The Connected Business

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Projects need clear, measurable goals

Paul Taylor says a surge in spending has fuelled a lively debate over the role IT plays in productivity growth

ince the first commercial computers went into service in the 1950s, information technology has become a vital component of industrial infrastructure.

At the same time, the surge in IT spending has fuelled a lively debate over the role IT plays in driving productivity growth.

Some economists have suggested that up to 40 per cent of US productivity growth between 1995 and 2002 can be attributed to accelerated investment in IT.

Other economists have questioned the validity of these estimates, but a study prepared for the US Congress Joint Economic Committee in 2001 suggested that companies that invest can expect productivity gains for two reasons.

"First, the rapid decline in the price of computing power has spurred huge investments in IT. This investment, like any other form of capital spending, should raise the productive capacity of those firms that undertake it.

"Second, IT has the potential to allow firms to implement efficiency-enhancing changes in the way they do business."

Borrowing from earlier academic studies, the Congressional report also suggested that IT is a "general purpose" or enabling technology - just like electricity – that "opens up opportunities rather than offering a complete, final solution"

The report also noted that at the turn of the 20th century, US industry underwent radical change because of the increasing availability of electricity. Companies invested heavily in electrical machinery as the price of electricity fell relative to other forms of power.

Even if companies did not change their production processes, they could still expect an increase in productivity as a result of this capital spending.

However, the switch from end of all costs, ranging from 1 steam to electric power also to 4 per cent," he says. allowed companies to change the floor plans of their factories



structure need to be accompanies by changes to businesses processes.

For example, Tim Lawrence, a manufacturing expert with the UK-based PA Consulting Group, argues that productivity gains from IT in manufacturing will be challenged by the slow recovery of budgets and the need to drive ambitious changes through a reduced workforce.

ing's IT spend is at the lower

tivity has an effect on all supply the CIO Research Team, warn

significantly - at best it has of success," he argues, "because recovered to 80 per cent of precrisis levels.

'The challenge therefore is to address issues such as critical process changes, automation or a product life cycle management system that works globally, with fewer resources but at an even faster pace, and at the same time manage work changes for staff remaining in the company."

Richard Hunter, vice-president and Gartner Fellow in Gartner's CIO Research Group - Office of

no one can say how much collaboration is going on now, no one can say how much collaboration will be taking place when the programme is under way and finally collaboration is not a business outcome."

Instead, he suggests that companies should define meaningful targets, such as increasing the number of products the product development team creates in any year, the quality of their design or customer satisfaction with an organisation's redesign.

unit executives to understand how they want to achieve value and how that value is going to be expressed.3

He is particularly critical of organisations that buy technology for its own sake.

"Buying a treadmill is not the same as losing 10 pounds," he observes

'Once a goal such as improving customer ing customer retention has been retention has been set. you can become very

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measured by return on assets, has declined steeply over the past four decades.

IT can enable much deeper and more scalable relationships with customers and a growing array of third parties, as well as fuel network effects for performance improvement and learning, they point out.

Crucially they argue that in order to create the most value, companies need to view enterprise IT in a fundamentally different way from how they did in the past.

set, you can become very intelli-Hitherto, its main effect has gent about what tools, what changes in process and personbeen to standardise business

"Traditionally, manufactur-

"Current pressure on produc-

Other consultants, including

"Any one of these is material and can be quantified and can be base-lined, so we will know when things have changed," he says

in a way that increased efficiency. In this way, companies changed their production process "and hence experienced a second productivity 'kick' from using electricity", the report said.

But most IT and management consultants agree that simply "throwing money" at IT projects is unlikely to produce the best outcome and that in most instances, changes in IT infrachain and payments related processes, as well as key processes in overheads such as finance and procurement.

"Some manufacturing organisations have adapted staff numbers to current and future capacities, and this means they will need to implement IT and process changes with fewer key personnel.

"Unfortunately, this does not mean IT spend has increased

that while IT can help drive productivity, this is by no means assured. He believes that many organi-

sations fail to set measurable business goals for projects by which their success or failure can be judged. He gives as an example, set-

ting as targets vague concepts such as "improved collaboration between product designers". "That is a meaningless mark

Mr Hunter says the IT department may have a valuable role to play in identifying how a target can be achieved, for example how to automate a process in a way that adds value and goes beyond what was originally envisaged.

But ultimately he says, "It is the responsibility of business intelligent about what tools will be used'

"The chief marketing officer may for example say 'I want Siebel CRM,' as if that is the desired outcome, And in the very worst case, the organisation buys Siebel CRM, installs it, gets it up and running and then discovers that it has no idea what to do with the thing."

nel or in the organisational structure will be needed to achieve that outcome.'

