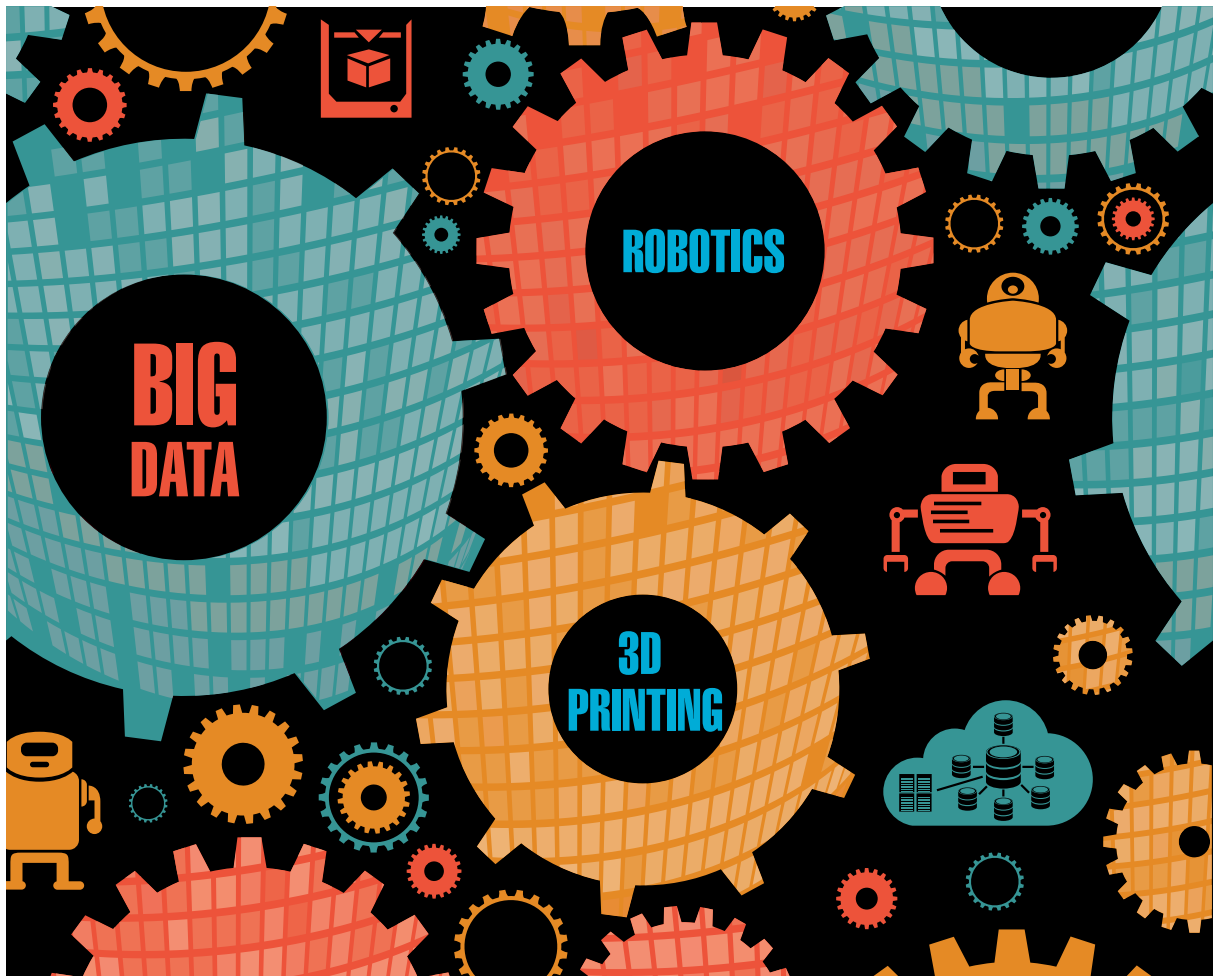


DIGITAL TRANSFORMATION REVIEW

N° 05 January 2014

Gearing Up for Digital Operations

- The Second Machine Age - [Erik Brynjolfsson](#) and [Andrew McAfee](#)
- ABB and the Evolution of Robotics - [Dr. Per-Vegard Nerseth](#)
- The Implications of 3D Printing for Manufacturing and the Wider Economy - [David Reis](#)
- UPS: Putting Analytics in the Driver's Seat - [Jack Levis](#)
- How HMRC's Big Data Solution is Helping Transform the UK's Tax System - [Mike Hainey](#)
- edX and the Transformation of Learning through Big Data - [Anant Agarwal](#)
- The Missing Link: Supply Chain and Digital Maturity - [Capgemini Consulting](#)
- Backing Up the Digital Front: Digitizing the Banking Back Office - [Capgemini Consulting](#)
- Putting Digital at the Heart of Europe - [Neelie Kroes](#)



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Gearing up for Digital Operations

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CONTENTS

EDITORIAL

Digitizing Operations –
The Unclaimed Prize
- Capgemini Consulting’s
Editorial Board

page 6

DIGITIZING OPERATIONS: VIEW FROM LEADERS



The Second Machine Age:
