

# Business Model Transformation through a Technological Innovation: Lessons Learned by Kodak Driving into the Future

## Introduction

This story is about a rapid transformation of an industrial company from suddenly obsolete to a new breakthrough technology – this story is about Kodak which we know and we don't know. Challenges of getting into the future started for Kodak back to 2005 when the core company's business of filming went away with the invention of digital photography. To stay in the market Kodak had to overcome an extremely fast transition of a manufacturer who makes its money on a 'pointed capture' to a producer who is making its capital by 'pointed printing.' This case is about a technological innovation that creates a totally new value for a customer. In this investigation we particularly look at the questions of how to address unmet customers' needs; what is a technology-driven innovation; when intellectual property (IP) can transform company's business model, save the business and create a new product. This case describes seven years of Kodak recent experience in capturing an innovative underestimated market.

## Overture, or the background to the story

Yogi Berra, U.S. baseball player and coach once said, "You've got to be very careful if you don't know where you're going, because you might not get there." This saying describes many situations when sometimes we think we know where we are going but we end up in a very different direction and sometimes it might not be a bad thing. For Kodak this meant a story of how an effort to solve one manufacturing problem resulted in a technology with the strong profile to develop a completely different market and this is what was behind it, or rather what was in the past that determined its future.

We assume that most of our readers hardly heard about Yogi Berra but we expect them to know about Peter Drucker and since our story is about innovation we get back to as far as 1954 and from the bookshelf open "The Practice of Management." In 1954 Peter Drucker wrote "There is only one valid definition of business purpose: to create a customer. Therefore, any business enterprise has two — and only two — basic functions: marketing and innovation"\*. Innovation is about creating products that are "new," but it is not enough; in business an innovation needs to create a value for the customer to avoid being just an invention – whether simple or difficult it may be. To understand the issue of creating a value for the customer we look at Kodak starting-up and see the way Kodak cared for different customers who *valued the value* of their innovation...

...Back to the beginning of the 20<sup>th</sup> century, Kodak was the 'Google' of its day, creating an entirely new set of businesses that achieved stellar growth: photography for the masses, motion picture, and even the first X-ray film receiver. Kodak was a vertically integrated company and produced lots internally. Kodak was a world into itself: cows (for gelatin); forests (for chemicals); savings &

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\* Source: Peter Drucker (1954) "The Practice of Management ", New York: Harper & Brothers.

loan (for employees); fire department (for safety); and even its own definition of 'time' (for convenience). A few examples shown below are to illustrate how far the vertical integration inside Kodak went. These examples of Old Kodak are essential to explain many of the challenges that New Kodak faced later on. These examples are also to oppose a widely-spread misled view that Kodak simply "resisted the rise of digital technology", which was not really the case although one might read it elsewhere. Now you will get to know why we started with Yogi Berra's saying, "You've got to be very careful if you don't know where you're going, because you might not get there."

### *Eastman Gelatin*

At the end of 1881, customers complained about fogged and darkened plates. The gelatin supplier had changed its source. The original cows grazed on sulfur-rich mustard. The later cows were lacking sulfur in their diet. So in a typically vertically integrated company, Kodak had to bring own herds of cattle to make sure the animals eat the right grass and thus ensure the consistency of photography. At the end of December 2011, Eastman Kodak Company announced that it has agreed to sell its Eastman Gelatine Corporation business to Rousselot, part of the Eindhoven, Netherlands-based Vion Food Group. The decision was consistent with Kodak's previously announced intention to sell non-core assets to sharpen the Company's focus on its digital growth initiatives thus accelerate Kodak's transformation to a digital company. Within Kodak, Eastman Gelatin has been successfully managing the transition of the photographic market by increasingly expanding its sales into non-photographic categories, such as the pharmaceutical, edible protein and food/confectionary categories. Rousselot is positioned to help Eastman Gelatine continue the recent growth in its sales outside the photographic industry towards growing pharmaceutical markets.



Photo: Kodak of 19th century

### *Tennessee Eastman Corporation (now Eastman Chemical)*

World War I disrupted the German supply of photographic paper, optical glass, gelatin, and many chemicals, including methanol, acetic acid and acetone. At the end of the war in 1918, Eastman Kodak founder, George Eastman, was determined to have an independent supply of chemicals for the photographic processes. Thus, Kodak bought the facilities to make its own supply including Appalachian forests which provided raw materials to make methanol and acetone and to have an independent supply of chemicals for the photographic processes. From its beginning more than 90 years ago, Eastman has grown to be a leader in the global chemical industry.

### *Eastman Savings & Loan*

Eastman wanted to provide the employees with an institution that served essential financial needs, especially for mortgages. On February 1, 1996, Eastman Savings and Loan changed its charter and became ESL Federal Credit Union. Today, ESL offers members much more than just mortgages and is one of the largest and strongest credit unions in the country. It is the largest, locally owned financial institution in the Greater Rochester area and the largest credit union in New York State. ESL is in the top 1% of national credit unions ranked by assets. Since 1920 when George Eastman founded it, ESL Federal Credit Union turned into a full-service financial institution with \$4.3 billion in assets. ESL employs more than 640 people locally and about 310,000 members world-wide. The company was twice recognized as one of the Best Small and Medium Workplaces in America by the Great Place to Work<sup>®</sup> Institute and presented by Entrepreneur<sup>®</sup>. Access to the credit union includes 19 branch locations and more than 40 ATM locations, a Contact Center, and Internet, online and mobile banking channels<sup>†</sup>.

### *...and even the Fire Department*

Eastman Kodak Company's Kodak Park plant includes 121 major manufacturing buildings, nearly 30 miles of roads, 22 miles of fence line, two power plants, its own sewer system, water treatment facility and even the fire department. Since 1897, the Kodak Fire Department has maintained a 24 hour presence at Eastman Business Park and responds to all sorts of emergency calls such as fires, chemical spills, odors, elevator rescues and emergency medical service<sup>‡</sup>.

### *Cotsworth Calendar*

The International Fixed calendar is a solar calendar that provides for a year of 13 months of 28 days each, with one or two days a year belonging to no month or week [(13 x 28) = 364]. It is therefore a perennial calendar, with every date fixed always on the same weekday. Though it was never officially adopted in any country, it was the official calendar of the Eastman Kodak Company from 1928 to 1989 because it fitted beautifully with the manufacturing schedule. The 13-month calendar (also known as the Cotsworth plan, the Eastman plan, or the Equal Month calendar) was in use at Kodak until 1989 for pay and reimbursement schedules.

### *Kodak Technological Advancements*

In 1912 George Eastman hired Dr. C.E. Kenneth Mees, a British scientist to organize and head a research laboratory in Rochester, one of the first industrial research centers in the U.S. It was the time when Kodak Research was founded. Kodak became one of the pioneers of industrial research with General Electric and AT&T. To provide just a few examples of Kodak contemporary technical innovation we name: electrophotography (1975), digital camera (1976), OLED\* 1987, inkjet printer 2007, APEX 2008, stream technology 2009.

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<sup>†</sup> [http://en.wikipedia.org/wiki/ESL\\_Federal\\_Credit\\_Union](http://en.wikipedia.org/wiki/ESL_Federal_Credit_Union) accessed February 2013.

\* An OLED (organic light-emitting diode) is a light-emitting diode (LED) OLEDs are used to create digital displays in devices such as television screens, computer monitors, portable systems such as mobile phones, handheld games consoles and personal digital assistants (PDA). Efficient OLEDs using small molecules were first developed by Dr. by Ching W. Tang and Steven Van Slyke in 1987 at Eastman Kodak. The term OLED traditionally refers specifically to this type of device, though the term SM-OLED is also in use. Accessed from <http://en.wikipedia.org/wiki/OLED> (January 2013).



It all started....in 1878 when George Eastman for the first time demonstrated to the world the great convenience of gelatin dry plates over the cumbersome and messy wet plate photography prevalent in his day. Dry plates could be exposed and developed at the photographer's convenience; while wet plates had to be coated, exposed at once, and developed while still wet. Already in 1879 Eastman invented an emulsion-coating machine which enabled him to mass-produce photographic dry plates. A year later, Eastman began the first commercial production of dry plates in a rented loft of a building in Rochester, New York. In January 1881, Eastman and Henry A. Strong (a family friend and buggy-whip manufacturer) formed a partnership known as the Eastman Dry Plate Company. In September, Eastman quit his job as a bank clerk to devote his full time to the business, including the problem of the yet-to-come gelatin problem that we have started with.

*Cohesion of the new Kodak with the new*

Since 1890s most of the Kodak technologies were about fine coating onto materials raising an IP portfolio of 12.000 patents in imaging. Kodak is making one patent for one million US dollars spend in R&D and today IP portfolio makes the living for the company. In memories, many people have the vision of the red and yellow colors and the idea of an old filming company. In 2006 Kodak lost the yellow box in the brand logo, simplifying the image and also moving towards a rounded type



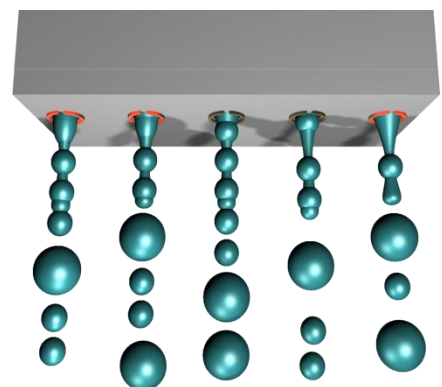
font of "a" to give the name a more contemporary look<sup>§</sup>. The Kodak of today is a new milestone marking a new chapter in Company's history transforming from b2c to a b2b digital manufacture involved into printing and commercial imaging. Thanks to wide IP portfolio, Kodak of today exploits competitive advantage at the intersection of materials science and digital imaging science, utilizing its history in deposition technologies to transform large markets. If someone might still think of Kodak as the b2c application, caring an image of an old filming brand that prints photos, having a "problem" – it is no longer the case. The company has shifted from 1878 technology of putting 14 macroscopic layers of chemistry with great accuracy deposited to a paper in the dark to a new 2000s technology which is based on dropping the image on the paper. Kodak technology has moved from the coating film to a newly invented technology of billions drops applied in one second to the paper using air deflection. With the new patented technology Kodak can print a bible within 4.2 seconds like no one else. As ever Kodak is the 'Google' of the time. Back to 19<sup>th</sup> century Kodak was revolutionizing the photography now Kodak is discontinuing printing.