Similarly, as John Hagel and John Seely Brown argue in their guest columnist, IT is a doubleedged sword.

As a result, he says some com-

"They go through an expen-

panies manage to waste millions

of dollars and hundreds or thou-

sive implementation and then

find out that they have abso-

lutely no idea how they are

mine what their goals are, for

example, to improve customer

"Once a goal such as improv-

"They should instead deter-

going to profit from a project.

sands of hours.

retention.

It has the potential to destroy business value as well as create

They note that despite steady gains in labour productivity, corporate financial performance processes, and wherever possible, automate activities to remove people from those processes They note "the primary focus

of IT innovation is now about connecting people, and helping them improve performance more rapidly through working together.

"And more and more, it's about connecting people across institutional boundaries.

Faster decision-making and fewer dud products

Manufacturing

Rapid prototyping allows designers to see accurate models at an early stage, says Ed Hammond

George Kessler weaves through the maze of metallic grey automata that dominate the floor of his east London factory. Moulding machines and white hot lasers bend and shear long steel sheets. The air is thick with the odour of singed metal and melting acrylic.

His company, Kesslers International, is a UK designer and manufacturer of "point of purchase" displays for goods in shops, and it invests about £250,000 a year in computer equipment. He points out that this is less a recessionbeating strategy than a key to survival.

Even so, he says, having the most up-to-date IT system is not, in itself, going to get a manufacturing company out of the recession. "No matter how good the computer is, you still need the right people to keep the business progressing."

Even as demand for manufactured goods has fallen during the past two years. the cost of renewing the IT systems needed to keep pace with international competition has kept rising.

While investing in the latest systems might not offer an easy route out of recession, there is a risk that by underspending in an

companies will struggle to make rapid decisions about emerge from the downturn. what does and does not 'You can afford to get a year behind the latest tech-Anything more nology. than that and you simply cannot compete and the business will fail," Mr Kes-

sler says. That view is widely held among manufacturers and, although computers cannot substitute for a skilled workforce, they do give much greater speed to react to changing demands. Even at the basic produc-

tion level, specialised programmes can help a factory machine work out which tool it needs to cut certain shapes. In the past, this

'What IT has done for the marketing side of the business is as important as what it has done for production

"tooling up" of machines was done by workers - a laborious task

Manufacturers also point out that, thanks to IT, machines are now capable "looking after themselves" to a certain degree, and can work out when they need servicing and which parts need to be replaced.

Depressed demand for goods has given greater buying power to customers. who can now afford to be more specific in their demands

The upshot is that manu- that rapid prototyping has

attempt to boost margins, facturers need to be able to work as a product. Charles Clarke, a special-

ist in computer-aided design (CAD) and writer on the industry, says sophisticated systems have allowed companies to "rule out the basket case" products and save time and money on wast-

"An IT system cannot bring you vision, but it does mean you can find out much faster when that vision is wrong and start correcting it," Mr Clarke

says "Computers have liberated the designer and got rid of some of the more intensive parts of the manu-

facturing process," he adds. The increased prevalence of expensive rapid prototyping machines, which use minute layers of plastic or metal to build up an object programmed into the computer by designers, is an example of how IT can be used to to gain an edge over the competition.

Mr Kessler says that being able to see the physical object and assess its functionality, without having to send it off to be built, has revolutionised the way manufacturers can think about their products.

As well as allowing designers to see them faster and with more accuracy, rapid prototyping printers have given manufacturing companies the ability to print physical objects which

tomers.

can then be shown to cus-Mr Kessler also points out difficult.



George Kessler: 'You still need the right people'

changed the way companies can market goods.

Indeed, computer systems have changed the way manufacturers can showcase products and is allowing some companies to pull away from the competition and emerge strongly from the recession.

As much as the advancements in CAD have given process the production greater speed and fluency, the impact IT has had on presentation is in some ways even more significant. Nigel Hobden, director of the Random Group, an engineering consultancy, says: "What IT has done for the marketing side of the business is as important as what it has done for produc tion

"It makes a huge difference when you can show exactly what the finished product will look like and how it will work. The real challenge is to work out how to get the most out of the systems available," Mr Hobden adds.

Having the latest systems and even the people to use them is not enough to help manufacturers beat the recession. But without the right

hardware to support growth potential, any exit from the throes of economic hardship may be much more

IT allows patients more control

Healthcare

Sarah Murray says integrated systems will facilitate better care that costs less

The question for healthcare companies when it comes to information technology is: "Buy or build?" And until recently, the answer - particularly for larger hospitals themselves from others. and healthcare centres has often been "build". tend to like to invent it

However, that balance is themselves," says Mitch shifting, as IT providers Morris, rush in to claim their share Deloitte Consulting's Life of the market, and health-Sciences and Healthcare care providers recognise the practice and its national leader for Health IT. "But advantages of standardisation, interoperability and each unique solution makes information exchange. it more difficult to hook them all together.