An Industrial Revolution
Powered by Digital
Technologies

page 12

Rise of the Automatons:
ABB and the Evolution of
Robotics

page 18



The Third Dimension:
The Implications
of 3D Printing for
Manufacturing and the
Wider Economy

page 25



UPS: Putting Analytics
in the Driver’s Seat

page 31



An End to Data Poverty:
How HMRC’s Big Data
Solution is Helping
Transform the UK’s Tax
System

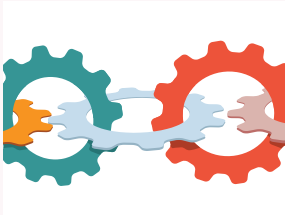
page 38



Global Brain Power: edX
and the Transformation of
Learning through Big Data

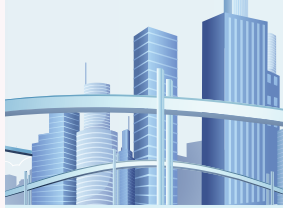
page 44

DIGITIZING OPERATIONS: IN FOCUS



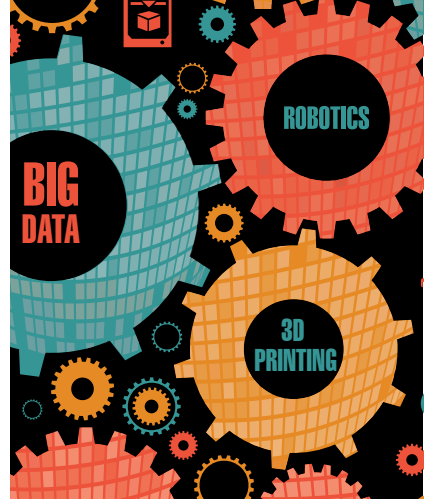
The Missing Link:
Supply Chain and Digital
Maturity

page 53



Backing Up the Digital
Front: Digitizing the
Banking Back Office

page 63



SPECIAL GUEST



Putting Digital at the Heart of
Europe: An Interview with
Neelie Kroes

page 77



COMPANIES TO WATCH: VIEW FROM SILICON VALLEY

By Sergi Herrero, CEO,
L'Atelier BNP Paribas USA

pages 30, 51, 75

Digitizing Operations – The Unclaimed Prize

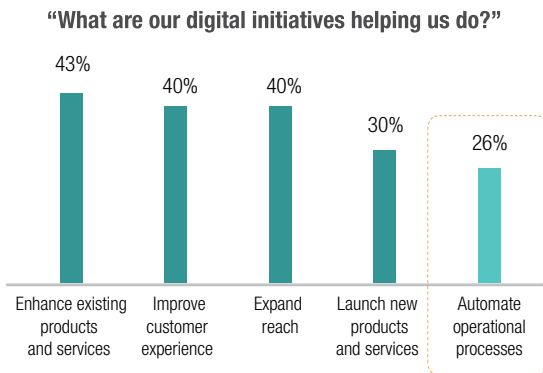
Introduction By **Cappgemini Consulting’s Editorial Board**

