370/135 computer to track inventory on an item level for merchandise in the retailer's DC and on a category level in stores. The computer also held data on payroll, accounts payable and sales by department for each store, and provided income data for each store. Walmart noted in 1975 that it ran Singer electronic cash registers in 64 stores and NCR mechanical and electronic registers in 71 stores.

The late 1970s saw an acceleration of investment in technology, with Sam Walton being pushed by some of his hires to implement key innovations. As Walton recalls:

> David Glass and Jack Shewmaker were pushing hard for heavy investment in more and more, better and better computer systems, so we could track sales and merchandise and inventories across the company – especially instore transactions. When Jack became our President in 1978, he worked really hard at getting me to invest in bar coding and SKU item control, which is a computerized stock keeping unit inventory control system. Jack was also heavily involved in the creation of our satellite system, which turned out to be one of our tremendous competitive advantages.[7]

In 1977, Walmart completed the installation of a company-wide computer terminal network and stated that it was one of very few US retailers to possess an 'intelligent' in-store computer terminal. The terminals enabled messages to be sent to

and from stores. Stores were therefore able to place merchandise orders directly, as the terminals 'talked' to Walmart's computer (note the absence of a plural there), enabling orders to be processed more quickly. Corporate payroll was also installed on the system, enabling store managers to keep abreast of each store's payroll costs and transmit those to head office. Tellingly, Walmart stated that these developments enabled it to 'communicate with its 195 stores within hours – not days'.

The following year signalled a step change in Walmart's approach to information technology: the construction of a 16,000 sq. ft facility designed to house the 'latest in technological advancements in data-processing equipment'. Walmart noted that each new store was equipped with an IBM 3774 terminal and that it enjoyed better communications with its 229 stores than it did when its store-count was only 40.

Noting that each store was in constant communication with each warehouse, Walmart added that its General Office handles over 500,000 'item reactions' each week, with communications being transmitted over telephone lines. The retailer said that the information carried on each computer was 'mammoth', including data on payroll, bank deposits, daily sales from each store's 36 departments, estimated sales figures, warehouse inventory and hot-selling items. The year 1978 also saw an effective doubling of Walmart's IT capacity: the retailer stated that it was the proud owner of two central computers: IBM 370s, Model 148. With signs that the retailer was realizing the potential of this nascent technology, it revealed the existence of a 'computer development group' tasked with keeping up to speed with technological advances in order to accelerate communications and refine the usability of data.

In a fit of honesty – perhaps even humour – Walmart concluded that: 'The financial savings and the number of personnel hours saved daily by using the computer centre is incalculable – even by the computer.'

[7]Walton, p 270

The 1980s: technology acceleration in-store

At the start of the new decade, Walmart lauded the benefits of the progress it had seen in its store computer terminal network, as it enabled the tracking of inventory, provided a mechanism for replenishment and kept management informed of sales trends.

In a progressive development, Walmart revealed that it was trialling scanning technology in order to improve accuracy and the front-end experience for shoppers. In a prescient comment (some 30 years before the same suspicions were levelled at the introduction of self-checkout by many retailers, including Walmart), the retailer insisted that new technologies were designed to be people-supportive, not implemented to replace people.

The next few years saw a number of key developments, including the 1981 deployment of a purchase order management system and successful completion of the trial of point-of-sale scanning systems. The next year witnessed the upgrade of in-store back-office computers to offer greater capacity and lower running costs. Further tests were completed of point-of-scale electronic scanning systems and the company's merchandising function was adapted to enable electronic purchase order management.

The year 1983 saw the completion of the back-office computer upgrade and a reaffirmation of Walmart's commitment to a test of electronic scanning of the UPC (Uniform Product Code) at point-of-sale by expanding the test to 25 stores. An additional 70 stores were pledged, with the trial being expanded to 200 stores in the following year. Don Soderquist recalls of the embryonic barcoding system: 'the retailing industry did not generally accept UPC in its early days. Many thought it would be impossible to get everyone to agree on standardization and that the method would ultimately cost too much for everyone to adopt. Our perseverance prevailed, though, and we made it happen.'[8]

Other initiatives in 1983 included the installation of bespoke computers in a number of pharmacies and the start of work on a regional merchandising system to account for the idiosyncrasies of certain regions and individual stores.

The year 1984, ironically the title of George Orwell's 1949 dystopian vision of the future which predicted a world of technology-enabled surveillance, was the year that Walmart announced the signing of a contract for the purchase of a satellite communications system intended eventually to link all stores and DCs with its head office. The system was intended to allow information to be simultaneously sent and received from office to stores as well as the transmission of television communications to announce company news and conduct training. Initial testing began with the installation of earth stations at head office and two distant distribution facilities.

In another sign of Walton's reluctance concerning hefty technology investments, Jack Shewmaker recalled how 'Glenn (Habern, data processing manager) and I came up with the idea of using the satellite and I said "Let's pursue it without

asking anybody." So we got it to the point where we were ready to make a proposal and we told Sam. He just listened, he didn't necessarily discourage me. But he didn't encourage me either. Sam never gets excited about systems.'[9]

With regard to the satellite network, Sam Walton described the fundamental part it played in the retailer's success:

> The satellite turned out to be absolutely necessary because, once we had those scanners in the stores, we had all this data pouring into Bentonville over the phone lines. Those lines have a limited capacity, so as we added more and more stores, we had a real logjam of stuff coming in from the field. As you know, I like my numbers as quickly as I can get them. The quicker we get information, the quicker we can act on it. The system has been a great tool for us, and our technical people have done a terrific job of figuring out how to use it to our best advantage.