For a variety of reasons, providers have tended to go it alone when introducing hooking everything tonew technologies into their gether is seen as the key to systems. "At places such as Johns Hopkins, 30 years care providers are coming ago, we were developing our own solutions," says Baltimore-based Stephanie Reel, chief information of the financial crisis, governments have pledged

officer for both Johns Hopkins University and Johns Hopkins Medicine. Part of the reason is that, care IT systems. In the US, 30 years ago, no providers were developing the kinds of specialised systems needed by physicians and

hospitals. "In the 1990s, we recognised that we would need technology to do what we wanted to do," says Nina Schwenk of the Mayo Clinic. But for the clinic's large, complex centre in Rochester, Minnesota, she says there were "no out-ofthe-box solutions that could electronic and

meet our needs" Today, the industry has a to co-ordinate patient far wider choice of provid- care, cutting paperwork

ers, as large companies and unnecessary tests. such as IBM and Cisco Systems have set their sights on the sector. Obama However, the fragmented nature of the industry, the next decade. which encompasses every-

thing from large hospitals

"Doctors and hospitals

a principal

And when it comes to

the benefits of technology,

progress, something health-

implementation of health-

for example, the administra-

Moreover, with health-

of patient records.

to recognise.

According to Deloitte, the funding pledged by the administration could save up to \$90bn over

'When we decided to put in electronic medical records in Florida, it was very much to drive costs down because it was taking so many people to process the charts," says Dr Schwenk. However, as well as cost-savings, quality is a priority. "If we're improving our quality, even at the same cost, then our value is increased," she says.

She cites turnround in times, enhanced safety and accessibility of the records as examples of how doing things digitally improves quality. "So, even if it

> Schwenk: 'Even if it weren't for cost, we'd go down this path'

In addition, in the wake wasn't for the cost issue, we'd go down this path." Despite lingering privacy funds to accelerate the concerns, the ability to exchange information easily is also becoming a priority. Through health information tion has devoted stimulus exchanges, for example, funding to the digitisation healthcare information no longer resides in a single institution but can be transferred electronically.

care costs rising rapidly (in the US, healthcare accounts Technology can also for one dollar in every six extend the reach of services. Videoconferencing, for spent), the urgency to find example, allows remote solutions that can reduce those costs is intensifying. diagnosis, bringing special-IT holds that promise, ised services to more places. with the potential to gener-Remote monitoring and ate efficiencies through access to medical records also holds potential for prescribing an improved ability improved service delivery and lower costs. Home monitoring systems can also be

connected to online per sonal health records, such as Microsoft's HealthVault and Google Health. Diabetics, for example,

could have glucose monitors connected to their health records and local healthcare centre. Any abnormal change in glucose levels would trigger an alert, allowing a doctor to call the patient to find out what had caused the change and help the patient take action to reverse it.

But the biggest change is the role of the patient. With the advent of personal health records, the doctorpatient relationship is shifting, with patients taking greater control over their information and care.

"It's about assigning responsibility in a shared way, so that patients are empowered to manage their own health - and after all, who has the greater incentive to remain healthy than the patients themselves? says Ms Reel. "Technology is providing a great deal more support for this."

Evidence suggests this is also something people welcome.

A briefing paper from Deloitte highlights the fact that 50 per cent of consumers would like a personal monitoring device.

The next step will be adding mobility. Devices such as mobile phones, smart phones and tablet computers will be able to collect information and transmit it to personal health records in real time. Deloitte calls this the "killer app" for healthcare providers.

Of course, in another sense, the technology would be far from a killer - on some occasions it could in fact save people's lives.

with many facilities to single-physician practices, has also delayed the adoption of standardised systems. Moreover, a concern for many healthcare businesses has been to differentiate

The Connected Business

Information technology is a double-edged sword

Guest Column

JOHN HAGEL III and JOHN SEELY BROWN

Too many senior executives are tempted to hand IT strategy to their chief information officer and forget about it.

CIOs certainly have a significant role to play, but a profound change in the infrastructure of business what we call the "Big Shift" - has made IT central to the entire board of directors.

If executives of all stripes do not engage with IT strategy, they will probably fail to navigate the profound dislocations ahead.

That's because IT is destroying business value, as well as providing an opportunity to create it. IT is a double-edged sword.

A Steady Erosion of Profitability The Big Shift is a fundamental reordering of the way we live, learn, play, and work. A new technology infrastructure is a big part of this transformation. Consider technology platforms such as Amazon Web Services, Google Apps, Android, Facebook, Twitter, the iPhone App Store, and now the iPad.