Digital transformation today is pervasive across organizational functions. There is no area within a company where digital has not made its impact felt. Nevertheless, most organizations have largely focused on the ‘shinier’ parts of digital transformation – namely the front-end and the customer-experience. The reasoning behind this has been pretty straightforward – customers see, interact and engage with the front-end organization. And organizations cannot be seen as lacking the digital prowess of their competition. However, in maintaining this focus, many organizations have neglected the benefits that digital technologies can bring to an area that is usually hidden from the customer’s view – operations. Indeed, our research with the *MIT Sloan Management Review* suggests that only 26% of organizations use digital technologies to automate

their operational processes (see Figure 1). In this *Digital Transformation Review*, we shine a much-needed spotlight on this neglected area, canvassing the views of thought leaders, academics, and the senior teams of companies that are determined to seize the digital operations prize.

When we say organizations have neglected digitization of operations, what do we mean exactly? What are the key digital technologies that organizations should leverage but are not doing currently?

Figure 1: The Digitization of Operations Has Been Neglected by Most Companies



Source: Cappgemini Consulting – MIT Sloan Management Review, “Embracing Digital Technology: A New Strategic Imperative”, 2013

“
There is no room for complacency in the fast-moving digital world.
 ”

- Neelie Kroes



Academics **Andrew McAfee and Erik Brynjolfsson**, from the **MIT Center for Digital Business**, are a good place to start

for answering this question. They are on the verge of releasing their next book on the second machine age – an era when machines are now able to take over a lot of cognitive tasks that humans can do. Erik

and Andrew have identified **Big Data and Machine intelligence/ Robotics** as powerful technologies that organizations should closely track and implement.

Erik and Andrew have a strong vision for the brave new world offered by these technologies, stating: *“The second machine age will have greater impact than even the first industrial revolution.”*

Robots have always conjured up images of a humanoid serving coffee, but, silently, they have been revolutionizing several areas of manufacturing operations. And who better a person to vouch for this than **Per-Vegard Nerseth, Head of Robotics at ABB**. ABB Robotics has already shipped over 200,000 robots worldwide, and Per-Vegard gives us an in-depth view of robots, humans, jobs and impact on operations. An area closely linked to robotics is **3D printing**.



“
The Second Machine Age will have greater impact than even the first industrial revolution.”

- Andrew McAfee and Erik Brynjolfsson



While an open-source 3D printed robot might still be some time away, many organizations are already deploying 3D printing to drive key elements of their operations.

David Reis, CEO of Stratasys,

one of the biggest 3D printing companies globally, is a key industry thought leader who expounds on the implications of this digital technology for manufacturing industries.

Big Data analytics has come into its own in the last couple of years. While overall adoption has been low, however, the intent to invest in it continues to rise steadily.

However, investments speak only to one side of the story. Big Data delivers big results only when it is used to transform operations. And this is exactly what three organizations that we identified have done.

With a delivery volume of 4.1 billion packages across 220 countries, UPS faces a logistical challenge the scale of which Big Data analytics loves. And the company rightly recognized that. We spoke

to **Jack Levis, Director of Process Management at UPS**,



to understand how Big Data analytics is helping them get the most bang for every buck spent on fuel. He should know. The deployment of descriptive and predictive analytics systems

several years ago enabled UPS to reduce 85 million miles driven per year.

There are common misconceptions on how public sector authorities in many countries are typically behind industry-leading private sector organizations in their adoption of the latest technologies. Clearly, **HM Revenue and Customs – the UK tax authority** – is out of this club. The department is one of the early adopters of Big Data analytics in order to combat tax and welfare fraud. HMRC has seen extremely strong results from adopting Big Data. They invested around £45 million over five years in a Big Data solution. As of April 2013, it enabled the department to uncover fraud worth over £2.6 billion. No wonder **Mike Hainey, Head of Data Analytics at HMRC**, wants to now use Big Data analytics in newer areas such as improving customer experience and end-to-end lifecycle of customer handling.