### The interface, or innovation from the unexpected

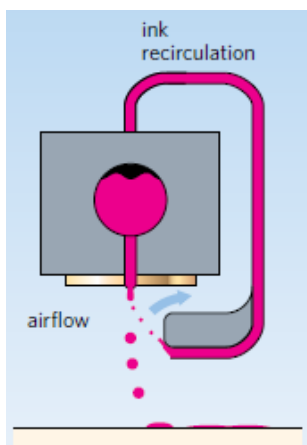
Our story has started with a collision of the old Kodak with the new one. In particular, we wanted



you to imagine how coating film might require depositing microscopic layers of chemistry with great accuracy onto an acetate film at high speed, 14 times, in the dark. As part of this innovation journey, Kodak invented a unique technology and patented a nozzle array technique that uses air deflection to deposit just the molecules needed onto the film at a rate of a few billion drops per second. So, the technology worked really well...and not only as an invention.



Thus one day, typically for an innovation being a result of serendipity, in a classic skunk works project, a small engineering team worked out that if the array could be modulated, it could print patterns of uniform drops at a speed 10 x faster than any



other existing technology in the world. This exactly how the Stream Inkjet writing system was born. To explain more of technicalities, in the Film Coating System, a steady stream of fluid is formed under pressure from an array of uniform jetting nozzles. Individual streams are stimulated by thermal energy to break each stream into individual droplets. The droplets are directed to the media with great accuracy or to a recirculation catcher as determined by the input data stream.

Modulating the stream, Kodak created a Novel print head which:

- Offsets class productivity, reliability, cost, and quality;
- Supports a range of papers and substrates;
- produces up to 3,000 ft per minute;
- makes 5.1 Billion ink drops per second;

<sup>§</sup> [http://www.kodak.com/ek/US/en/Our\\_Company/History\\_of\\_Kodak/Evolution\\_of\\_our\\_brand\\_logo.htm](http://www.kodak.com/ek/US/en/Our_Company/History_of_Kodak/Evolution_of_our_brand_logo.htm) Accessed February 2013

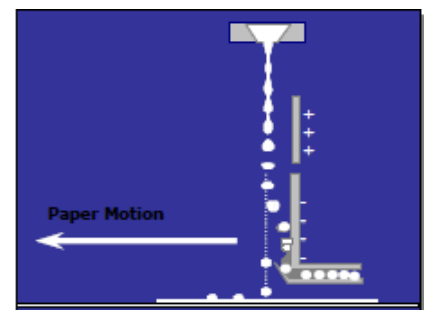
- introduces a technology so fast that it can print as many pages as in a standard Bible in 4.2 seconds.

In the words of Henry Freedman, Technology Watch Editor and a third-generation printer, the pigments in Kodak Inks “range from 10 to 60 nm mean particle size, meaning that the pigments are much smaller than the wavelength of visible light, greatly reducing scatter, resulting in brighter, cleaner colors”. Technology Watch has published more than 400 scientific and technical articles about printing, publishing and the information industry over more than 35 years. It has become one of the leading technical sources on the future of technologies in printing and publishing... they “found Kodak’s color gamut is superior to offset”\*\*.

Just for a bit of curiosity, we look back at the history of the first printed bible. We believe it is important to mention the history of the Gutenberg Bible and pause Kodak story-telling by referring to Johann Gutenberg who in 1454 or 1455 discontinued books either ‘copied by hand’ or ‘printed from engraved wooden blocks’—processes that could take months or years to complete. Johann Gutenberg invented a mechanical way of making books, a printing press that made it possible to produce many copies of a work in a relatively short amount of time. The process soon spread throughout Germany and from there to Italy, France, and the rest of Europe. By the end of the fifteenth century, hundreds of book titles were being produced each year on wooden hand presses like Gutenberg’s<sup>††</sup>. “The printer first cut a block of hard wood the size of the page that he was going to print. Then he cut out every word of the written page upon the smooth face of his block. The letters were inked, paper was laid upon them and pressed down.

With blocks the printer could make copies of a book a great deal faster than a man could write them by hand. But the making of the blocks took a long time, and each block would print only one page”<sup>††</sup>. Like in the Gutenberg time, the stream technology is a true game changer. It enables high speed printing at offset printing quality but with a new and unique advantage – every page can be different. Let’s say you’re producing high volume direct mail solicitations. By adding a Stream Print head, one will be able to produce more creative mail pieces with lower cost of operation compared to any other variable data option at the offset level.

“Stream Technology will bring some exciting changes to the industry and this technology demonstration will be an impressive display of its offset class capabilities,” says Ronen Cohen, Vice President of Marketing, Kodak Inkjet Printing Solutions. “Stream Technology provides a number of flexible features to meet the needs of commercial printers for applications like direct mail, catalogs, and free standing inserts. Stream Technology is one of the foundations that will solidify Kodak’s leadership in inkjet innovations. The feedback from the demonstrations in Dayton has been fantastic”<sup>§§</sup>.



### More of the technological innovation

The technology works like a dripping tap in a crosswind! Drops created by tension fall from the nozzle and are deflected by airflow. If the drop is one that is needed for printing, the frequency is adjusted to make the drop larger, which are less affected by the airflow and fall onto the page. The

\*\* Source: [http://graphics.kodak.com/us/en/about\\_gcg/news/2012/121009b.htm](http://graphics.kodak.com/us/en/about_gcg/news/2012/121009b.htm) accessed March 2013.

†† Source: <http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/history/#top> accessed March 2013.

†† Source: <http://www.gutenberg-bible.com/history.html> accessed March 2013.

§§ Source: <http://www.wideformatonline.com/index.php/home/841-kodak-moves-to-introduce-high-speed-inkjet-to-commercial-printers> accessed March 2013.

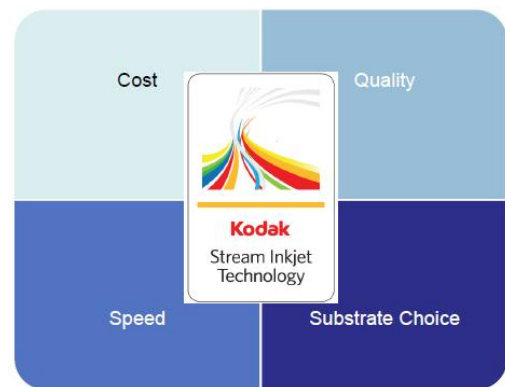
smaller, non-printing drops with less mass are deflected into a recirculation unit for reuse. In a technical nut-shell:

- Drops created by fluid surface tension much like water dripping out of a faucet;
- Controlled pressure and high-frequency vibration create uniform size and spaced drops;
- Airflow used to select drops;
- Non-print drops are blown to a “catcher,” and recirculated in the ink system;
- Print drops travel in an undeflected path to the media.

Now, let’s see how the invention is becoming innovation, or how the technology adds value to the customer, addressing met, or in our case unmet needs.

### Creating the value...or invention developing into innovation...

To begin with, let’s understand what are the needs of the commercial printing? They can be: cost, quality, speed and substrate choice. In other words, the traditional vectors of a need for an offset printing technology are simply a high speed, offering high quality, with the ability to print on a range of substrates, at low cost. Stream is the first digital printing technology to map to all four vectors in a competitive manner to traditional offset printing – but offers that fifth benefit of enabling every page to be unique. This industry is faced with a challenge as certain printing applications are in decline (e.g., newspapers). The core activity, offset printing, is highly competitive and requires fairly long runs to cover the fixed set-up cost. Stream enables shorter runs to still be produced effectively. The next question to answer is how did Kodak commercialise its new technological solution? Having in a puzzle, on one hand, continues inkjet printing, on the other, discontinuous stream printhead, with in between unmet and unknown media and inks.



To come up with a product, Kodak had to pull together 3 disciplines: (i) Stream printhead; (ii) the paper transport and ink recirculating systems from Versamark, a company purchased in 2003; and (iii) inks & media draw on Kodak’s long history in chemicals and imaging (the micromilling process used to produce the pigmented inks came out of Kodak’s work on film dyes and emulsions). Kodak innovated in ink design, too: creating very small (nanoscale) pigment particles with a uniform particle size. This is achieved using a micromilling process that was developed back in the film days, linked to the creation of small particle silver halide crystals. Ink in the system needs to be as mobile as possible and once it hits the page it needs to become as permanent as possible, thus, for the technological point of view it is important formulating the inks so that they will provide the best performance.

In doing so, the following results are achieved. Printing has equal or better quality with less ink with lower cost of operation. The equipment has less wear and tear on inkjet nozzle. The end product has less scattering of light, more color and vibrancy. Offset quality has enhanced optical density and blackness. For coated glossy papers the permanence of the final results are in fast water and light. For a user, the new approach is easy to integrate on-line with analog printing presses in hybrid environments.

## **What's now, or unmet customers' needs**

We started our story with the statement that “innovation is about creating products that are “new,” but it is not enough; in business an innovation needs to create a value for the customer to avoid being just an invention – whether simple or difficult it may be”. So, let's now consider the application of a new technology where it can be used. One of the potential applications might be in printing newspapers.

The printed newspaper has been around for well over a century and it hasn't really changed that much during that time. The production technology has changed beyond recognition but the product and the business model hasn't. It's a mass-market product – one size fits all with very little segmentation apart from demography and geography. But just because it has survived for well over a century doesn't mean it will survive another one. With the rise of digital technology and the time of multichannel communications, the customer requirements are changing. Today, an average customer, browses through 60% of the paper and reads 10% of what serves his/her interests. Each customer does his or her segmentation and targeting but what a Newspaper might meet those needs and reinvent it? Let's put aside for the moment the reality of manufacturing, logistics, or costs and re-invent the newspaper to meet the needs of the individual Consumer.