These technologies are profoundly destabilising to companies-and the profits that fuel them. Our research has found that IT is intensifying competition and reducing barriers to entry in ways that are putting extreme pressure on profitability over the long term.

Despite gains in labour productivity, corporate financial performance has steeply declined over the past four decades. Recent findings from the Center for the Edge's Shift Index have showed a significant deterioration in return on assets, which have declined more than 75 per cent for all public companies in the US since 1965

Moreover, the gap between the most and least successful businesses has increased. The "winners" in aggregate are barely maintaining their previous ROA levels, while the losers are experiencing mounting losses. Our research shows this longterm pattern was in evidence well before the recession began in 2007.

The breakdown of corporate ROA coincides with the introduction decades ago of two innovations: the microprocessor and packet-switched network standards.

These technologies are the foundations of a digital infrastructure that continues to transform the business and social landscape.

Just as the telephone, automobile, and aeroplane reshaped society in the first half of the 20th century, the infrastructure that shows no sign of



iChange: new digital infrastructure, software and hardware, such as the iPad, are reordering the way we live, learn, play and work

digital infrastructure is reshaping life in the 21st. There is a key difference, however, between this technology revolution and previous ones.

In past upheavals, new technologies launched with a burst of innovation, experienced rapid performance improvements for a short time, and then witnessed a flattening of the performance-improvement curve. Stability followed the initial disruptive innovation.

As the performance curve of a technology flattened, innovators learnt the best ways to organise the infrastructure so as to deliver the distinctive capabilities of the new technology.

But for the first time in history, we are dealing with a technology

stabilising. In fact, the exponential rates of improvement in the three building blocks of today's digital infrastructure - processing, storage, and transport - are likely to continue indefinitely. Improvements are coming ever faster, leaving us with little time to figure out how to capitalise on them.

Digital technologies are also systematically reducing global barriers to entry and movement. Thanks to digital networks, even the smallest companies can now reach a worldwide market.

Meanwhile, competition is intensifying on a global scale. Companies face new competitors from unexpected quarters. They are discovering that rivals can more rapidly copy even their most innovative moves.

New Sources of Business Value At one level, therefore, IT represents a powerful force to erode and destroy economic value.

At the same time, it offers powerful new sources of value creation. It can enable much deeper and more scalable relationships with customers and a growing array of third parties, as well as fuelling network effects for performance improvement and learning. In fact, for the first time IT offers the potential, along with new management practices, to turn performance curves with diminishing returns into ones with increasing returns, where everyone learns faster as more participants join in.

But to create the most value, companies need to view enterprise IT in a different way. The primary thrust of enterprise IT investment over the past several decades has been to standardise business processes and automate activities to remove people from processes

Bloomberg

In a shift, the primary focus of IT innovation is now about connecting people, and helping them to improve performance more rapidly through working together. And more and more, it is about connecting people across institutional boundaries.

As we describe in our recent book, The Power of Pull, innovation is now largely concentrated along various edges, from geographic edges, such as emerging economies, to demo-

graphic edges - the new generations entering the workforce and markets. For example, some of the most profound institutional innovations are

being pioneered among entrepreneurial companies in China and India, which are developing management techniques to break up tightly integrated and specified business activities into more loosely coupled and scripted modules of activity across large global networks of diverse participants.

So far, these innovations have been implemented without a lot of support from IT, because previous generations of IT have been regarded as too rigid

As newer generations of more modular systems architectures become available, there is an opportunity to integrate these with the management practices emerging in China and India.

In addition, innovations such as cloud computing and social networks have empowered people operating at the edges of companies - in remote branch offices or in business initiatives – to accomplish things that were unthinkable a few years ago.

These people are taking advantage of the scalable, on-demand infrastructure of the cloud to gain access to sophisticated IT resources and analvtical tools for ambitious experiments, while using social software to connect with each other and learn more rapidly from the experiments. We are in a period where people at

the edges can take advantage of innovation much more rapidly than before.

This ability gives the edge great potential to challenge the core. The edge of innovation is therefore something every business executive should be deeply concerned about.

The Journey Ahead

IT is creating both tremendous opportunities and challenges. If executives don't watch out, something on the edge that they dismissed as trivial may rapidly achieve the scale needed to take them head-on.

On the other hand, these forces create significant opportunity for another transformative wave of innovation

We see a huge upside here for those who can harness the Big Shift and master the new practices and architectures that are required to profit from the dislocations of the future

We look forward to exploring these strategies in the columns ahead.

John Hagel III, and John Seely Brown are independent co-chairmen, of the Deloitte Center for the Edge.

Their books include The Power of Pull, The Only Sustainable Edge, Out of the Box, The Social Life of Information, Net Worth, and Net Gain.