Mike Hainey, Head of Data Analytics at HMRC

By now, if you thought Big Data analytics is only useful for driving corporate efficiency goals, you could not be further from the truth. The key advantage of Big Data analytics is that it thrives with data, and it does not differentiate one dataset from the other. And this is more than amply demonstrated

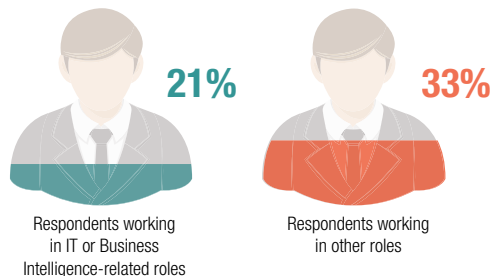


when **Anant Agarwal, President of edX**, says, “Our objective is to improve the learning experience on campus by understanding how people learn.” edX is a not-for-profit organization, founded by Harvard and the MIT in May 2012, which aims

to expand access to education for everyone while improving educational outcomes on campus and online by using Big Data analytics.

As these companies showed, Big Data can indeed bring a step change in operations. Consequently, the usage of Big Data is expected to keep rising. It is estimated that over 4.4 million IT jobs will be created around Big Data by 2015¹. However, do companies have these skills? Evidence seems to suggest the answer is no (see Figure 2).

Figure 2: Knowledge/Understanding of Big Data



Source: E-Skills UK, “Big Data Analytics: Adoption and Employment Trends 2012-2017”, November 2013

Having talked to several industry leaders about the use of digital technologies in operations, we then decided to investigate the digitization of operations in a specific function and in a sector in more detail. We looked at the digitization of supply chains as well as banks’ back offices. The results, unfortunately,

¹Gartner, “Gartner Says Big Data Creates Big Jobs: 4.4 Million IT Jobs Globally to Support Big Data By 2015”, October 2012

validate the view that organizations who are tackling digital operations seriously are in a minority.

For many organizations, some of the most complicated parts of their operations typically lie in their supply chains. But **are organizations doing enough to use digital technologies to transform their supply chains?** It seems not. We conducted a survey of global supply chain organizations and the results should start worrying CxOs. Over 65% of companies have not started or have only partly framed a digital vision and strategy for supply chain. And there is more. Over 57% of supply chain organizations acknowledged a competency gap in their people abilities on digital technologies.

Banks around the world can fall prey to the focus on the digital front-end – concentrating an inordinate amount of effort on front-end customer-facing digital innovations. But when it comes to the back office, they continue to rely on decades-old legacy systems that have received a steady stream of complicated additions. Indeed, if banks wish to continue offering customers a more enhanced and differentiated digital experience, then the **time to digitize their back offices** is now.

And finally, digital transformation, be it of the customer experience, operations or business model, is not just for companies. The world around us is rapidly becoming digitized and government authorities around the world have as much digital responsibility, if not more, than CEOs. And one of the strongest supporters for digital is **Neelie Kroes, Vice President of the European Commission**, leading the flagship Digital Agenda for Europe program. Neelie Kroes exemplifies the importance of digital when she says, *“There is never room for complacency in the fast-moving digital world”*.



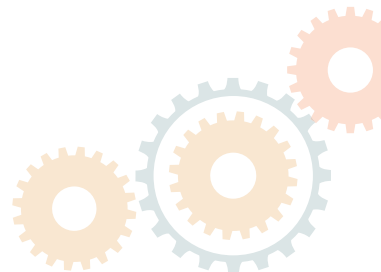
At Capgemini Consulting, we are firm believers in the power of digital transformation. We strive to share the best thinking on digital and highlight some of the thoughts and views of digital leaders from around the world. We hope you find this edition of the *Digital Transformation Review* insightful and thought-provoking. We look forward to hearing from you on the channel you prefer – digital or not. Happy reading.