A newspaper can be divided into 3 major sections:

Section 1. Belongs to the editor and includes News, Opinion, World, Business, Sport;

Section 2. Belongs to both worlds – editors and customers – and covers Art & Entertainment, Homes, motoring, special likes & dislikes to the customers' profile

Section 3. Belongs to the customer entirely and comprise additional pages from a list of options such as specific sports, Business, Investing, Fashion, World, local News.

The question is how do you create a Newspaper like this? With a Prosper press of course! Using a printing press where every copy can be different, but enables every customer get his or her own unique Newspaper, without causing the Publisher to compromise on speed, cost or quality! However, this has a fundamental impact on what a Newspaper Publisher provides as value and change to become content aggregators rather than a printers!

Kodak sees the solution is Prosper printing, or offset presses. Prosper will allow segmentation and targeting as every page can be different but still printed at offset speed, quality and cost. One can even print in an order to fill each delivery van with exactly the mix they need by Shop on their route. Newspapers will get extremely inflexible manufacturing systems enabling to do segmentation or targeting and on op of that deliver speed and quality at today's cost. Additionally, one can think of the logistic benefits, too, via printing a variety of different Titles, on one press, with every copy different, produced in an order that fits with the van route. Each shops can get a unique mix of papers to be bundled together straight off the production line.

This technology is nascent and a handful of installation emerging in Europe of similar technology; although, the power to innovate is still there.



## Lessons leant

Real innovation creates value, solves a problem for a customer, and finds a way to reinvent the business. One needs to keep listening to the customers' likes and dislikes and think laterally about what you have that you can re-use in a different form? How the technology can be applied in novel ways to meet a need to provide unique value possibly in a very different market application. Innovation disrupts the status quo sometimes dismissed by incumbent players or completely missed by the market leaders.

### *Kodak Commercial Segment implies (b2b)*

- Digital and Functional Printing (*Digital Printers & Presses; Digital Imaging Systems Packaging*)
- Graphics and Entertainment & Commercial Film (*Digital Plates & Output Devices; Unified Workflow Solutions; Entertainment Imaging; Commercial Film*)
- Enterprise Services & Solutions (*Document Imaging; Services For Business*)



### *Kodak Commercial Segment implies (b2c)*

- Inkjet Systems
- Retail System Solutions
- Professional and Consumer Film, Paper and Output Systems



Our solutions portfolio reflects Kodak's growth from its beginnings in analog products to a diversified set of digital solutions today.

Although we continue to have market-leading film capture and entertainment products; Kodak's digital product lines accounted for approximately 75% of total company revenue in 2010.

### ***LifeSpring Hospitals.***

As with the Aravind example the origins of this innovation lie in concern for a specific group of users who are marginalized from access to a key medical service – maternity and perinatal care – on the basis of cost. The problem of maternal mortality is significant; India has the highest rate of pregnancy-related deaths in the world, with around 117,000 per year. (the Maternal Mortality Rate – the number of such deaths per 100,000 live births – is 540 whereas the US figure is 17). There is a high correlation with perinatal treatment; of the estimated 26million births each year only 43% are supported by skilled staff.

Established in 2005 Lifespring targets customers from a key tier in the Indian population, not the very bottom but low down the pyramid. Their customers are typically women whose husbands work in the informal sector, who have no health coverage and who are urban slum dwellers or in low income housing. The mission is to provide core maternal healthcare (antenatal and postnatal, normal and caesarian deliveries, and family planning services) at an affordable price . LifeSpring also provides pediatric care (including immunizations), diagnostic and pharmacy services, and health care education to the communities in which its hospitals are located.

Lifespring was set up as a joint venture between Hindustan Latex (a major manufacturer of contraceptives) and the Acumen Fund (a US-based social capital investor) and has treated more than 200,000 patients and delivered nearly 12,000 healthy babies since its inception in 2005. The model involves creating small - 20-25 bed – hospitals; the first broke even within 20 months and enabled the expansion of a chain of similar facilities via what has become a standard operating model. It maintains a tight focus, specializing in obstetrics, gynecology and pediatrics for women within a 10km operating radius of their hospitals. Importantly, the facility is designed for high throughput of ‘standard’ cases; women with complications are identified early and referred to other clinics. Lifespring has become the largest chain of maternity hospitals in South India, treating more than 70,000 patients and delivering more than 7000 healthy babies each year; it now operates 12 hospitals in the Hyderabad area.

The hospitals are positioned as a low-cost alternative to private clinics; there are some government facilities which offer lower cost (subsidized) treatment but these are oversubscribed and access is often difficult. Typically the charges for normal and Caesarian deliveries are 12% of private clinics; normal births cost around 1.5K rupees as against 8 to 10K and Caesarian figures are 6K as against 20-30K (Monitor\_Group 2008).

Achieving these significant reductions has again involved a process of innovation against a clear focused target vision. Once more the basic principles of high volume standardized ‘production’ are central to this and there are clear similarities to the Aravind model. In particular, LifeSpring's model is characterized by four ‘pillars’ which provide a focus around which a range of innovations are grouped:

- Service specialization
- High throughput
- High asset utilization
- No frills service

(Significantly these are essentially the core principles of the low cost airline business model which has had such a disruptive effect in short-haul aviation).

Service specialization involves a high level of standardization around a tightly focused service offering. This allows for rapid replication and spread of the model – a ‘drag and drop’ approach. Importantly complications are screened out early and such patients are cross-referred to other specialized clinics. Operating protocols and procedures are standardized which allows for the rapid training of low-skilled staff and the replication of the model quickly into other situations. Standardized kits are used for a wide range of surgical and other procedures and the range of medications is kept low to reduce cost and increase purchasing leverage. Importantly a lower skill-grade of nurse - ANM as opposed to GNM<sup>1</sup> – is recruited; these nurses are trained internally in a narrow field and achieve a high level of competence. This helps retention whilst also reducing labour costs.

High throughput involves operating at a much higher volume (outpatient and deliveries) than traditional players, enabling LifeSpring to spread its fixed costs over a larger number of customers. In their hospitals they complete 100-120 deliveries per month compared to 30-40 in similarly sized hospitals). Making this model work depends on maintaining a consistent flow of patients. This is achieved by focusing on areas of high population density but also working with those communities to ensure widespread awareness. This is important in a sector with low literacy where word of mouth is the key communication channel and where trusted recommendation is of significance. Lifespring operate through a ‘sales force’ working in the community and make use of education ‘camps’ and offer vouchers and baby packs to generate repeat business.

The ‘no frills’ element involves systematic focus on driving down costs through elimination of unnecessary and non-value-adding activity – essentially the principles of ‘lean thinking’ (Womack and Jones 1996). Medicines used are drawn from a narrow range and inventories are kept low through a –just-in-time policy; pharmacy services are outsourced to reduce costs and also cut the risk of pilferage. The hospitals do not run their own ambulances and wards are general rather than specialized. Capital expenditure is reduced through renting space in old hospital premises and by working with a standard and limited set of equipment.

High asset utilization is achieved through deploying a cluster model; by setting up multiple small hospitals within a single city many key resources – ambulances, back-up facilities, etc – can be shared. Of particular significance (since the main cost in

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<sup>1</sup> General Nursing and Midwifery and Auxiliary Nursing and Midwifery certification by the Indian Nursing Council

prenatal care is in doctor's salaries) is the use of fixed salaries for doctors.  
For more information see:

<http://www.lifespring.in/>

## INNOVATION AS A WAY OF LIFE

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### A Case Study of the Marshall Group

#### Introduction

Some things don't change. In 1909 people still enjoyed a night out clubbing -and they still faced the less inviting prospect of trying to get home afterwards. The vagaries of the English weather and the lack of public transport didn't help much either.



But some things do change – and it was whilst working at the University Pitt Club that David Marshall spotted an opportunity amongst the late-night revellers trying to find their way home. The streets of

Cambridge were beginning to get used to the idea of the motor car as an alternative to the various horse-drawn options or good old Shanks's pony as a means of transportation. Why not offer a chauffeur driven car service? He obtained a couple of cars and drivers and the Marshall company was formed with its first steps into the new world of motor transportation.

The business quickly grew as a service operation and although it was difficult during the period of the First World War, the company was able to develop a new line of business servicing ambulances and other military vehicles – in the process extending their experience and skills in support and maintenance. By the end of the war David saw another emerging opportunity as people embraced the motor car as a form of personal transportation. With the mass production revolution pioneered by Henry Ford in the USA the motor car was becoming a mainstream product. A number of entrepreneurs began establishing car manufacturing in the UK and Marshall saw the opportunity for working in what he felt would become a growth sector. In 1920 he took on the dealership for the Cambridge area for the new Austin company, bringing to this operation the experience and knowledge gained in



running and maintaining his fleet of chauffeur driven cars.



The next step involved what was becoming a familiar pattern – spotting opportunities in unmet needs. Whilst the motor car brought many benefits, Marshall saw that for some people – specifically those who enjoyed horse-riding, feeling the wind in their hair and fresh air on their faces – it had some drawbacks. Because the cabin was enclosed they were insulated from this open air experience – so why not give them the option to take the top off the car? However, when he approached Austin with the idea, they insisted they only made ‘standard’ cars. So rather than give up he purchased standard Austin cars and – using the skills and equipment in his workshops where they already knew the Austin car inside out – converted them, making the first Austin sports car.

### **Innovation by connecting**

Understanding and often anticipating user needs and connecting them with a technological capability – is a well-established characteristic of successful innovators and one which runs through the history of the Marshall group of companies. It has grown from its origins in the automotive sector to become a major player in a variety of manufacturing and service fields – but this is not simply a conglomerate. There is a clear and strong underlying link between its businesses and significant use of knowledge acquired in one area to help enter and open up new ones. Today it is one of the UK’s most successful privately owned businesses with a turnover of around £650m and with over 4000 employees. Still headquartered in Cambridge, the Marshall Group has interests in the retail motor industry, transport refrigeration, aviation and specialist vehicle engineering.