The same year saw Walmart provide an update on its purchase order management system. The company stated that the system allowed its merchandising division to store information on vendors and merchandise and access order information through computer terminals. Walmart added that Telxon handheld terminals enabled in-store personnel to reorder merchandise. In-store associates were also able to use the handset to scan shelf labels in order to access information on quantities ordered and the cost and retail price of the item. Walmart concluded that the system saved time and improved the efficiency of the reordering process.

In an update on its regional merchandising programme, Walmart reported that the programme relied on CAD (computer-aided design) to tailor each store's offer based on 128 traits such as climate, ethnic orientation, recreational preferences and the characteristics of local catchment areas (which were classed as rural/urban, military/college town etc.). The findings were used to determine store layout and departmental adjacencies. The retailer also revealed that it had installed a Human Resources System in 1984, enabling it to maintain a profile of each employee that included details such as salary information, training details and education etc.

Scanning at checkout was also gathering pace. While the retailer noted that it had historically limited data collection at checkout to the barest minimum in order to expedite the checkout process, Walmart described how the testing of electronic scanning of the UPC at checkout had enabled it to rapidly process price and merchandise information, assisting in replenishment efforts, as well as creating a much speedier checkout process for customers. As a consequence, Walmart pledged that all 115 new stores opened in 1985 would feature UPC scanning and that the system would eventually be rolled out across the chain.

In 1985, the company confirmed that UPC scanning had been expanded to 235 stores and that the satellite system had been installed and was functioning in a number of locations. The Walmart Satellite Network (WSN) was to be rolled out to 600 stores and seven DCs over the course of the year, with complete deployment scheduled for the middle of calendar 1987. The benefits were said to include improved voice and data communications as well as a reduction in credit-card approval times to around four or five seconds.

In a key strategic move – which began joining the dots between stores and Walmart's logistics network – the Douglas, GA, DC began operations in January 1986 using a UPC barcode laser scanning system similar to that used in stores, enabling a faster and more accurate flow of merchandise. Walmart again reiterated that all stores and DCs would be converted to this system by mid-1987. The system enabled store staff to receive and price-mark products using a handheld scanner, therefore bypassing the previously onerous paperwork.

UPC scanning in-store, in addition to the previously cited benefits for both retailer and shopper, had allowed the retailer to install a new 'Data Collect' function. This function allowed store managers to gather and analyse sales on an item-specific level, better enabling them to maintain an in-stock position on bestsellers and minimize shrink by providing greater visibility into the capture and recording of mark-downs.

Walmart revealed in 1986 that the trial of the UPC barcode laser scanning system in the Douglas, GA, DC had been a success and that all other DCs would be retrofitted with the system. The benefits of the system for stores were said to include more efficient paperless billing and automated receiving, the latter of which was said to provide a time saving of around 60 per cent compared to previous systems. In-store Series One computers matched the receipts against shipments and processed the necessary claims; all data were then transmitted via satellite to head office.

It becomes clear in this narrative that so many things that retailers and shoppers now take for granted were fairly innovative as recently as 25 years ago. For instance, it was only in 1987 that Walmart stated that the removal of price tags from items – replaced by on-shelf labelling – was being trialled in five stores and could represent significant cost savings if rolled out.

The year 1987 was something of a keystone year for Walmart's emergence as one of the most tech-savvy retailers on the face of the planet: the roll-out of in-store scanning was completed, as was the installation of the WSN, the largest private satellite network in the United States. WSN, scanning, automated receiving and the Telxon merchandising reordering were combined by Walmart as the foundation of future applications and systems development.

Walmart continued to pursue technological enhancements to its operations throughout the 1990s. In 1996, the retailer revealed how its in-store operations were being improved by the use of 'magic wands' (handheld computers) that enabled in-store employees to manage the 70,000 or 90,000 SKUs carried in a discount store or Supercenter, respectively. The handhelds were linked by a radio-frequency network to in-store terminals, enabling in-store associates to track inventory on hand, backup merchandise and deliveries. 'What it's really about is putting information in people's hands', said Randy Mott, Senior Vice President and Chief Information Officer at the time. 'We're careful not to get too enamoured with all the bells and whistles of technology. It's there to support people.'

Around this time, Walmart revealed that it had an annual technology and communications budget of $500 million and an information systems staff of 1,200. For the sake of context, that budget was equivalent to around 0.5 per cent of turnover. The average retail IT budget is around 4 per cent of sales now, but often only around 2 per cent of sales for grocers. 'With this technology, we're getting better, quicker and more accurate information to manage and control every aspect of our business', Mott said. 'Walmart has always been intensely conscious of holding down expenses, because that's another way we can have lower prices, better merchandise and service for our customers and better returns for our investors. We may be talking about state-of-the-art computer systems, but the way we manage them is pure Walmart.'

As we've seen in the previous chapter, the combination of forward- looking technology and Walmart's burgeoning expertise in logistics was a killer strength for the business, enabling it to brush aside its competitors in its march to world supremacy. By the late 1990s, Walmart was able to tell investors that it 'leads the retail industry with its version of a "just in time" supply system in which computers track every product and automatically alert warehouses when it's time to restock the shelves'. The company provided an example of how its operational improvements directly contributed to returns for investors: despite a 12 per cent increase in sales in 1998, the company saw only a 4 per cent increase in inventories, saving about $1.4 billion. Rather than blindly slashing inventory, Walmart used the data gathered by technology to make more inventory available in the key items that customers wanted most, while reducing inventories overall. The retailer added that, by 'data mining' the massive supply of information on customer shopping habits that its information technology systems provided, it was able to refine its store layouts and design, so that new and remodelled stores served shoppers more effectively.