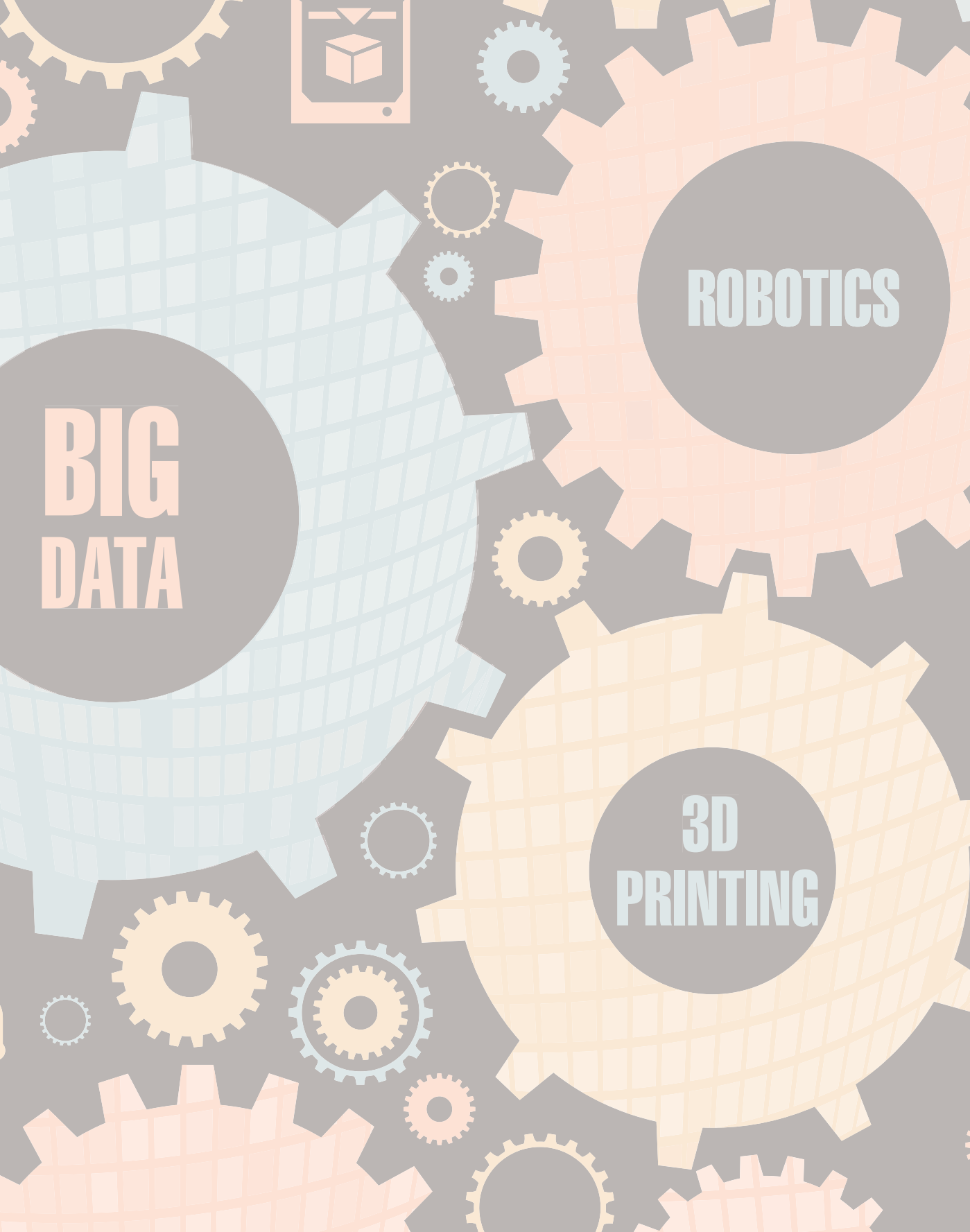
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**BIG
DATA**

ROBOTICS

**3D
PRINTING**

Digitizing Operations: View from Leaders



The Second Machine Age: An Industrial Revolution Powered by Digital Technologies

Erik Brynjolfsson is the Director of the MIT Center for Digital Business and Andrew McAfee is a Principal Research Scientist at the Center. Erik and Andrew are widely-acknowledged thought leaders on technology evolution and co-authors of the 2011 book, “Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy”. They have now written a new book, “The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies”, which is scheduled for release in early 2014¹. We spoke with Erik and Andrew to understand their thinking on digital technologies, how they are likely to evolve, and what this means for individuals, society and organizations.



Interview with Erik Brynjolfsson and Andrew McAfee, MIT Center for Digital Business

Technology in Top Gear

What is the core premise of the “The Second Machine Age”?