*For more background information on the company see appendix 1 and the associated websites.*



### **Like father, like son**

Riding the wave of public interest in motor cars helped Marshall to grow as a business – and by staying close to their principles of working with customers they were able to expand the car retailing business, especially in the after-sales service and maintenance area. But the recipe for their continuing success is as much about diversity as careful stewardship of an established market position.

Arthur Marshall, David’s son had graduated from University in 1926 with a strong interest in flying. Just as his father had seen opportunities in the newly emerging field of motor cars, Arthur felt that his hobby might also presage a growing new area of opportunity. The Wright Brothers had flown their aeroplane in 1903, planes had been used extensively in World War One and by the late

1920s flying was beginning to attract the interests of a growing number of people. Being an adventurous young man Arthur decided he would like to learn to fly and having done so purchased his first aeroplane in 1929.



Not long afterwards an opportunity arose from his new hobby. One Monday Sir Alan Cobham, famous for his flying circus, saw Arthur's little aeroplane on a field outside the family home. Over lunch with Cobham a plan was hatched that saw the land becoming Cambridge's first airport, with the condition that its first use was to be for Cobham's flying circus. Through this Arthur found another opportunity and

developed a business out of teaching people to fly in his spare time on the De Havilland Gypsy Moth. The flying training business prospered as local people wanted to learn to fly.

Running an airport and flying school is not a simple matter and it quickly drew the company into a new learning phase as it mastered the skills and technologies which go with flying aeroplanes – for example providing hangars for people to store their planes in and maintenance crew to look after them. And borrowing lessons learned in car retailing there was a fruitful line in providing finance to help people to purchase planes.

As with the car business aviation proved another successful growth area for the company. But in the 1930s it also became clear that some key forces were shaping its development in important new directions. The aeroplanes that Marshall stored were getting bigger and were heavy as they were being made of metal instead of wood so they would have to move. In 1937 Marshall moved to a new and larger site and established Cambridge's second airport.



With the onset of WWII there became little need to provide services for the flying enthusiast so instead Marshall concentrated on providing services to the RAF. The company strengthened its flying training skills by the establishment in 1938 of an *ab initio* flying instructor training scheme which enabled young men without previous flying experience to learn to fly and become flying instructors within a 14 week period. This scheme, which was an immediate success, was universally adopted by the Royal Air Force in 1941 and continues to this day. Through its flying school Marshall taught 20,000 British pilots to fly, one sixth of the total number trained.

During this time the British Government were under increased pressure, as there was very limited capacity in the RAF or the manufacturing companies to make vital repairs and maintenance to the planes. Consequently Lord Nuffield set up the Civilian Repair Organization, a body which looked for companies that could do maintenance, repair and modification work on aircraft. Marshall fitted neatly into this area and during the wartime period worked on over 5000 aircraft.

Central to the ability to work in this way was an accumulation of learning about operating aircraft – just as motor cars – as a total service operation. Skilled technicians capable of working on airframes and engines, investment in facilities and equipment to deal with a wide range of often-open ended challenges and close feedback from users (such as the thousands of pilots who they trained) helped build on understanding of the particular needs of this demanding market- and the capability to deliver solutions configured to meet those needs. Much of the activity inside a Marshall hangar would involve improvisation and innovation around a particular repair or modification each one of which presented its own challenges and required its own particular blend of knowledge, skill and equipment, With 5000 opportunities for carrying out such learning it was not surprising that by the end of the war the company had a deep understanding and capability in the aircraft support industry.

### **A different tune, a different dance**

Whilst the wartime period had helped Marshall develop deep competencies, the end of the war brought with it a crisis. The military business declined rapidly and the company was too highly geared up to volume work to return to the relatively low demand of the leisure flying business. The result was 3,000 people working for Marshall with very little to do. At this point what Arthur Marshall described as 'another stroke of luck' came their way. Near to their Cambridge base was Bourne airfield on which the British Government were storing over 3,000 vehicles which had been loaned out to industry in support of the war. The government wanted some of them back but wanted them serviced. Others required scrapping but could be used for spare parts and the rest were 'nearly goers' - not good enough for government use but still with potential. Arthur saw the potential in this rusting collection and, using contacts he had made during their wartime work, secured the contract to carry out the repair/recovery work. Whilst there was a good business in repairing or scrapping for spares, the real opportunity came with converting the 'nearly goers' into specialist vehicles for delivery and related work for companies like Chivers Jams and Whitbread Breweries.



It is worth reflecting for a moment on this idea of a 'stroke of luck'. Certainly an opportunity existed but it takes vision to see the possibilities, especially beyond the obvious. And vision is not enough if there is no capability to deliver on it – it was the years of experience and competence-building around repair and



modification of cars and aircraft which enabled Marshall to establish their Specialist Vehicle division. Some luck, perhaps – but as Pasteur notably put it, *'chance favours the prepared mind'*.

### Still flying high

Although the immediate post-war period saw a decline in aviation, it picked up again as a market, both in the military sense (with the Cold War putting emphasis on aircraft and missile technology) and in the rapidly growing civilian airline business. With its wartime experience Marshall was in a strong position to play a role as a sub-contractor to the growing number of aircraft manufacturing firms in the UK. It carried out work on a wide range of military and civilian aircraft.

But it didn't achieve this position by accident or by resting on laurels won through their extensive wartime work. Continued investment in skills and technology and an increasing commitment to building a design capability lay at the heart of this growth. By working across a broad spectrum of aircraft and markets they were essentially following a 'lead user' approach, constantly being stretched to acquire and deploy the latest technical capabilities. And by continuing to invest in manufacturing they could make spare parts and offer extensive support to the maintenance operation. The other key ingredient was investment in a *design* capability – *"it's our in-house design and aircraft design that really does set us above all the other jobbing shop and aircraft maintenance companies"*. They have invested heavily in aircraft design (they are the second largest in the UK after BAe Systems) and this gives them a hard to imitated competitive edge. As Terry Holloway put it, *"aircraft design work gives us a skill level above screwing nuts... It provides graduate engineers with design work that is part of the motivation process because they want to stay with the company because of the work that we are doing"*.

In 1960, the Company began its strong links with the North American aircraft industry when it became the first Gulfstream Service Centre outside the USA. These US links were strengthened in 1966 when Marshall began a relationship with Lockheed Martin in introducing the C-130K Hercules aircraft to Royal Air Force.



Since then, they have provided continuous support on the Hercules conducting over 300 major modifications that have included wing rebuilding and fuselage stretching. Their agility and innovation skills were clearly demonstrated in the installation of air to air refuelling equipment at the time of the Falklands War in 1982 – they were able to complete the entire project including designing, in just 19 days.



More recently, Marshall have helped introduce the new C-130J variant to Royal Air Force service and is also managing the Contractor Run Interim Logistics Support Organisation, on behalf of Lockheed Martin in Swindon, supporting the C-130J fleet at nearby RAF Lyneham.

In 1982, the company further strengthened its relationship with Lockheed Martin when nine civilian TriStar aircraft were converted to Strategic Tanker Freighter Aircraft for the Royal Air Force. Marshall is a Sister Design Authority to Lockheed Martin for both the C-130 Hercules and the Lockheed TriStar. and to Boeing for the RAF fleet of E3 Airborne Early Warning AWACS aircraft which it has been responsible for servicing since 1995.

### **Driving innovation**

Their progress in aviation did not overshadow the motor retailing business which had been the basis of the company since the 1920s. In 1955 Michael Marshall as a third generation family member joined the motor business and began expanding it. His early contribution was to take it from the original Jesus Lane garage site through a major expansion programme. Today the business represents 16 manufacturers and is engaged in a wide range of leasing, financing and other related activities as well as retailing and servicing vehicles. Innovation has been just as evident in this field – the company were the first to install CRM (customer relationship management) software in the UK and pioneered the concept of the multi-franchise car supermarket. Their parts and distribution systems are highly developed and integrated to provide scale economies across different franchises. Above all they have stayed close to their customer base, developing a strong reputation for service and customer loyalty.

### **A question of balance**

Marshall's has used its diverse nature to its advantage and it has been able to balance out the peaks and troughs of business through spreading the risk it takes through different revenue streams. We have already seen this in their ability to switch into different but related areas of technology and market. But it also operates as a principle within business areas, for example, in the motor retailing part of the organisation where they have 16 different franchises. Similarly, part of the rationale behind deciding to maintain a manufacturing operation is that it provides the business with large amounts of cash in arrears but high costs upfront, whereas the advantage of the motor retailing business is that they do not have to pay the manufacturer till much later.

But the ability to operate in business areas with different cycles and cash flow patterns only works if there is integration at a deeper level, around the area of technological and market knowledge. Their consistent investment in building mechanisms to get and stay close to user needs (even in the highly demanding field of aerospace) and in learning-by-doing around key technological areas has

paid off in giving them the flexibility to make such cross-business synergies actually work.

### **Innovation philosophy**

It would be hard to argue with the premise that Marshall are an innovative company – in products and services offered, in processes deployed, in markets and positioning and in their underlying business models. They are well known as early adopters and often pioneers of new fields – a tradition which clearly goes back to the early days of the business.

Yet although they are consistently at the forefront in terms of innovation they don't see themselves as driven by the pursuit of innovation. Rather this is an *output*, a consequence of having positioned themselves to be able to identify and exploit interesting new opportunities. As Terry Holloway puts it,

*"Innovation itself is not something that drives our business, what I see driving our business is the opportunity to make profit which sustains growth, growth provides long term which provides long term employment, sustains our workforce and enables us to increase skills if you have a high skills base you can be more flexible you can become more innovative"*

Being family owned has enabled Marshall's to have a long-term strategic outlook on its future rather than be driven by short-term gain. This has often seen the company invest in projects that did not always offer a return such as a rocket that Marshall developed with NASA. Whilst this project did not make money, it enhanced their reputation in the field and led to further opportunities. Other projects in the same vein have included work on the fuel cell that was eventually used in all U.S space aircraft, the design of Concorde's dropped nose and auxiliary fuel tanks on the Boeing ER range. The value from these projects is not viewed purely in monetary terms but the fact it offers Marshall's engineering varied and interesting leading edge projects and builds their reputation.