Finding spares can be a complex challenge

Aerospace

Charles Batchelor considers approaches to the supply chain for machines that may be in service for decades

odern civil airliners are complex pieces of equipment with as many as 4m components involved in their manufacture. Organising the supply chain that delivers anything from nuts and bolts to complete sub-assemblies is equally tricky.

Enterprise resource planning systems are common throughout many industries as a way of managing a wide range of company functions, from finance through human resources to supply chain.

Big ERP suppliers, such as SAP and Oracle, offer systems that can manage ordinary supply chains, but aerospace industry experts say specialist products to meet the sector's requirements are needed.

For all its high-tech image, the aerospace industry has proved less than leading-edge in managing its supply chain – as both Boeing and Airbus have found. Delays to recent launches by the two leading aerospace companies have revealed gaps.

Boeing made the mistake of subcontracting large parts of the manufacture of its 787 Dreamliner while at the same time boosting the quantity of high-tech composite materials in the design. EADS, the European aircraft-making consortium, faced problems installing the 500 kms of electrical wiring in each of its Airbus 380s.

"The aerospace industry has from component suppliers. been very much a craft industry

for a lot longer than the automotive sector," says Peter Dickin, marketing manager for Delcam, a Birmingham, UK based developer of manufactur-ing software. "Until now, the industry didn't make aircraft in anything like the volumes cars have been made in for decades." "The sector is split between

large groups, such as Rolls-Royce, that are global, and a very long tail of smaller companies," explain Ed Savage and Tim Lawrence, supply chain experts at PA Consulting Group. "There are thousands of components in an aircraft and any one can stop it flying. There is a real logistical challenge in tracking all these components deep down into the supply chain."

The challenge facing the industry is complicated by the fact that aircraft may remain in service for decades and need spare parts for their entire

working life. "Auto manufacturers bring out a new model every four to six years, but an aerospace company can be making the same components 40 years later," says Andrew Mair, chief executive of the Midlands Aerospace Alliance, a UK regional grouping of

suppliers. "Companies have to service, overhaul and repair aircraft, but

that often involves only small volumes of a particular part."

Just as specialist logistics companies have evolved to handle deliveries in sectors such as food retailing and automotive components, similar organisations have emerged in the aerospace industry. Umeco, a London-listed company, works with customers, such as engine supplier Rolls-Royce, to establish their needs, create bills of materials required and match that with inventory that it holds

"We provide an outsourced



Engine craft: a Rolls-Royce Trent 1000 under scrutiny

solution for C-class parts, the nuts and bolts of the industry," says Clive Snowdon, chief exec-

utive. "We inspect products and deliver to the point of use. We have a proactive vendor management programme and may put our people into suppliers if they default. We look for well financed, well-resourced suppliers, because a casualty can cause enormous disruption."

Umeco uses a common IT platform to link its five supply hubs around the world so it can see

'There are thousands of components in an aircraft and any one can stop it flying'

where it has a particular product in its network.

It originally bought an IT package from a local supplier, but when that company said it would no longer support the software, Umeco bought the code and continued to update it and broaden its functionality.

"A lot of mainstream distributors have tried to break in, but they realise their systems are not capable of dealing with the complexity," says Mr Snowdon. 'Our customers need full traceability, so we have to provide to make rapid changes.'

provenance back to the base metal."

NewsCast

Michael Burkett, managing vice-president of supply chain research at Gartner, an IT research company, says: "The aerospace industry has a need for basic supply chain management capability, such as demand planning and production scheduling, but there are also business processes that are unique to aerospace.

"The big airline manufacturers have long order books but they don't necessarily know the configuration customers want. When they get the final order, they have to be prepared for things to change. They need the capability to deal with that."

This has led to the creation of a web-based business-to-business hub called Exostar, formed by a partnership of BAE Systems, Rolls-Royce, Boeing, Lockheed Martin and Raytheon. This allows customers to forecast their requirements and source

material from suppliers. "The ERP vendors have achieved a deeper penetration of supply chains, but ERP its still not 100 per cent what the aerospace industry needs," says Mr Burkett. "Spare parts planning, in particular, requires unique algorithms to forecast demand. The problem is still the ability

Integration of design tools speeds up car production

Automotive

A single platform for designers and engineers is a leap forward for carmakers, writes John Reed

Ford Motor, when designing the latest version of its Mondeo model, deployed the eight-foothigh, 20-foot-wide Powerwall.

The huge back-projection screen allowed the carmaker's designers in Dearborn, Michigan to review progress on the vehicle's design in real time with colleagues at Ford's European operation in Saarlouis, Germany, and discuss tweaks via audio and video links.