As we noted earlier in this chapter, Walmart's (possibly undeserved) reputation for being a reluctant pioneer in technology, data and information placed the company in a great position to capitalize on its technology- enabled flow of data to become a better retailer. In 1998, Walmart stated that its emphasis on information stemmed from Sam Walton, quoted as stating that: 'People think we got big by putting big stores in small towns. Really we got big by replacing inventory with information.'

While much of the benefit realized by Walmart from technology related to behind-the-scenes advancement in efficiency, logistics and inventory management, the company was also able to generate competitive advantage through a better understanding of its shoppers. With regard to the shopper insight that its IT systems generated in the late 1990s, Walmart noted that its systems were able to gather information on exactly what any given shopping cart contained: 'The popular term is "data-mining," and Walmart has been doing it since about 1990.'

The retailer added that the resultant output was an enormous database of purchasing information that enabled it to place the right item in the right store at the right price. Walmart's computer system was said to receive 8.4 million updates every minute on the items that shoppers took home and, vitally, the relationship between the items in each basket: 'The computerized transmission of transactions to our systems, which keep track of what merchandise is needed where, is a key tool as Walmart merchants work to serve our customers.'

With Domesday theorists predicting the Y2K meltdown of the global network at the turn of the Millennium, 2000 was a key year for the international IT fraternity as much as it was for Walmart: the company announced that its computer system was the most powerful in the corporate world, with only the US government operating a larger computer network. Walmart's philosophy of building 'people-supportive' systems, it said, had 'given us a competitive edge that has and will be instrumental in the company's success'.

By 2004, Walmart was telling its investors that, thanks to over 75,000 associates in Logistics and in its Information Systems Division (ISD), it had 'the firepower' behind its retailing strategy that strived to achieve the Holy Grail for retailers: to have what the shopper wants, when the shopper wants it. Walmart noted that, with a data warehouse storage capacity of over 570 terabytes – larger than all of the fixed pages on the internet at the time – it had a remarkable level of real-time visibility

into its merchandise planning. In a fantastic real-life example of how this influenced the retailer's merchandising, Walmart recalled how 'when Hurricane Ivan was heading toward the Florida panhandle, we knew that there would be a rise in demand for Kellogg's Strawberry Pop-Tart toaster pastries. Thanks to our associates in the distribution centres and our drivers on the road, merchandise arrived quickly.'

To ensure greater supply chain visibility, satellite-based tracking technology was being installed in the company's entire fleet of over-the-road trailers. The data generated by the system increased productivity, reduced costs and enhanced security. Construction of an Innovation Lab was also under way. This centre was intended to showcase leading-edge technology and demonstrate how it could lead to future products, as well as better ways to serve shoppers.

[8]Soderquist, p 143

[9]Walton, pp 270–271

Opening the inner sanctum: Walmart's use of third-party IT suppliers

Until 2007, Walmart was famous for its in-house IT strategy and development: it had traditionally developed, maintained and operated its own systems in Bentonville and elsewhere through its ISD. This approach was possibly reinforced by the fact that vendors were usually more than willing to adapt to the systems used by Walmart, in many cases their biggest customer, at the same time as using standard third-party solutions for dealing with their other major retail customers.

Furthermore, Walmart clearly benefited from creating and shaping its own systems around its retailing and logistics functions rather than adapting its business to use off-the-shelf solutions from external hardware or software providers. Another factor is at play here: Walmart likes being independent and self-reliant and has not traditionally welcomed in third-party advisers or suppliers to interfere in its key trading systems.

Until five or six years ago, Walmart was wary of opening up to third-party software companies, consultancies and service providers, perhaps fearful that they have been known to develop systems and best practice at one company and then turn around and implement similar systems at a competitor. 'This is why we try to avoid working with software vendors and consultants in IT', a vice president IT of Walmart said in 2003.

Another benefit of the self-reliant approach was the fact that this strategy enabled centralization. 'Performance is crucial for us', a senior Walmart executive explained. 'The company loses $1,000 per hour per cash register that is down. And we get a better performance in China by managing our data in Bentonville.'

In keeping with the all-pervasive EDLP model that is the very DNA of Walmart's strategy, in-house technology development had the added advantage of being relatively cheap (as opposed to lining the pockets of external technology providers). According to a Walmart board member in the 1990s, the IT spending of the retail behemoth was 'significantly under' 0.5 per cent of its turnover. It is likely that other retailers have historically spent well over 1 per cent of sales on sourcing IT solutions and services from external providers.

Merchandising systems – often at the very heart of a retailer's operations – were a key area developed in-house by Walmart. Walmart's efforts in this regard dated back to the 1970s and were mainly based on IBM tools, when Walmart developed one of the first merchandising systems in the world, programmed in Cobol (central) as well as IBM 370 Assembler (store network), using IBM's CICS transaction processing system.