It has also helped them follow through and grow with emerging opportunities. For example, in the aerospace field *"we saw the advantage of putting our design office equipment right alongside our maintenance people in the hangars so they could interact and work together. We recognised that aircraft maintenance was a complete service package, and by being able to offer post design support we now manage people's fleets of aircraft "*

But their approach to innovation is not simply picking up on opportunities – they are adept at getting close to users and working with them to develop new directions – essentially employing their version of what Eric von Hippel calls the 'user active' approach to innovation. A good example comes from the Specialist Vehicle division where through a contract with the British Army developing Land Rover ambulances another project arose. When talking to the doctors about the ambulances, they also started complaining about how terrible the tents were

that they used as operating theatres. Through this conversation Marshall's were able to link their existing competences of making mobile units such as bakeries to being able to create an expandable mobile theatre. The resulting mobile theatre is ISO container size in transit but expands to three times the size. It has been designed as a modular unit to transport, yet with surgical facilities that looked exactly the same as an NHS operating theatre from inside but in miniature. These were highly successful in the Gulf War and sold to other governments.

But the same doctors highlighted the shortage of NHS operating theatres, which take years to build new hospitals. From this came the idea of designing modular full size operating theatres that were built by Marshall in 25/26 weeks, fully equipped and tested. Then they were broken down and transported over a weekend and installed on a pre-prepared site. From specialist vehicle to providing the health sector with increased capacity that is cheaper and easier to install shows the Marshall innovation philosophy in action.

### **The importance of human capital**

Underlying the Marshall Group's success is a strong commitment to its employees, one indicator of which is the number of long service awards achieved in the company. Three awards have been awarded for 60 years of service, 23 for 50 years, 194 for 40 years and 545 for 30 years of service! This is not simply the result of paternalistic employment practices but rather recognition of the high dependence the business has on its workforce. Being able to offer highly customised solutions to emerging market needs requires a combination of technical expertise, creativity and flexibility which is delivered through motivated and well-trained people. The commitment which the company has to training goes well beyond simply upgrading skills to include significant opportunities for personal and career development – but it is also based on sound business logic around securing a long-term return on this investment. *"We have an ethos in the business of giving people the greatest skills possible as well as initial training and continuous professional development and you can't afford to do this if you don't keep your people for a very long time because if not they become a drain on your overheads which means that you are not competitive".*

A good example of this philosophy has been their approach to apprenticeships. Whilst this form of training lapsed during the second half of the 20<sup>th</sup> century some companies recognised that without investment in developing the combination of technical knowledge and its practice future growth prospects would be damaged. The aerospace sector is a good example which explains why Marshall continued to invest in this activity; 23% of the Modern apprentices for the Aerospace Industry in the UK in 2004 were trained by Marshall Aerospace confirming its commitment to 'good' people in its businesses.

## Innovation as a dynamic capability

Any organization can get lucky once – someone comes up with a new idea, someone spots a great unexploited opportunity, the firm finds itself in the right place at the right time, or some other combination of circumstances leads to some success with something new. Using innovation to enable long-term survival and growth is much more difficult – it depends on building the capability to repeat the trick. Research on innovation consistently supports the view that successful firms *learn* how to do this – not always an easy process and with problems as well as successes – but a process which builds capability and also makes it harder for others to simply copy them. The trouble with innovation, of course, is that it is unpredictable – the challenges of new markets, technologies, the business and political environment and a host of other elements don't stay conveniently static. So effective innovation management involves learning and continuing to learn – building what is often called *dynamic capability*.

Marshall offers a good example of this process – on the surface it appears to have had a number of 'lucky' breaks – being in the right place and equipped with the capabilities to exploit new opportunities as they emerge. But if we look closer we can see that their ability to take advantage of new circumstances depends enormously on investments and commitments they have made in the past and capabilities which they have built up. They faced a number of crises – for example, the downturn in demand following the end of the Second World War could have finished the company but instead they were able to diversify into specialist vehicle building and conversion. But they could only do this because of a long-standing commitment to developing the technology and skills base around vehicle repair and maintenance – something which went right back to the earliest days of the chauffeur cars business. Similarly their ability to play a key role in aerospace is not simply the fact that they have a long history of being linked to aviation but because they have invested consistently in building the knowledge and skill base (as shown in their commitment, for example, to design capabilities) to move forward with that industry.

Innovation tends to move in two modes – long periods of 'doing what we do, but better' punctuated by occasional radical shifts into completely new territory. Marshall demonstrate an ability to deal with the former through systematic incremental innovation and in particular working closely with users. But they are also able to deal with 'discontinuous' innovation and move into radically different areas of activity. This is not a matter of size or asset base but rather the ability to combine a deep knowledge base with emerging opportunities in the technological and business environment. Their private status may help create the conditions for taking riskier bets than a publicly quoted firm might be comfortable with – but their internal decision-making is still firmly grounded in responsible business development. It is rather a case that they are able to preserve some of the agility, which they had when first starting out as a small business – being able to spot an opportunity early on and then do something about it. Increasingly the 'doing something about it' requires deeper knowledge

resources (in skills, technologies, market understanding, etc) but these have been systematically and proactively developed over many years – as their investment in human capital demonstrates.

In many ways their innovation success is not down to a formal innovation plan or even a specific innovation structure such as we might find in the pharmaceutical industry. Instead it is embedded in the culture of the company – ‘the way we do things around here’. Their success comes from learning and building this culture up over the long-term and might be captured in the phrase attributed to Gary Player, the famous golfer. He used to explain his consistent success by saying ‘its’ funny – the more I practice, the luckier I get!

## Appendix 1: Background information on the Marshall group of companies

Founded in 1909 with little capital as a chauffeur drive company in Cambridge, Marshall moved into the retail motor business in 1911, obtained the Austin Distributorship for Cambridgeshire in 1920 and entered the aviation business in 1929. With all its growth funded by ploughed-back profits, the Marshall Group, which is still a privately owned family Company and chaired by the third generation of the Marshall family, now has a turnover approaching £650M per annum. The Group currently has an employment of approximately 4,000 working in the fields of Aerospace engineering; design and manufacture of specialist vehicle applications, military mobility shelters and hospital surgical units; Motor Vehicle sales and after sales support; Refrigerated Transport sales and support; and Airport Property Ownership and Management. ([www.marshallgroup.co.uk](http://www.marshallgroup.co.uk))

The Group looks forward to building on its strengths for the future prosperity of the shareholders and the community, based on the reputation it has earned during many years for stability, quality of workmanship, value for money and service to its many customers throughout the world.

Each of the main companies of the Group is largely autonomous and self-accountable.

### 1. **MARSHALL MOTOR HOLDINGS**

The largest and founding company of the Marshall Group, with a turnover of around £500M per annum and just over 2,000 employees is Marshall Motor Holdings, which itself comprises four principal businesses:

#### **MARSHALL MOTOR GROUP ([www.marshallweb.co.uk](http://www.marshallweb.co.uk))**

With 42 showrooms representing 16 different manufacturers, a turnover approaching £450M per annum and almost 1,700 employees, Marshall Motor Group is one of the largest privately owned motor dealer groups in Great Britain. Although the dealerships are largely concentrated in the Cambridge/Peterborough/Bedford area of East Anglia, Marshall Motor Group also has operations in Ipswich, Reading, Leicester, Bury St Edmunds, Melton Mowbray, King's Lynn, Lincoln, Grantham and Spalding.

The Marshall Motor Group is widely recognised as a leader in the development of large multi-franchise sites. The most impressive example of this is the Marshall Car Centre, which was opened on Marshall-owned land opposite the Airport on Newmarket Road in Cambridge by HRH The Prince Michael of Kent in 1995. The Marshall Car Centre occupies nearly half a mile of prime retail land on this important entry route into Cambridge and remains unique in scale and concept in Great Britain. With eleven different vehicle manufacturers represented, together with a substantial dedicated used car sales operation and a 60,000ft<sup>2</sup> parts warehouse, Marshall Car Centre customers enjoy unrivalled choice and levels of customer service.

Marshall also operates a similar multi-franchise operation in the Boongate area of Peterborough, where seven dealerships are situated side-by-side.

**MARSHALL THERMO KING ([www.marshallthermoking.co.uk](http://www.marshallthermoking.co.uk))**

Founded in 1972, Marshall Thermo King now has 12 depots covering England, a turnover of around £35M per annum and 270 employees. Marshall Thermo King specialises in the sales and after sales support of advanced, vehicle-mounted, temperature control units. With nearly 130 fully equipped mobile engineers on call 24 hours-a-day, 365 days-a-year, Marshall Thermo King offers unrivalled support to transport fleet operations across the country, including those for many of the country's largest retailers.

**MARSHALL LEASING ([www.marshallleasing.co.uk](http://www.marshallleasing.co.uk))**

With 25 employees, a turnover of around £20 million per annum, and a fleet of about 3,000 cars, Marshall Leasing fills a specialist niche sector in the vehicle leasing and fleet management market. Through its offices in Huntingdon and London, Marshall Leasing has built up a portfolio of household name customer companies which value the personal attention, flexible service and the range of tailored packages available from Marshall.

**VTR GROUP ([www.vtrgroup.co.uk](http://www.vtrgroup.co.uk))**

The VTR Group, with 30 employees and a turnover of £3M per annum, is a Midlands-based company specialising in the service and maintenance of commercial vehicle tail lifts. The company has branches in Walsall, Atherstone, Worcester, Stoke and Didcot. This, along with its fleet of mobile engineers, provides a service "around the clock" to customers from Manchester in the North to the Thames Valley in the South.