The Powerwall enables Ford's designers to view a car from all angles and test different colours and backgrounds - a cityscape at night, for example – zooming in on fine details down to the metallic flake of its paint.

Ford has several of the screens, the largest of which is 60 feet across.

Ford also now uses the portable screens to display digital images to focus groups. The US carmaker still uses clay mockups for final design sign-offs, but fewer than before.

Like most of its competitors, Ford is increasingly turning to sophisticated information technology systems in every step of the development process, from design to manufacturing.

"One Ford" is a corporate mantra for Alan Mulally, chief executive, as he pushes the company's operations in the Americas, Europe and Asia to co-operate more closely in an attempt to strip some of the cost and waste out of the competitive business of making cars.

Most of the industry's other big producers, from Ford's Detroit rival General Motors to Germany's Volkswagen, are harnessing IT to shorten their vehicles' time to market.

Fiat's Sergio Marchionne, one of the most cost-minded chief executives in the car business. brought the Italian carmaker's Bravo model from design to market in 18 months when it launched in 2007.

Computer-aided design (CAD) and computer-aided engineering (CAE) are not new tools; what is new, say manufacturers, is the growing level of integration of IT systems through all levels of 24.3 the vehicle development process - and the growing accessibility of these tools to employees.

Kevin Timms, Ford's senior executive responsible for IT and project creation, says: "The real inflection point in this industry is that we've gone from a separate set of technologies to the integration of the CAE companies and the CAD companies. The companies are getting their software to talk to each other

it is a big change." When Ford's designers have finished their work, the focus moves to its engineers, who are given a set of requirements such as how far forward and back a seat should go, or how much leg and shoulder room a passenger should have. Whereas in the past Ford's engineers would have generated their own CAD.

In the 1980s, each part was produced in hardware form so that tooling could then be created to build it

then checked whether it violated or met design norms, their efforts are now directly integrated with the designers' work. "We are bringing that CAE analysis, CAD and design rules into one place," says Mr Timms. So, for example, when engineers want to see how a vehicle body can withstand a crash, they extract the relevant data from the CAD system. This integration has allowed Ford to reduce that process by two to three weeks.

Once the engineers are done, Ford can study a vehicle in virtual reality, checking, for example, whether buttons can be easily reached, or if its design creates blind spots. In the past, this would have required physical

prototypes – and more time. "The product development cycle in the automotive industry used to be 48 to 60 months, says Sarwant Singh, partner at Frost & Sullivan, the consul-

tancy. "The Japanese brought these cycles down to 36 months - that's how they were able to gain an advantage on the US and Toyota brought it down to

Yet the ascendancy of ever more powerful IT tools in carmaking - as in many other areas of business - has not been without controversy. When diagnosing the causes of Toyota's recent wave of recalls affecting about 11m vehicles with braking and other problems, some industry analysts cited the Japanese carmaker's heavy reliance on virtual testing of its cars and prototypes.

As the IT used in automaking grows ever more sophisticated, manufacturers are also finding they need to ensure staff training and hardware keep up.

'You need faster machines, better equipment – and storage, storage, storage," says Arne Lakeit, head of production and factory planning with Audi, the Ingolstadt-based luxury marque.

Like Ford, Audi has moved from generating data independently at each stage of the vehicle development process to using a common set from design to production.

Audi also uses virtual reality to study the exterior and interior quality of a car - down to how its upholstery and other surfaces will appear when viewed under light shining from different sides.

Mr Lakeit recalls working on the Audi 80 model back in 1985 when he started at the company. Back then, each part of any car in development had to be produced in hardware form so that tooling could then be created to build it.

Today, Audi captures data for parts from its CAD database that allow it to plan the process. The data are then fed down the production line.

Another big change is the improvement in the man-tomachine interface. Whereas less than a decade ago, top-end IT was the province of a few Audi employees, now it is used widely through the company's ranks.

"Half of my planning department - about 1,000 people - are using virtual tools, virtual equipment," says Mr Lakeit. "It's not for specialists any more.

Digital-savvy shoppers drive change

Retail

Jonathan Birchall reports on applications to deliver increased sales and lure customers from rivals

est Buy, the largest US electronics retailer, is testing a system that sends messages about special offers to customers' mobile phones when they enter its stores.

Kohl's, the mid-price department store, is rolling out in-store touch screen kiosks that will allow customers to order online items that are not available in the store.

JCPenney, its rival, is moving towards the launch of a mobile e-commerce platform, and has just upgraded its website search system. Walmart, the international retail

group, is creating a global e-commerce platform.

Customer demand may still be sluggish after the recession of the past two years, but US retailers have been continuing to spend money on technology aimed at their customers.