There have been two big turning points in human history. The first was the industrial revolution, where machines replaced muscle power. The Second Machine Age is the time when machines are now able to take over a lot of cognitive tasks that humans can do. It started roughly around the time IBM’s Deep Blue computer in 1997 beat Gary Kasparov in a chess match. That year also witnessed median incomes peak in the United States, and a subsequent rise in productivity. The Second Machine Age will be a bigger transformation and have greater impact than even the first industrial revolution.

¹ <http://www.amazon.com/The-Second-Machine-Age-Technologies/dp/0393239357>

“
The Second Machine Age is the time when machines are now able to take over a lot of cognitive tasks that humans can do.”

What are the defining characteristics of this Second Machine Age?

We see three defining trends in the Second Machine Age.

The first is an exponential improvement in computational power, communications technologies, data storage and even software. Some technologies are even improving faster than Moore's law (Moore's law is the observation that, over the history of computing hardware, the number of transistors on integrated circuits doubles approximately every two years).

The second characteristic of this age is the digital nature of core technologies. Digital technologies have unusual economics compared to the economics of atoms – they can be copied at virtually zero cost, transmitted almost

instantaneously and resultant copies are perfect, identical copies of the original. The idea that you can perfectly replicate goods for free, obviously leads to some very unusual economics compared to the “textbook” perception. An increasing number of industries have software at their core and, therefore, are characterized by these economics of digitization.

The third characteristic is the combinatorial nature of innovation. Digital innovations can be combined and recombined to create even more value. And that's a very encouraging thing; a larger base of inventions means an even larger set of raw materials for the next wave of innovations. This is very unlike traditional inputs that yield diminishing returns.

“
The Second Machine Age will have greater impact than even the first industrial revolution.”

New Digital Technologies, the Industry and the Neglect of Operations

From an industry perspective, what are the key technologies that organizations should keep a close eye on?

We believe companies should pay close attention to two areas when it comes to technology development – machine intelligence and the global network of people and machines.

Machine intelligence is the idea that by including different combinations of digital technologies, we can now allow machines to do cognitive tasks that they could never have done before. Take language and voice recognition. For the very first time in history, we can talk to our machines and have them understand what we are saying and carry out our instructions. People have been working on language, motor control and problem solving for decades. However, very little progress had been made until just the past 5 or 10 years, which is when

things started picking up very rapidly. And part of that is due to the exponential improvement in technologies, in particular the power of **Big Data**.

Similarly, robotics has greatly improved in recent times and robots today are good with both gross and fine motor control. Take the example of Baxter — a two-armed robot that operates at an hourly rate of just \$4! Or consider Google's self-driven car. A few years ago, it would have been impossible to imagine that machines could even accomplish something like this. But today, we have crossed that threshold. And finally, machines have become remarkably good at solving unstructured problems. An example of that is what IBM's Watson did with the TV show "Jeopardy". The supercomputer defeated two of the show's greatest champions. Watson is now being applied at call centers, for legal advice, investment advice, medical diagnosis, and many other kinds of unstructured problems.

The other key area that we believe holds great potential for both organizations and the society at large is the networking of all people on the globe. For the first time in history, we are

networking together billions of brains, all the humans on the planet, to solve problems. In the past, only a relatively small share of humanity was engaged in problem solving. In the coming decades, almost all of humanity can be partners in this problem-solving enterprise. And that will multiply the opportunities for invention and innovation and creativity, disproportionately, and will also lead to a big acceleration in the rate of inventions. Organizations need to tap into this massive source of brainpower.

“
We believe organizations should focus on leveraging technologies around machine intelligence, big data and connected networks.”

To summarize, we believe organizations should focus on leveraging technologies around machine intelligence, big data and connected networks.

From our research, we found very few companies are exploiting new digital technologies in their operations. What is your take on this?

Indeed, we think that is the most important challenge before us — despite technology rushing ahead, our organizations, societies and governments are not adapting rapidly. One of the key issues is that CXOs don't fully appreciate and understand the power of these new technologies. Many don't even realize that they are in the midst of this tidal wave of change. There are some who realize it though. However, they don't know what to do next. And finally, for those that initiate change, the big challenge is in making that change. So, for all those reasons, we're faced with lagging organizations and institutions.

“
CXOs don't fully appreciate and understand the power of these new technologies. Many don't even realize that they are in the midst of this tidal wave of change.”

industries, from automobile production to software creation. Unfortunately, in the past 15 years, the job destruction has continued, but we have not created new jobs and new industries equally fast.