**2. MARSHALL AEROSPACE LTD ([www.marshallaerospace.com](http://www.marshallaerospace.com))**

Marshall Aerospace, with employment which averages around 1,700 and sales approaching £120m per annum, has a wide range of international approvals and certifications, including ISO 9001 (BS5750), JAR 145 and FAA Maintenance and Repair Station, and has specialised in recent years in design, modification and maintenance support for aircraft such as:

- C-130 Hercules, for which Marshall Aerospace has been the UK Designated Company for the RAF aircraft since 1966 and Sister Design Authority since 1988. The Company has carried out a number of major modifications including fuselage stretching and wing rebuilding, and designing and implementing the installation of a wide variety of specialised equipment, including the provision of air-to-air refueling and electronic self defense capability. The company is a global leader for C-130 work, and in addition to its work for the RAF, the Company performs work on C-130s for a wide range of other air forces and civilian operators. This has recently included a major avionics upgrade for the South African Air Force, the conversion of aircraft for Austria, and ongoing maintenance work in Australia. It has received over 1,500 inputs and has carried out work for over 30 international operators of the aircraft. The Company provided support for Lockheed Martin to help with the introduction of the C-130J into RAF service and is managing, on behalf of



Lockheed Martin, the Contractor Run Interim Logistics Support (CRILS) arrangements supporting RAF C-130J operations at RAF Lyneham.

- Lockheed L10-11 TriStar, for which the Company is the Design Authority for the Royal Air Force fleet of TriStar Tanker/Freighter aircraft which Marshall converted to these roles in 1983/92. The Company has also converted 10 passenger TriStar aircraft for use as civil freighters in the United States. Marshall Aerospace enjoys a world-wide reputation for maintenance, repair and modification of a large number of civilian operated TriStars. The Company has also designed and installed the modification of an aircraft for carriage and launch of 50,000 lb Pegasus rockets to place satellites into orbit and, subsequently, modified the same aircraft to carry X-34 a NASA Hypersonic Space Research Vehicle.
- Boeing E-3D Sentry AEW, for which Marshall is the appointed Sister Design Authority for the RAF and is currently contracted to carry out major servicing (Depot Level Maintenance) on the RAF fleet of seven aircraft.
- Marshall Aerospace's Corporate Division has been approved by Cessna since 1974 and is the only Cessna approved Citation Service Station in the UK approved on all Citation Models. From the original Citation 500 and 650 models to the advanced Citation VII, the Company is fully equipped to offer the full range of scheduled maintenance and AOG support. A large inventory of spares is held in stock at Cambridge, to allow immediate response on maintenance work.

Marshall Aerospace is fully conversant with the CESCO computerised maintenance system and maintains CESCO records on the customer's behalf.

All Cessna Service Bulletins can be incorporated and engine work undertaken, including HIS and Overhaul, on all JT15D series engines.

Airworthiness and flight test staff are experts in the Citation, with several test pilots having long association with the type.

- Airbus A320 on which Marshall Aerospace carries out maintenance for a number of airlines and currently includes major servicing for KLM.
- Boeing 747-400 on which the Company has conducted modification work on over 130 aircraft on behalf of British Airways. The Company has also undertaken maintenance work for Lufthansa.
- Boeing 777 on which the Company has conducted modification and maintenance work on new aircraft for a number of airlines.
- MD-11 which has included a major interior modification programme for Delta Airlines and servicing for KLM.
- Boeing 767
- A range of other aircraft, including DC10, BAE 125, Dominie, and numerous light aircraft.

- Marshall Aerospace is also working closely with BAE Systems, providing design and maintenance work to underwrite the airworthiness of the sole flyable AVRO Vulcan, which it hopes to be able to return to flight.

A major strength of the Company's aerospace business is its Aircraft Design Office. Notable past achievements have included the design and build of the Concorde droop nose and visor in 1967, and a space sled for medical research which flew 121 orbits in the Space Shuttle "Challenger" in 1985. The Design Office also undertakes considerable work associated with modification and maintenance programmes, which has recently included an avionics update for the RAF fleet of navigation training Dominie aircraft. Recent programmes include a major avionics update and integration programme on C-130 Hercules aircraft for the South African Air Force. The Company's Aircraft Design Office is equipped with the latest Sun CAD stations with a variety of software programs, including Mentor Graphics for avionics and wiring, MEDUSA and CADAM for two-dimensional structure design, and NASTRAN advanced finite stress analysis. The Company introduced CATIA in 1998 to provide three-dimensional structural design and this was updated to CATIA series 5 in 2000. The Design Office also uses desk-top publishing programs for technical publications.

The Company's extensive Manufacturing facilities comprise state-of-the-art CNC milling machines, automatic lathes, a 35 ft bed sculpture milling machine, specialist pipe bending equipment including of double skin pipes, and 5-axis CNC inspection equipment. Recent products include the manufacture of Marshall designed lightweight long-range fuel tanks for Boeing MD-11 aircraft, the manufacture of freight doors for Gulfstream IV aircraft, and a range of non-aircraft precision work including airport signs, military bridge components, high-technology windows for the House of Commons' new administrative building, and railway carriages. The Company is currently engaged in a major manufacturing project, producing Marshall designed revolutionary lightweight fuel tanks for Boeing 747 -400 aircraft, and Boeing 777 aircraft.

The Company also provides extensive engineering support for a number of customers on a worldwide basis, including Post Design Service work, management of rotables and maintenance support.

The Company has hangar space sufficient to accommodate, at the same time in full flying trim, up to three Boeing 747-400 aircraft, or up to six wide-bodied aircraft (TriStar or MD-11 etc) and up to 12 C-130 aircraft, eight Gulfstream aircraft (or BAe 146) plus over 50 assorted smaller aircraft ranging from Citation down to Cessna 152s.

A Marshall Aerospace subsidiary company, **Aeropeople** ([www.aeropeople.com](http://www.aeropeople.com)) provides trained manpower to a wide range of international customers.

Marshall **Aerospares**, with an inventory of over 55,000 parts and a dedicated team of spares and rotables controllers, is one of the leading businesses in its field providing 24 hours a day, seven days a week service.

### 3. **MARSHALL SPECIALIST VEHICLES LTD ([www.marshallsv.com](http://www.marshallsv.com))**

Established in 1946, Marshall Specialist Vehicles (MSV) is, today, a world leader in the design and supply of Mobile Military Equipment, Medical Systems, and Homeland Security Vehicles. Marshall SV is an ISO 9000/2000 company with an annual turnover in excess of £25M and an employment close to 150.

Historically, MSV has supplied the MoD with more than 80,000 vehicle bodies and more than 5,000 tactical shelters in over 200 different configurations. Additionally, the company designed, manufactured and delivered 9,500 DROPS Flatracks which are currently in service with the British Army. MSV went on to design and supply 43 DROPS Fuel Racks as 'mobile filling stations' and 830 field ambulances on Land Rover chassis to the British Army.

With the British Forces' change from a Cold War emphasis to a Rapid Reaction Expeditionary Force, MSV's military business has changed from being an equipment manufacturer to a Systems Integrator. MSV's Military business is centred around providing deployable Systems for the UK MoD and Military customers world-wide. Currently, MSV is a Prime contractor for the supply of mobile Field Hospitals, Power Pack Repair Facilities, and Mobile Bakeries. MSV also designs and integrates Ground Stations for the Stand-off Radar (ASTOR) project and the Battlefield Communication (Cormorant) project.

Very recently, MSV has branched into the provision of vehicle systems for use by the Emergency Services in the event of terrorist attacks on the homeland. MSV is a major player in providing solutions to deploy various countermeasures equipment to satisfy the Homeland Security measures being put into place by the UK Government.

MSV also provides Modular Surgical Facilities to the NHS. Indications are that MSV's Modular Medical Systems Group is set to become an important part of the business as NHS hospitals rush to modernise their infrastructures.

4. **MARSHALL OF CAMBRIDGE AIRPORT PROPERTIES LTD**

The Group owns the 475 acres to the South of Newmarket Road which comprises the Airport itself and its 50 acre industrial area, as well as 70 acres of industrial land on its North Works. A total of 1.25 million square feet of hangars, industrial buildings, showrooms and offices are occupied by Marshall Aerospace, Marshall Specialist Vehicles and the Marshall Motor Group's unique Marshall Car Centre and Airport Garage. The Group also owns 250 acres of farmland to the North and East of the airfield and in its property portfolio in Cambridge are included two investment properties, The Quorum and the Greenhouse Park Innovation Centre.

5. **CAMBRIDGE CITY AIRPORT ([www.cambridgecityairport.com](http://www.cambridgecityairport.com))**

Marshall owns and operates Cambridge City Airport. The airport maintains a full Public Use Licence which, among other requirements, includes a team of licensed Air Traffic Control Officers and supporting staff, as well as fully qualified Fire and Rescue Service staff, dedicated security staffs and some of the most up-to-date major fire appliances. The Airport has an Instrument Landing System, a digitised colour radar approach facility, an NDB and a DME. A new Control Tower was commissioned early in 2000, and an area radar was commissioned in 2002.

The first part of the main runway was built in 1953 and progressively extended to its current 1,965 metre length. The runway is capable of accepting most aircraft types, including wide-bodied jets, which includes Boeing 747-400 aircraft.

The extensively equipped and up-to-date modern International Airport provides excellent facilities for business travel through the Marshall Executive Air Centre, together with holiday and recreational flights to and from Cambridge. As a particularly well equipped Regional Airport, Cambridge City Airport is available to make an important contribution to the future development of air transport in the region. The Airport is of particular importance to Cambridge University for conferences, the support of horse racing at Newmarket, and the bloodstock trade in general. The Airport also supports a wide variety of military test flying, flying training and business flights.

6. **MARSHALL EXECUTIVE AVIATION ([www.marshallexecair.com](http://www.marshallexecair.com))**

Based at Cambridge City Airport, Marshall Executive Aviation utilises the company's very modern Citation Bravo aircraft offering a variety of aircraft charter operations through Europe and Northern Africa.