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"Retailers have maintained as spending priorities anything that may enhance the customer relationship or experience," says Nikki Baird, of Retail Systems Research, a consultancy that specialises in retailers' information systems. "Everything else has struggled."

The current spending on customerfacing technology is supported by the need, in a slow-growth economy, to deliver increased sales by luring shoppers away from rivals, says Ms Baird. But it also reflects a significant shift in the traditional world of retail technology.

Instead of introducing customers to technology aimed at increasing operational efficiency, such as bar codes, or electronic payments, retailers are now struggling to stay abreast of the technology at the fingertips of their customers.

Shoppers equipped with smartphones can now use tools from the online world in-store. They can check prices at rival stores and look for independent product reviews. They can use their phones to receive digital offers, and increasingly to access payment systems and complete transactions

But dealing with the digitally equipped "multichannel" shopper is presenting challenges for the industry that go well beyond what the customer sees in the store.

"It may start with the customer," savs Ms Baird. "But as soon as we go down that path, there are questions to do with business models, supply chain design, how you compensate stores for online sales that happen at an [in-store] kiosk. These are big issues for a retailer.'

"It's not just about integrating channels, it is about changing your business model, and no one wants to hear that."

For retailers, the challenges of creating a single customer experience both online and in stores can encompass basic considerations such as ensuring the prices or offers are the same whether the customer is buying in a shop or via the internet.

In one of the most radical responses to the challenge, Moose-



JCPenney

Smarter shopping: the 'multichannel' customer can check prices at rival stores and look for product reviews Bloomberg

jaw, a small outdoor equipment retail certainly customer-experience kind of chain based in Michigan, has done away with a separate computer system for its point-of-sale devices.

Instead, the in-store machines connect to the same IBM Websphere Commerce database as its e-commerce site, which is also used by its call-centre sales staff. The system also operates a loyalty reward scheme – the customer's purchase history is accessible in all channels. "All the channels are updated in real time and can each offer the exact same features," says Gary Wohlfeill, Moosejaw's creative director.

With just seven stores, Moosejaw's multichannel transformation was relatively straightforward.

At the other end of the scale, Tom Nealon, chief information officer at JCPenney since 2006, is overseeing the creation of a digital platform for the retailer, which has more than 1,000 stores and sales of \$17bn last year. The platform, he says, will eventually encompass "all the main processes you need to run any business'

"Traditionally, a digital platform is

stuff," he says. "But even there, we take it deeper into order management, fulfilment, enterprise planned allocation, customer analytics. It is really quite comprehensive.

Initially, JCPenney's online business - worth more than \$1bn annually - was largely built on its "big book" catalogue business, which presented customers with more conservative products than its stores.

The shift to a single buying system and fully-aligned merchandise meant that some sales were lost in the transition, with the old big book catalogue finally discontinued this year. Mr Nealon says the introduction of the new technology has largely followed rather than led those organisational changes, which he said were 'a huge first step"

Once the new teams started working together, "that's when you started to see what the process needs were, and how you were going to build the technology out.'

The first part of the e-commerce platform to be launched will, however, be its mobile e-commerce capa-

bility – an area that is gaining attention from a range of leading retailers, including Walmart, Target, Best Buy and Sears Holdings.

But, while most now have mobile phone applications that allow customers to browse their website or locate stores, they provide "brandbuilding" and information, rather than mobile transactions, which require a full digital platform.

"Mobile has become a huge priority just in the past eight or nine months," says RSR's Ms Baird. "The CIOs I've talked to say that, while they are throwing out customerfacing applications, they are frantically working on the back-end to be able to support them in an efficient, sustainable and leverageable way.'

Smartphone apps, says Mr Nealon, raise the question "to what degree do you intend to transact business through that application?'

"That's where the new digital platform comes in. You actually have to have the order management, fulfilment and the pricing capability [to support mobile transactions]. That's what we're building out right now."

In-store e-kiosks

Kohl's, the mid-price US department store, is deploying touch-screen kiosks across its more than 1,000 stores, one of a number of efforts by US retailers to bridge the gap between their physical stores and their websites, writes **Jonathan Birchall**

"We think the kiosk implementation has an opportunity to lift our trend in e-commerce," Kevin Mansell, chief executive, told investors this year, discussing what the company is calling a 'significant" investment in technology.

Kohl's machines will allow customers to browse its e-commerce website, but also complete transactions - so they can order items that might not be immediately available in the store, or in the size or colour they want. Holders of Kohl's private label credit card will be automatically recognised when they swipe their card, making the transaction easier.

JCPenney, Kohl's main rival, also has a "Buy More" self-service kiosk linked to its website, which is expected to be in about 150 stores by the end of September. But it is taking a different tack, illustrating the kind of decisions retailers are now making, trying to assess the likely return on new technology investment.