Nevertheless, in 2007, Walmart started to shift away from its strategy of self-reliance and isolation. The two most important vendors of enterprise applications, Oracle and SAP, were some of the first through the door. Firstly, Walmart introduced two software solutions from Oracle Retail. The first solution, Profitlogic, was implemented to help Walmart to optimize prices during mark-downs of seasonal apparel. The second solution was a merchandise planning solution for the buyers. In October 2007, Walmart decided to replace its legacy accounting and controlling systems with SAP Financials, a decision that provided conclusive evidence that Walmart's technology strategy had been opened up to packaged applications. We should be clear that purchasing packaged business applications doesn't mean that Walmart will necessarily have implemented what's known as a 'vanilla' solution. All complex business applications require configuration – which can make one company's implementation very different from another's – and in addition, Walmart might well have completed bespoke development on top of this.

The SAP implementation was followed in 2008 by a very decisive and comprehensive move: Walmart's selection of the Oracle Business Intelligence Suite Enterprise Edition Plus to provide comprehensive data intelligence and analysis from across all of Walmart's operations. Walmart planned to use the system to administer its logistics, transportation, category management, finance, human resources, real estate, merchandising, store and club operations and other business

resources, within Walmart and Sam's Clubs. Oracle stated at the time of the deal: 'Information Technology has long been regarded as a core strength that enabled Walmart to reduce costs and improve operational efficiency.' From Walmart's perspective, Rollin Ford, Executive Vice President and Chief Information Officer, stated that 'Technology and analytics are essential to help us be more responsive and effective in serving Walmart customers and Sam's Club members. The Oracle solution is very robust and it integrates well with our other applications, particularly as our business continues to grow in scale and complexity.'[10]

In June 2009, Walmart decided to implement another piece of standard software into its planning processes. Space optimization software provider Galleria Retail Technology Solutions was the recipient of Walmart's next move in its ongoing shift to utilizing third-party solutions. The retail giant had successfully completed a user acceptance and extensive scalability testing of Galleria's configured store and merchandise planning software system and stated that it would implement the solutions into its assortment, allocation and space planning process.

Of course, before this overt change of strategy, Walmart had already deployed hardware, components and services into its own systems from external technology vendors. Before the 2007/08 glasnost, names such as Teradata, IBM, SAS, Microsoft and Hewlett-Packard were already to be found within Walmart's internal technology architecture. But Walmart's data volumes, query requirements and stringent requirements for precision made it hard for an off-the-shelf product to be slotted in. So core solutions like merchandising systems, HR systems and logistics management had been developed in-house by the ISD.

[10]http://www2.prnewswire.com/cgi-bin/stories.pl?ACCT=104& STORY=/www/story/07-21-2008/0004852304&EDATE=

Data warehousing: helping Walmart drink from a hosepipe of information

We have already described how Walmart has an embarrassment of riches in terms of data: 'We keep everything! Data is the great enabler', a Walmart board member stated in 2006. Data warehousing is the term for the organization and storage of this data in order that Walmart might benefit from identifying some of the trends and implications within it. Teradata is the provider of Walmart's data warehousing function, 'increasing its lead as the largest retail data warehouse in the world'. In addition to the application activities used in servicing Walmart's shoppers, the Teradata warehouse at Walmart is the foundation for the company's Retail Link decision-support system used by Walmart and its suppliers. As we've already noted, Retail Link allows suppliers to access large amounts of online, real-time, item-level data that can help those companies improve their operations.

In August 2007, HP announced that Walmart had selected the HP Neoview data warehousing platform to power complex analysis of data collected across its 4,000 US stores. The announcement took industry experts by surprise as Walmart had already built up one of the largest data collections in the world using NCR's Teradata technology. In January 2011, HP announced the discontinuation of its Neoview product and Walmart once again turned to Teradata technology, expanding its data warehouse capacities.

In late 2010, Walmart decided to upgrade and enhance its Teradata data warehouse environment. The expansion included a data warehouse technology refresh programme which ensured that Walmart's data warehouse was once again at the leading edge of technology. The agreement also included a research and development relationship. The Teradata technology had the additional benefit of a 50 per cent reduction in floor space required and a 40 per cent reduction in energy consumption required to run the data warehouse.

'As this partnership is expanded, we will be able to leverage scalability, processing power, and storage capacity, along with software enhancements', said Jose Hernandez, Walmart's Chief Technology Officer and Senior Vice President of Infrastructure. 'Consistent with our sustainability initiatives, this expansion will result in a significant reduction in our data centre power and cooling footprint.'[11] Walmart's Teradata Data Warehouse is now the second-largest civilian database behind eBay. The retailer keeps each POS transaction for two years and then it is paged out to a second tier of storage. This vast reservoir of data has been an invaluable asset for Walmart: 'This automated process has made it possible for Walmart stores to be in stock consistently and minimize the dollars invested in inventory at the same time – that equals superior service for the customers and reduced capital commitment from the company'.[12]

[11]http://dssresources.com/news/3177.php

[12]Soderquist, p 146

Retail Link: a new era for Walmart and its suppliers

Like 1987, 1990 was a monumental year for Walmart's technology-enabled rise to supremacy: it was the year that the retailer announced Retail Link to its vendors. Retail Link was described as 'an aggressive step to further our partnership relations by moving beyond electronic data sharing. We desire to provide our vendor partners the quality of information concerning sales trends and inventory levels to facilitate genuine partnering in our mutual goal to serve our customers.' The system was said to be intended to capitalize on existing barcode and satellite capacities 'to bring our suppliers closer to our individual stores'.