7. **MARSHALL CHAUFFEUR DRIVE ([www.marshalldrive.co.uk](http://www.marshalldrive.co.uk))**

Marshall Chauffeur Drive is the founding business of Marshall which started in 1909. Today, the company offers a fleet of luxury high class chauffeur drive Jaguar, Rover and Chrysler vehicles for its many customers.

8. **COMMUNITY MATTERS AND EMPLOYEE DEVELOPMENT**

The Marshall Group of Companies takes a pro-active environmental stance, and works closely with local Councils, the Environment Agency and the Government Offices of the Eastern Region on a wide range of topics.

Marshall of Cambridge, as the major engineering employer in the region, maintains particularly strong links with Cambridge University, local colleges, the Training & Enterprise Council and Business Link, The Cambridgeshire Chamber of Commerce and Industry, The Science and Technology Regional Office (SATRO), EEDA (East of England Development Agency), the new Learning & Skills Council, Connexions, the County, City and District Councils, as well as with a variety of Residents' Associations and Parish Councils. The airport has an active Consultative Committee which acts as an important interface with the local community. The Company also provides strong support to the Cambridge Air Training Corps Squadron. All of these relationships help maintain the harmonious relationship between the Company and the communities where its businesses are located.

The Group of Companies and its employees participate in a wide range of community projects including: wildlife, the arts, sport, healthcare, education and charities. There is also a diverse programme of visits to the Company's Airport Works premises. The Company supports a number of local schools and has "sponsored" three Cambridge Schools, Teversham Church of England Primary School, Bottisham Village College and Coleridge Community College, where dedicated members of staff assist with Science, Engineering and Mathematics

projects. The Company also takes interest in a wide number of other schools where employees assist with school management as Governors. Strong leadership is demonstrated by senior directors and executives who take on a number of non-executive roles in a wide range of community projects. National projects which benefit from the encouragement and help of the Group of Companies include: The Air League Educational Trust, the Air Training Corps, the RAF Benevolent Fund, the Duke of Edinburgh's Award Scheme and BEN, the charity of the Motor Industry.

The Company has strong links with the University of Cambridge which particularly includes Cambridge University Engineering Department through the "Sir Arthur Marshall Institute for Aeronautics" (SAMIA) ([www.samia.org.uk](http://www.samia.org.uk)) which encourages a wide range of aeronautical engineering disciplines.

The Marshall Group of Companies is a Member of the Engineering Employers' Federation, The Society of British Aerospace Companies and The Institute of the Motor Industry and the Eastern Aerospace Alliance. The advancement of employee skills is maintained through a robust training and development programme. The Marshall Group Training School maintains a regular apprentice intake each year and provides surplus training capacity to other local companies. Currently, 23% of the Modern apprentices for the Aerospace Industry in the UK are trained by Marshall Aerospace. Marshall was also one of the first companies to introduce the Modern Apprentice Scheme to the Aerospace Industry, and has pioneered the development of its very successful re-skilling programme to enable adults over 25 years of age to upgrade their capabilities and to become skilled aircraft fitters at an NVQ 3 level. The company takes in around 12 graduate trainees each year, and participates in "The Year of Industry" scheme for undergraduates.

Marshall Aerospace holds the national "Investors in People" Award and takes huge pride in the large numbers of employees who have achieved long service with the company. Three awards have been awarded for 60 years of service, 23 for 50 years, 194 for 40 years and 545 for 30 years of service.

## **The dimming of the light bulb**

### **In the beginning....**

God said let there be light. And for a long time this came from a rather primitive but surprisingly effective method - the oil lamp. From the early days of putting simple wicks into congealed animal fats, through candles to more sophisticated oil lamps people have been using this form of illumination. Archaeologists tell us this goes back at least 40,000 years so there has been plenty of scope for innovation to improve the basic idea! Certainly by the time of the Romans domestic illumination - albeit with candles - was a well-developed feature of civilized society.

Not a lot changed until the late 18<sup>th</sup> century when the expansion of the mining industry led to experiments with uses for coal gas - one of which was as an alternative source of illumination. One of the pioneers of research in the coal industry - Humphrey Davy - invented the carbon arc lamp and ushered in a new era of safety within the mines - but also opened the door to alternative forms of domestic illumination and the era of gas lighting began.

But it was not until the middle of the following century that researchers began to explore the possibilities of using a new power source and some new physical effects. Experiments by Joseph Swann in England and Farmer in the USA (amongst others) led to the development of a device in which a tiny metal filament enclosed within a glass envelope was heated to incandescence by an electric current. This was the first electric light bulb - and it still bears more than a passing resemblance to the product found hanging from millions of ceilings all around the world.

By 1879 it became clear that there was significant commercial potential in such lighting - not just for domestic use. Two events occurred during that year which were to have far-reaching effects on the emergence of a new industry. The first was that the city of Cleveland - although using a different lamp technology (carbon arc) - introduced the first public street lighting. And the second was that patents were registered for the incandescent filament light bulb by Joseph Swan in England and one Thomas Edison in the USA.

Needless to say the firms involved in gas supply and distribution and the gas lighting industry were not taking the threat from electric light lying down and they responded with a series of improvement innovations which helped retain gas lighting's popularity for much of the late 19<sup>th</sup> century. Much of what happened over the next 30 years is a good example of what is sometimes called the 'sailing ship effect'. That is, just as in the shipping world the invention of steam power did not instantly lead to the disappearance of sailing ships but instead triggered a whole series of improvement in that

industry, so the gas lighting industry consolidated its position through incremental product and process innovations.

But electric lighting was also improving and the period 1886-1920 saw many important breakthroughs and a host of smaller incremental performance improvements. In a famous and detailed study (carried out by an appropriately named researcher called Bright) there is evidence to show that little improvements in the design of the bulb and in the process for manufacturing it led to a fall in price of over 80% between 1880 and 1896. [Bright, 1949 #214] Examples of such innovations include the use of gas instead of vacuum in the bulb (1913 Langmuir) and the use of tungsten filament.

Innovation theory teaches us that after an invention there is a period in which all sorts of designs and ideas are thrown around before finally a 'dominant design' settles out and the industry begins to mature. So it was with the light bulb; by the 1920s the basic configuration of the product - a tungsten filament inside a glass gas-filled bulb - was established and the industry began to consolidate. It is at this point that the major players with whom we associate the industry - Philips, General Electric, Westinghouse - become established.

### **Technological alternatives**

Although the industry then entered a period of stability in the market place there was still considerable activity in the technology arena. Back in the 19<sup>th</sup> century Henri Becquerel invented the fluorescent lamp and in 1911 Claude invented the neon lamp - both inventions which would have far-reaching effects in terms of the industry and its segmentation into different markets.

The neon lamp started a train of work based on forming different glass tubes into shapes for signs and in filling them with a variety of gases with similar properties to neon but which gave different colours.

The fluorescent tube was first made commercially by Sylvania in the USA in 1938 following extensive development work by both GE and Westinghouse. The technology had a number of important features including low power consumption and long life - factors which led to their widespread use on office and business environments although less so in the home. By the 1990s this product had matured alongside the traditional filament bulb and a range of compact and shaped fittings were available from the major lighting firms.

### **Meanwhile, in another part of the world....**

Whilst neon and fluorescent tubes were variations on the same basic theme of lights, a different development began in a totally new sector in the 1960s. In 1962 work on the emerging solid state electronics area led to the discovery

of a light emitting diode - LED - a device which would, when a current passed through it, glow in red or green colour. These lights were bright and used little power; they were also part of the emerging trend towards miniaturization. They quickly became standard features in electronic devices and today the average household will have hundreds of LEDs in orange, green or red to indicate whether devices such as TV sets, mobile phones or electric toothbrushes are on and functioning.

Development and refinement of LEDs took place in a different industry for a different market and in particular one line of work was followed in a small Japanese chemical company supplying LEDs to the major manufacturers like Sony. Nichia Chemical began a programme of work on a type of LED which would emit blue light - something much more difficult to achieve and requiring complex chemistry and careful process control. Eventually they were successful and in 1993 produced a blue LED based on Gallium arsenide technology. The firm then committed a major investment to development of both product and process technology, amassing around 300 patents along the way. Their research culminated in the development in 1995 of a white light LED - using the principle that white light is made up of red, green and blue light mixed together.

So what? The significance of Shuji Nakamura's invention may not be instantly apparent - and at present the only products which can be bought utilizing it are small high power torches. But think about the significance of this discovery. White LEDs offer the following advantages:

- 85% less power consumption
- 16 times brighter than normal electric lights
- tiny size
- long life - tests suggest the life of an LED could be 100,000 hours - about 11 years
- can be packaged into different shapes, sizes and arrangements
- will follow the same economies of scale in manufacturing that led to the continuing fall in the price of electronic components so will become very cheap very quickly.

If people are offered a low cost, high power, flexible source of white light they are likely to adopt it - and for this reason the lighting industry is feeling some sense of threat. The likelihood is that the industry as we know it will be changed dramatically by the emergence of this new light source - and whilst the names may remain the same they will have to pay a high price for licensing the technology. They may try and get around the patents - but with 300 already in place and the experience of the complex chemistry and processing which go into making LEDs Nichia have a long head start. When Dr Nakamura left Nichia Chemical for a chair at University of California, Santa Barbara, sales of blue LEDs (light-emitting diodes) and lasers were bringing



the firm more than \$200m a year and the technology is estimated to have earned Nichia nearly \$2bn.

Things are already starting to happen. Many major cities are now using traffic lights which use the basic technology to make much brighter green and red lights since they have a much longer life than conventional bulbs. One US company, Traffic Technology Inc. has even offered to give away the lights in return for a share of the energy savings the local authority makes! Consumer products like torches are finding their way into shops and on-line catalogues whilst the automobile industry is looking at the use of LED white light for interior lighting in cars. Major manufacturers such as GE are entering the market and targeting mass markets such as street lighting and domestic applications, a market estimated to be worth \$12bn in the USA alone.