Rather than deploy the kiosks to all stores, it is focusing on its 300 or so smaller shops that do not stock a full range. Tom Nealon, chief information officer, argues that customers equipped with smartphones to place orders are less likely to need to use in-store kiosks.

"We are not looking to deploy a lot of hardware at great expense, when we have such conviction that the mobile devices our consumers are carrying in are going to be wired to that capability," he says.

The kiosk issue reflects the central problem facing CIOs in retail, as they try to determine which of the emerging technologies will eventually become as much a part of shopping as swiping a credit card.

"As part of our customer experience strategy, we are constantly having to decide where we want to invest our money and



Regulators push technology to track trades in real time

Capital markets

Michael MacKenzie says there is greater appreciation of how data can help manage risk

Technology has transformed US capital markets in recent years and efforts by regulators to gain realtime insight into the trading of bonds, derivatives and stocks will only accelerate the use of computerised models and platforms.

Today, equities are transacted in microseconds or 1,000 times faster than the human eye can blink, while sophisticated electronic systems underpin trading across global bond and foreign exchange markets.

The advance of technology has contributed to cheaper trading costs, as the prices in these markets have become more transparent and thus fairer, and improved computerised risk-management systems that can track exposures.

"It is hard to dismiss the notion that markets are more efficient and transparent thanks to technology," says Larry Leibowitz, chief operating officer at NYSE Euronext, the US-based exchange operator.

The closer embrace of technology is being driven by regulators seeking realtime information about trading to understand risks brewing in markets. The focus on capturing data and analysing what they mean is a crucial next step in the evolution of capital markets and risk management.

Paul Rowady, analyst at Tabb Group, a consultancy, says data "are the central nervous system for global markets to bind critical components in a unified manner.

As electronic trading grows, it encourages the greater use of quantitative or "quant" systems such as algorithms, which in turn places greater emphasis on data. This is likely to of \$2.1bn.



system so as to save pre-

NYSE also provides soft-

ware for managing risk,

and the data centre enables

banks and broker-dealers to

integrate their own systems

and/or use third parties.

'There is a history

innovation that

processing

services

places stress on

This "co-location" proves

the desire among investors

to trade in microseconds

and also highlights the

changing dynamics of the

NYSE, which now defines

its business as comprising

Beyond equities, elec-

tronic trading has become

well established in foreign

bond markets during the

past decade. Global cur-

rency trading is largely con-

ducted across two large

executing trades.

Meanwhile, the New York narrow the gap between trading desks and the com- Stock Exchange has begun pliance and risk manageopening the doors of its new ment sections of financial data centres in New Jersey investing companies. and Basildon, outside Lon-"There is a history of don.

front-office innovation that places stress on back-office processing," says Mr Rowady. "The rise of 'quants' in trading leads to a greater appreciation of data, which cious nanoseconds when will help improve compliance.

The greater reliance on technology has sparked an arms race among trading firms for speed, but there are critics. The Securities and Exchange Commission is conducting a broad-based review of the US equity market, which has been Of front Office transformed in recent years by rapid fire trading systems.

The importance of the SEC's review has grown since the "flash crash" of May 6 when stocks plunged and subsequently recovered inside 20 minutes, seen by critics of technology as a swift right hook against trading that lacks human involvement.

In the wake of the flash crash, the SEC wants to three units: equity trading, create a Consolidated Audit derivatives, and technology Trail to track all orders and trade information in real

time. Many in the securities industry, however question exchange and government the cost of setting up the CAT, estimated at \$4bn and gathering and analysing with annual running costs

platforms run by Reuters and Icap's EBS.

In bond trading, Icap's BrokerTec platform accounts for more than half of electronic US govern-In these vast buildings, ment bond trades and competes with eSpeed, the plattrading companies can place their computers in form owned by Cantor Fitzgerald. proximity to the NYSE's

This month, Icap unveiled an electronic platform for trading euro-denominated interest-rate derivatives. with streaming prices supplied by the likes of JPMorgan, Deutsche and Barclays. In the world of fixed income and derivatives trades, a handful of banks dominate electronic trading and seem set to hold that lead, as these markets increasingly embrace technology under the terms of the recently signed Dodd-Frank financial reform bill. In a recent poll of 907 institutional investors, Greenwich Associates, a consultancy, ranked Barclays Capital, Bank of America Merrill Lynch and JPMorgan as leading dealers in electronic trading.

"Electronic trading of rates is Barclays Capital's forte - clients benefit from the transparency it brings and we all benefit from the reduction in operational risk," says Harry Harrison, head of rates trading at Barclays Capital. "We expect trading volumes for derivatives to rise significantly, as clearing takes the credit risk out of trading.'

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