By 1996, the Retail Link system was being touted as a key component of Walmart's technological advantage, providing sales data – by item, by store, by day – to vendors. The system was therefore said to save vendors time and expense in planning production and distribution, translating into lower product prices at Walmart.

Walmart was at pains to reiterate the importance of Retail Link in its relationship with vendors in the late 1990s. Starting from the basic information compiled at the checkout, at the shelves, and gathered by associates equipped with handheld computers, Walmart used technology to manage its supplies and inventories not only in the stores, but all the way back to the original source. Through Retail Link, Walmart granted its suppliers access to some of its data, which enabled them to know exactly what was selling, and to plan their production accordingly. This not only helped Walmart keep inventories under control, but also helped the supplier deliver the lowest-cost product to the customer.

With sales and in-stock information transmitted between Walmart and its suppliers in seconds over the internet, buyers and suppliers were privy to the same facts and were thus able to negotiate based on a shared understanding – saving a significant amount of time and energy over more traditional, low-tech systems. Buyers were said to benefit from the supplier's product knowledge, while the supplier benefited from Walmart's experience in the market.

In an update to investors in 2000, Walmart once again underscored the fact that Retail Link was one of the core enablers of its success. It was keen to point out its fundamental belief in building a collaborative environment with its suppliers in which both parties worked together to grow both businesses and provide lower retail prices for customers: 'While some retailers have been reluctant to share sales or other proprietary data with suppliers, Walmart has allowed suppliers this type of access since early 1991. This system evolved into a web-based product called Retail Link.' It allows the company and suppliers to track merchandise to study how products sell in any store by region or by individual unit. They can also review inventory levels, returns and inventory adjustments. 'We think sharing information with suppliers allows for better input from them about how to maximize sales and profits. We can then implement best practices and pass the savings on to customers', Kevin Turner, the company's Chief Information Officer, said.

Retail Link continues to be an important – and global – cornerstone of Walmart's success. Suppliers, both big and small, are given a user ID and password to access the system. Retail Link is used to get reports regarding the sales of products, complete online supplier agreements and obtain information about how to do business with the retailer. In the words of Don Soderquist in 2005, 'No other retailer to date has replicated this system, which is another way that technology has aided Walmart in developing a significant strategic advantage in the marketplace'.[13]

[13]Soderquist, p 147

The false dawn of RFID

It was in 1992 that Walmart first publicly brought up the topic of radio frequency identification (RFID). The advent of RFID put many suppliers (in general, not just those that supplied to Walmart) in a tailspin. On paper, RFID had the potential to revolutionize the world of distribution and retail: the system enabled communication through the use of radio waves to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking. At the time of its nascent introduction by a variety of retailers, RFID was commonly perceived as having the potential to transform the world of commerce in the way that the barcode did several decades before.

Theoretically, RFID made it feasible for vendors and/or retailers to give each product, or pallet of products, its own unique identifying number to track its whereabouts or progress through the supply chain. For retailers in particular, RFID technology made it theoretically possible to locate pallets in DCs or in the storage rooms at individual stores. Even in this day and age, it is remarkable to what extent retailers can rely on manual checking of stock, opening up the possibility of human error and entire pallets of goods being misplaced.

While barcodes are rightly hailed as one of the greatest developments in the history of the distribution of consumer goods, they are not without their limitations. Barcodes have to be 'shown' to readers in close proximity; either by being passed in front of a static reader (such as a pallet being sped past a barcode reader on a conveyor belt in a DC) or, in a scenario familiar to us all, being manually passed over a checkout reader by a member of staff in a retail store. In other words, barcodes rely on proximity and a line of sight between label and reader, and scanners are generally only able to read one

barcode at a time. RFID, therefore, marked a huge advantage over barcodes: they can be 'read' from a distance; they can be read from within cartons; and they can be read hundreds at a time.

While RFID has become widely used in other areas of life (motorists using turnpikes in the United States will be familiar with the E-ZPass system; commuters in London will need no reminding of the ubiquity of Oyster cards; and other – more esoteric – uses of RFID include tracking high-value casino chips and monitoring livestock), its anticipated impact in the world of FMCG and retail has turned out to be something of a damp squib.

In 1992, Walmart stated that the aim of RFID technology was to achieve 'the simplification of what we do, elimination of waste and access to more meaningful information'. The retailer added that the advent of RFID enabled it to access better sales and inventory information, thus leading to a better in-stock position.

In February 2004, Walmart received the first pallets tagged with RFID labels in its Fort Worth, TX, distribution centre. They were shipped from Procter & Gamble, Gillette, Unilever, Kraft, Johnson & Johnson, Kimberly-Clark, Nestlé Purina and Hewlett-Packard. At this time, seven Supercenters, supplied by the Fort Worth distribution centre, were involved. Writing around this time, Don Soderquist posited that 'I am convinced that RFID will become a major breakthrough technology in the years ahead. And Walmart is out in front'.[14]

Two years later in 2006, Walmart told investors that 'innovation is taking place in a number of areas. Nowhere is this more evident than in the application of RFID technology. Walmart has been a critical catalyst that has brought this technology to business use and now is helping to foster worldwide RFID standards.'

On the back of this – and despite problems with RFID reading owing to the influences of metals and liquids in grocery distribution – Walmart was striving to roll out the technology at pallet and case level in the United States. Even though Walmart was expressing an aspiration at this stage that single items would be tagged with RFID chips, there were very few, if any, implementations at Walmart of this more granular tagging.