## Sewing up the Competition – Innovation in the Textile and Clothing Industry

Manufacturing doesn't get much older than the textile and clothing industry. Since the earliest days when we lived in caves there's been a steady demand for something to wrap around us to keep warm and to protect the more sensitive bits of our anatomy from the worst of the elements. What began with animal hides and furs gradually moved into a more sophisticated activity with fabrics woven from flax or wool – and with people increasingly specializing in the business.

In its early days this was very much a cottage industry – quite literally people would spin wool gathered from sheep and weave simple cloths on home-made looms. But the skill base – and the technology – began to develop and many of the family names we still have today – Weaver, Dyer, Tailor, for example – remind us of the importance of this sector. And where there were sufficient cottages and groups of people with such skill we began to see concentrations of manufacturing – for example the Flemish weavers or the lace-makers in the English Midlands. As their reputation – and the quality of their goods – grew so the basis of trading internationally in textiles and clothing was established.

The small-scale nature of the industry changed dramatically during the Industrial Revolution. Massive growth in population meant that markets were becoming much bigger while at the same time significant developments in technology (and the science underpinning the technology) meant that making textiles and clothing became an increasingly industrialized process. Much of the early Industrial Revolution was around the cotton and wool industries in England and many of the great innovations and machinery – such as the spinning jenny – were essentially innovations to support a growing international industry. And the growth of the industry fuelled scientific research and led to developments like the invention of synthetic dyes (which allowed a much broader range of colour) and the development of bleaching agents.

There's a pattern in this in which certain manufacturing innovation trajectories play a key role. For example, the growing mechanization of operations, their linking together into *systems* of production and the increasing attempts to take human intervention out through automation. Of course this was easier to do in some cases than others – for example one of the earliest forms of programmable control, long before the invention of the computer, was the Jacquard punched-card system which could control the weaving of different threads across a loom. But actually making material into various items of clothing is more difficult simply because material doesn't have a fixed and controllable shape – so this remained increasingly a labour-intensive process.

By the twentieth century, the industries had become huge and well established, with growing international trade in raw materials such as cotton and in finished goods. The role of design became increasingly important as basic demand was satisfied and certain regions – for example, France and Italy – began to assume strong reputations for design. Branding became increasingly important in a world where mass communications began to make the telling of stories and the linking of images and other elements into advertising, which fuelled demand for clothing as much more than a basic necessity purchase.

Mass production methods and the scientific management approaches underpinning them diffused rapidly and, in the case of clothing assembly which remained a labour-intensive process, led to the quest for lower-wage-cost locations. So began the migration of clothing manufacture around the world, visiting and settling in ever cheaper locations across the Far East, through much of Africa and Latin America to its present home in China.

Today this is a global industry embracing design activities, cutting and processing operations, assembly, distribution and sales – all fuelled by a huge demand for differentiation and personalization. This is an industry in which price is only one element – non-price factors such as variety, speed, brand and quality matter. And it's an industry dominated by the need for high-frequency product innovation – fashion collections no longer run along the old seasonal track with winter and summer collections. In some cases the range is changed every month and innovation in information and communications technology means that this cycle is getting shorter still.

All of this has shaped an industry which is highly networked across global 'value chains' and coordinated by a few major players. Much of the 'front' end of the industry is about major brands and retail chains while the 'backroom' operations are often small-scale subcontractors often in low-wage-cost areas of the world.

Like so many industries it has become somewhat footloose and wandered from its origins – leaving behind only a small reminder of its original dominance. Compared with countries like India and China today's European clothing industry is a small player on the global stage. There are some exceptions to this – and they underline the power of innovation and entrepreneurship.

Just because the dominant trends lead in one direction doesn't mean that there isn't scope for someone to spot and deploy ways of bucking this trend. One such player was a young clerk working in a small clothing retailing business in northern Spain. Frustrated with his career prospects Amancio Ortega Gaona decided to strike out on his own and in 1963 invested his savings – the princely sum of US\$25 – into a small manufacturing operation making pyjamas and lingerie. In classic fashion he peddled (and pedalled – his earliest transport was a bicycle!) his wares around the region and built the business over the next 10 years and then decided to move into retailing as well, opening his first shop in the north-western town of La Coruna in 1975.

Things have moved on somewhat since then. Industria de Diseno Textil – Inditex – the holding company which he established – is now worth around US\$21 billion, double the sales of less than a decade ago, and employs over 150,000 people. With over 7000 stores in nearly 70 countries this textile and clothing business has 8 key brand groups, each targeted at particular segments or product types – for example, 'Pull and Bear' for children, 'Massimo Dutti' for older men and women or 'Oysho' in lingerie. Best known of these is 'Zara' – a global brand with a strong design and fashion identity running through both the clothes and the stores in which they are sold. Its clothes combine stylish designs with a strong link to current high fashion themes with moderate prices. As Lotte Freddie, fashion editor of the Danish daily newspaper *Berlingske Tidende*, commented, 'If you want a classic, Italianate look in tune with current styles and at a reasonable price go to Zara.' Zara's successful growth is not simply a matter of low cost or of standardization but rather of *innovation*, based on the idea of 'fast fashion'.

The company have become leaders by exploiting some of the key non-price trends in the industry – for example, variety and product innovation. For example, over 18 000 different

clothing models are created and sold every year – this is most certainly not a case of ‘one size fits all’ or of long-lasting product types! Ortega has taken the entire system for creating clothes and built a business – and originally did so in an area which did not previously have any textile tradition.

At an early stage in the development of the manufacturing business he moved back into textile-finishing operations to make sure that the colours and quality of the material he used to make the clothes were up to scratch. Not only did this give better quality control but it also opened up the road to offering exciting and different fabric designs and textures. There are now 18 textile-designing and -finishing operations in the group as well as the clothing manufacturing.

A major part of the company’s success comes from a strong commitment to design – they employ over 350 designers and make extensive play of this commitment. It’s a theme which doesn’t stop with the clothes themselves but also extends to the presentation of the stores, their window displays, their catalogues, Internet advertising and so on. Part of the headquarters building in Arteixo La Coruna, Spain contains 25 full-size shop windows with display platforms and lighting which allow the team to see what real store windows would look like – not only under normal conditions but also on rainy days, at night and so on. Another key aspect of Zara’s success is the flexibility which comes from having a very different model for manufacturing. Around 2500 employees work directly in manufacturing operations – but behind them is a much larger workforce spread across villages and small communities in Spain and northern Portugal.

Once the new design has been approved the fabric is cut and then distributed to this network of small workshops – and these represent an outsource capability delivering a high degree of flexibility. Pre-cut pieces and easy-to-follow instructions are given to workers in what is still largely an informal economy – and their output then flows back into the massive Zara distribution centre like tributaries to a fast-flowing river. (This is not a small operation – the centre has around 200 kilometres of moving rails on which the products flow. Highly automated and with extensive in-line quality checking, the process transfers the incoming pieces into production lots which are then allocated to a fleet of trucks for fast shipment, mostly by air from the nearby airport at Santiago de Compostella.)

Needless to say this places significant demands on a highly flexible and innovative coordination system which Zara have developed in-house. In this way they make use of a model which dates back hundreds of years (the idea of industrial districts and clusters) but use twenty-first-century technologies to make it work to give them huge flexibility in both the volume and variety of the things they make. Where competitors such as H&M and Gap have to start planning and producing their new lines three to five months before goods finally make it to the stores, Zara manages the whole process in less than three weeks!

Their flexibility is also based on rapid response and extensive use of information and communication technologies. At the end of the day as the customers leave their 950 stores around the world the sales staff use wireless handsets to communicate inventory levels to the store manager who then transmits this intelligence back to Spain as a feed into the design order and distribution system. This gives an up-to-the-minute idea of what is selling – and what isn’t, so the stores can be highly responsive to customer preferences – which colours ‘work’, which themes are popular, which designs aren’t hitting the spot. But it’s not just following the market – Zara also push the game by making sure that no model is kept on sale for more than four weeks – no matter how well it is selling. This has a strong impact on their

brand – they are seen as very original and design-led – but it puts even more pressure on their ability to be agile in design and manufacture.

For example, an idea for a coat with a high collar and a metal ring to fasten it was born in Zara’s design studio in the small city of Arteixo. Five days later the draft sketches, themselves a result of feedback from store managers about fashion trends they were seeing, had been converted into a physical prototype. A second pattern maker then took over and working with a team of seamstresses and cutters worked the next 13 days to produce a batch of 8000 coats. Their final 6 days in manufacturing were spent being ironed, tagged, quality checked and prepared for despatch, moving from the logistics centre in Zaragoza to Barcelona airport. By the next day a truck was taking them from J.F. Kennedy airport to downtown New York to be sold in the Fifth Avenue Zara store, selling at \$189. Total cycle time, including transport and distribution, 25 days. This is not unusual; their fast fashion model has been able to move from idea to store in as little as 2 weeks!

Another is exclusivity; their model is geared around small batch production in which only a small number – for example, 25,000 of the coats – will be made. Selling out of stock is not a problem since Zara store managers need to keep making space for newer items which arrive twice a week from Spain.

As one analyst commented, ‘think of Zara not as a brand but as a very speedy chameleon that adapts instantly to fashion trends’ (Anne Critchlow, Societe General analyst, quoted in Wall St Journal, ‘How to make a success of fast fashion’, 7/12/16)

### Case Study Questions

1. Is the Zara model sustainable? What would you do to preserve their edge over the next 5–10 years, given that many other players are now looking to follow their example? If you don’t think it can survive, give your reasons for why you think the model is unsustainable and will fail.
2. You have been hired as a consultant to a small clothing manufacturer who wants to emulate the success of Zara and Benetton. She wants advice on an innovation strategy which takes the key lessons from these successful firms. What would you offer?
3. Zara Home has just opened using the same basic business model and deploying the same innovative approach as the rest of the business but in the home goods field. Do you think it might succeed and why?