In 2007, the RFID strategy leader at Walmart, Ron Moser, said that the retailer could increase sales by $287 million by fixing just a small portion of its inventory problems using RFID technology. As of late 2007, around 2 per cent of all lost sales were due to the simple fact that a store had run out of an item, but 41 per cent of lost sales were due to inventory problems, according to Moser. He expected RFID to have a bigger impact on the company than barcodes did when that technology was introduced in 1984. With RFID, Moser expected inventory accuracy to improve tremendously. He believed that products would get to shelves faster, thereby reducing lost sales, and that lost or missing merchandise would become a phenomenon of the past. Going forward, the company planned to work more closely with suppliers on RFID. By October 2007, 600 of Walmart's top suppliers had started using RFID tags at their own expense, in order to comply with Walmart's initiative. Some of these suppliers had found their own inventory cost savings, but others had not, according to Moser: 'We have seen suppliers that are getting no benefit out of RFID and use it only because we told them to. We've got to work with these suppliers to help them find cost savings and other benefits from the technology.'[15]

In July 2010, Walmart started to sell menswear such as jeans tagged with RFID labels in an effort to gain easier control of its inventory. This initiative marked the start of the retailer's new approach to RFID technology after some of its past projects were discontinued. The clothes were RFID-tagged by the suppliers at the point of manufacturing with EPCglobal's second-generation ultra-high-frequency (UHF) RFID standard tags. The new pro-gramme concentrated on those types of products that have multiple SKUs and are, therefore, a challenge to manage from an inventory perspective, according to Myron Burke, Walmart's Director of Store Innovation, who was leading the retailer's electronic product code (EPC) programme in the United States. 'We are addressing the opportunity to improve inventory accuracy and inventory availability', Burke said. 'We have been working collaboratively with suppliers on a strategic basis to make this part of our systems.' Unlike previous efforts, in which Walmart required suppliers to tag items by a certain date, the retailer was working with suppliers collaboratively to incorporate EPC data into their warehouse management systems, the *RFID Journal* reported. In order to address the substantial privacy concerns (Walmart employees were not removing or deactivating the RFID tags when items were sold), Walmart stated that it expected that its customers would cut off and discard the tags prior to wearing the items, as they customarily would for other non-RFID labels and hangtags. Walmart added that it would not be reading the tags at checkout, so the EPCs will not be associated with any personally identifiable information, to protect consumer privacy.[16]

By 2009, Sam's Club required some suppliers to tag single items with RFID tags. The edict applied to 5,000 club-sized bulk packs, rather than conventional store items. By the same deadline, Sam's Club expected all suppliers to tag all deliveries at the pallet level for all 17 Sam's Club distribution centres as well as for direct store deliveries with RFID. Suppliers failing to meet those requirements were being charged $2.50 per pallet.

[14]Soderquist, 144

[15]http://www.pcworld.com/businesscenter/article/138391/ walmart_eyes_287_million_benefit_from_rfid.html

[16]http://www.rfidjournal.com/article/view/7753

The globalization of technology in Walmart

An additional benefit of Walmart's self-sufficient approach to technology was the ability to use similar systems as it globalized. The world's largest retailer is rightly proud of the harmonization of its IT architecture around the world: according to a Walmart VP in 1997, about 90 per cent of all IT systems were the same in all countries.

This strategy is one pioneered by Walmart, although retailers such as Tesco (which developed an international back-office package called Tesco in a Box) have been following suit by standardizing technology across their international markets. Walmart was quick to establish a common technology strategy for all of its global operations: since 1995, Walmart's ISD has been using one common merchandise system for all of its cross-border retail operations. 'The common system, centrally managed, is our competitive advantage at Walmart', one of its vice presidents claimed.

Walmart continues to pursue this approach – exploiting best practice from the United States and elsewhere in all of its new and existing international markets. Walmart is expected to roll out its systems quickly in South Africa, for example, while it has already adopted this strategy in India. In 2008, Walmart decided to provide technology systems to its Indian joint venture partner Bharti, not only for the partners' jointly operated cash & carry business but also for Bharti Retail, Bharti's wholly owned subsidiary that operates easyday supermarkets and easyday Market compact hypermarkets. Both companies have entered into a franchise agreement whereby Walmart provides technical support to Bharti Retail.

Technology and private label development

Another key area where Walmart has been looking to third parties for technological enhancement has been in private label development – inherently a complex side of the business since many Walmart private brands are sourced from a disparate mix of low-wage economies and the end-products are sold through Walmart stores across the world.

Since 2008, Walmart has been working with Agentrics' product lifecycle management (PLM) platform to support the collaborative development of its private brand products, with initial efforts focusing on the Great Value grocery range. Agentrics' PLM features a web-based, collaborative, end-to-end work process, database and production environment to drive speed, innovation and consistency across the product lifecycle. Agentrics rebranded the Walmart system, which is now referred to as Walmart Aspect across the retailer's network. Walmart and more than 500 suppliers began using Agentrics PLM to support the redesign and re-branding of the Great Value line.

Walmart also deploys the collaborative design software Odin from Sun Brand Technologies for the brand management of its private label products. The online tool is accessed by Walmart staff, suppliers and external agencies to develop artwork. Brand guidelines and briefs are available, as well as the status of projects in progress. Asda in the UK was the first Walmart division to use the tool. Asda initially deployed the system for its own-brand food ranges, where the design-to-print cycle was cut from 18 to 12 weeks, before rolling the solution out to its non-food private labels. In 2009, Walmart US installed the brand management software across its Marketside range of fresh produce and its Equate health and beauty portfolio.

A similar process was implemented for George, the Asda-developed global fashion brand available in Walmart stores across the world. George, based in the UK, deployed an online collaboration portal from British internet specialist Concrete to serve the Walmart apparel businesses around the world. George implemented the solution to cut the costs of producing products for sale internationally, as well as to provide consistency in how George products are sold across Walmart International. Walmart's national retail divisions can browse all product designs and download artwork for those they wish to sell from George's head office in the UK. Before the portal was introduced, this artwork was being redrawn in each country for local suppliers to work from.

Price optimization

As we've already seen, price optimization (an analysis of factors such as price elasticity to ensure that demand and margins are maximized) was one of the first functions for which Walmart looked beyond its own capabilities and secured input from an external supplier, installing the Profitlogic solution from Oracle in 2007 to optimize mark-downs for seasonal apparel.

Since then, Walmart has deployed other, more general, price optimization solutions across its business. By mid-2010, DemandTec's price optimization solution was already live in seven of the retailer's markets. In the United States, Walmart uses DemandTec's price optimization for all of its retail operations, including Sam's Club.

Bean counting and number-crunching

In October 2007, Walmart decided to replace its legacy accounting and controlling system with SAP Financials. Walmart has since been rolling out the package from the German software maker globally in phases. By early 2010, Walmart had completed the implementation of SAP Financials at Asda in the UK. The retailer stated that the implementation 'went exceptionally well'. Walmart has since implemented the system in most of its international markets, meaning that virtually all of the retailer's operations have deployed the standard accounting and controlling system. The retail giant stated in its annual report that: 'this new financial system is a significant component of our internal control over financial reporting. We will continue to implement it in stages, and each implementation may become a significant component of our internal control over financial reporting.'

Walmart has commented that it does not anticipate any significant year-on-year cost increases for the implementation of the SAP financial system. SAP modules work hand-in-hand with in-house accounting and consolidation tools. According to Walmart, it purchased SAP Financials to 'support the retailer's global expansion and its need to efficiently respond to changes in the business and regulatory landscape. We believe SAP's experience in helping global companies with their financial systems will bring more flexibility and scalability to our growing business.'

In-store technology

Having provided some colour around Walmart's strategy and progress in establishing best practice in back-office technology, we can turn to the increasingly important issue of in-store technology. As shoppers, assisted by the proliferation of mobile devices, become more tech-savvy and as social media become more embedded in influencing shopper behaviour, Walmart has been on the front foot in terms of utilizing the latest technologies to optimize the shopping experience. This optimization stretches from the mundane (cash registers) to the more fanciful, but Walmart has proven time and time again that technology is a vital component of its effort to remain a core shopping destination for shoppers across the globe.

Walmart is proud of running the same POS software solution at most of its checkouts around the world. It is based on the relatively elderly IBM 'supermarket application' (IBM SA) but has been heavily modified by Walmart's in-house ISD in Bentonville.

An exception can be found in Walmart Japan, where Walmart was not able to reconcile the local language coding with its central POS solution. Because of its 'mature' POS technology base, Walmart's common POS system is not able to support the standard Unicode which helps to run software in all letters and language codes of the world.

Walmart has installed NCR's Selfserv Checkout (formerly Fastlane) in most of its stores in the United States and the UK. In a Walmart Supercenter in the United States, there are usually four self-checkouts and eight Express-Checkouts for smaller baskets added to an average of 26 full checkouts. Although Walmart predominately deploys self-checkouts from NCR, some stores are equipped with self-checkouts from IBM.

Walmart is the world's largest user of NCR's self-checkouts. The retail giant was also one of the first retailers to use this technology: after testing four different self-checkout systems in 2001, Walmart decided in 2002 to embark on a roll-out of NCR's NCR Selfserv system. Since then, every new and remodelled store has been equipped with self-checkouts. The retrofitting of existing stores proceeded quickly: in June 2004, around 840 stores had the system and by April 2005, 1,325 stores were running NCR Selfserv. In 2007, most Supercenters in the United States were running self-checkouts.

In the UK, Asda has installed NCR Selfserv in almost all of its stores. In May 2009, Asda completed the roll-out which it started in 2006. Most Asda stores now have either four or eight self-checkout systems. In June 2009, Asda opened a new store in Keighley which is the first Asda store with more self-checkouts than manned tills: the store comprises 22 self-service and 14 traditional checkouts.

With the colossal number of shoppers that enter its stores each week, both Walmart and its suppliers have been quick to realize the potential of Walmart – and its in-store TV network – as a valuable way of communicating to US consumers. In 2009, about 150 million Walmart shoppers viewed the chain's digital TV network each month. At this time, most Walmart Supercenters in the United States already had plasma screens in key departments, such as home electronics as well as health and beauty. By early 2010, the retailer had installed additional 15-inch screens at its checkouts.

In September 2008, Walmart US presented a revised in-store TV concept to agencies and marketers. It was called Walmart

Smart Network (Smart) and was facilitated by Thomson's Premier Retail Networks (PRN). Smart was the result of two years and $10 million in research and development used to identify the optimal locations, applications and programming for reaching the millions of consumers who visit the retailer's stores each week. Walmart completed the chain-wide deployment with 27,000 screens in early 2010. The new concept, which was developed with the support of the consultancy DS-IQ, involves moving TV screens or digital signage closer to eye level. The screens are now part of product displays and create interactive virtual assistants to provide product information to shoppers or refine choices in key categories.

Custom programming on the network is provided by Studio2, a newly formed company led by key advertising executives who are experts in in-store communications and who were involved in the development and testing of the new network. Network operations, implementation, advertising sales and high-definition television (HDTV) wall programming are provided by PRN. Response measurement, learning and message optimization technologies are provided by DS-IQ, which supplied analytical insights for the network pilot in 2010.

With the revised in-store TV, Walmart is the first retailer in the United States to roll out a next-generation retail media network using Internet Protocol television technology that allows the retailer to monitor and control more than 27,000 screens in more than 2,700 stores across the country. The Walmart Smart Network also deploys response measurement and message optimization technologies to enable delivery of the most relevant content to shoppers – by store, by screen, by day and by time of day. All of the content on the Walmart Smart Network is customized, designed to deliver product information to consumers at the point of decision when and where they need it in the store.

In February 2010, Walmart stated that its Smart digital signage network was a huge success compared to its predecessor, Walmart TV. At the Digital Signage Expo in Las Vegas, Walmart's creative director Andy Johnson said that the Smart Network had been successful in the past 18 months, as it had demonstrably increased sales for many of the products that were advertised on it. A Nielsen survey said that 40 per cent of Walmart shoppers noticed the network, 32 per cent recalled an ad on the network and 64 per cent reported a 'positive experience' from the network. Walmart sells what it calls triple play, where a campaign is shown on a large welcome screen at the entrance of the store, a category screen in departments and endcap screens on each aisle. According to Johnson, it takes 21 seconds for a shopper to move from the door of the store to the greeting area where the welcome screen is placed. 'We know what content is played on what screens at what stores at what times', Johnson said. 'And simultaneously we know what was sold at those times.'[17]

Like many retailers the world over, Walmart has implemented kiosk-based solutions to bring its shoppers value-added services. Principal among these services are redbox DVD rental and Coinstar coin-counting machines. Both services are operated by Coinstar, for whom Walmart accounted for 18.6 per cent of 2010 revenues.

In late 2009, Walmart started to install new photo kiosks from HP in its US stores. The roll-out of the 'Prints in Minutes' terminals was completed by summer 2010. The HP kiosks are replacing solutions from Eastman Kodak, which had been deployed at Walmart since 2006.

[17] http://www.digitalsignagetoday.com/article/159854/DSE- Walmart-reveals-18-month-results-for-SMART-Network

'Our computer really does give us the power of competitive advantage'

Walmart has justifiably been lauded as a retailer that owes much of its success to its early and rapid adoption of state-of-the art technology and, indeed, its own in-house technological development to create its own solutions when off-the-shelf alternatives were too costly, unsuitable or simply did not exist.

One aspect of the advantage that this prowess in technology gave Walmart was an advantage in terms of information. As Sam Walton noted, Walmart's forensic knowledge gleaned through Retail Link 'makes it tough for a vendor to know more about how his product is doing in our stores than we do. I guess we've always known that information gives you a certain power, but the degree to which we can retrieve in our computer really does give us a competitive advantage.'[18]

Retail Link still remains a key competitive advantage for Walmart and it remains a vital platform for the retailer and its suppliers all around the world. Indeed, when Walmart announced its intention to enter the African market, we were struck by the urgency with which local suppliers approached us for information and insight concerning Walmart's expectations regarding issues like Retail Link and other technological matters.

That said, we believe that Walmart's competitive advantage derived from technology has been eroded in recent years. Many retailers (in the United States and in other key Walmart markets such as the UK and Canada) have effectively caught up with the Bentonville giant, developing their own iterations of the Retail Link concept. In fact, many retailers, such as Tesco in the UK, have overtaken Walmart in technological terms, particularly in areas such as e-commerce and shopper insight systems. We've seen in another chapter how Walmart's relative lack of shopper insights led to some serious

missteps in its SKU rationalization programme, especially in contrast to Tesco which was able to conduct its own assortment editing process with fewer mistakes thanks to the data and learning from its dunnhumby shopper insights data.

The adoption by Walmart of standard systems (Teradata, SAP etc) also signals that Walmart may have relented somewhat on its more insular and independent approach to technology development and implementation. This might well make economic sense for Walmart, particularly as it enters more foreign markets where suppliers will be unable or unwilling to adapt to the Walmart way of doing things when they have much bigger customers to supply in markets such as the UK, South Africa and Japan. In the United States, where Walmart is the biggest game in town, the incentive for suppliers to adapt to Walmart's requirements is more substantial.

Technology might just be one of very few areas where Walmart has ceased to be a leader and has become a follower. Not a terminal condition to be in, but certainly an uncomfortable realization for the boffins in Arkansas. Although it's worth remembering the words of former executive vice president and chief information officer at Walmart, Linda Dillman: 'We don't want to be famous for our technology. We want to be famous for what our technology allows us to do.'

Internal technological excellence has been one of the key attributes that Walmart has been able to capitalize on. With e-commerce, mobile commerce and social media becoming all the more important as Walmart's multi-channel strategy evolves, Walmart's shopper-facing technological development is becoming increasingly important. We turn now to assess the importance of online retailing, along with other growth opportunities such as smaller store formats, for the future of the world's number-one retailer.

[18] Walton, p 285