“
We need to invent ways of racing with the machine, not against it.
 ”

How can individual and organizational skills be upgraded to compete in the Second Machine Age?

We have to transform our skills as we always did in the past, but we have to do it even faster. We have to start with education. You can think of humans as being engaged in a race between education and technology for much of the past two centuries. Sadly, the education industry has been one of the slowest ones to incorporate technology. We are optimists, so we actually see that as good news – it means we have a lot of potential for improvement. The future looks bright because we are nowhere close to harnessing the true potential of technology in education.

“
The education industry has been one of the slowest ones to incorporate technology.
 ”

What is the best way to resolve the growing concern over loss of jobs and the economic divide?

We need to fix this. We need to invent ways of racing with the machine, not against it. Earlier we talked about the example of Chess and how Deep Blue defeated Gary Kasparov in the World Chess Championship. The World Chess Champion today is not a machine. And it's not a human. The best chess player is a team of humans and computers working together. A team of humans and computers can defeat any computer or any human working alone. And that underscores the point that humans and computers have complementary and distinct skills and capabilities that, when they work together, can be more powerful than they are individually.

What are some areas where technology can be used to improve education?

In this context, Massive Open Online Courses (MOOCs) have a major role to play. MOOCs can do two big things. First, they can replicate the best teachers, methods, course materials to thousands or even millions of people, just as we saw in media, entertainment, software and other industries. Second, and more importantly, the digitization of education creates opportunities to apply Big Data analytics to better measure student patterns and behavior online. Key insights obtained from such analysis can be used to enhance the quality of education. *(For more information on how MOOCs are transforming education, please refer to our interview with Anant Agarwal, President of edX on page 44 – a not-for-profit organization founded by Harvard and the MIT.)*

“
We are going to see the rise of many new types of organizations; one example is what we call ‘micro-multi-nationals’.
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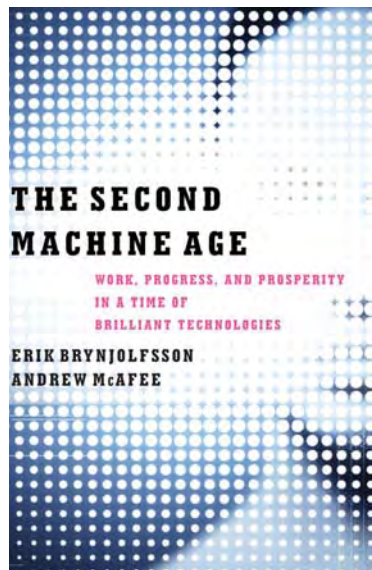
Visualizing the Digital Future

Does growing machine intelligence and the fact that everybody is networked lead to a new type of digital organization?

Yes, we are going to see the rise of many new types of organizations. One example is what we call ‘micro-multi-nationals’. Today, half a dozen people can market and distribute their products and services to the entire world through the Internet instantaneously. That is something we’ve never seen before in history. And they will network together with other micro-multi-nationals, with medium-sized companies and with big companies to coordinate production. You can have what we call ‘scale without mass’ – basically companies that reach globally, but have relatively few employees. Facebook or Instagram are examples of such companies.

But that is only one part of future organizational evolution. For instance, the digitization of the economy that we talked about earlier is leading to much lower marginal costs, and that inherently creates enormous economies of scale. There are also tremendous network effects, which also would

create demand-side economies of scale. Those tend to favor big companies like Google and Apple and other companies that have global reach. There will be many different types of winners in the Second Machine Age.



What is the key takeaway that you want organizations and individuals to bear in mind as they prepare themselves for the Second Machine Age?

The pace of technology development is going to continue to accelerate exponentially. More cognitive tasks will be automated and done by machines. The last ten years were pretty rough. The next ten years will be even more disruptive.

If organizations and individuals just go on autopilot and don’t pay attention, we could easily end up with a society with a tremendous concentration of wealth and income. Then, it will not be the 1%, but the 1% of the 1%, the one-hundredth of one percent, that ends up with superstar incomes; but the majority of people will not participate in that global abundance. A ‘digital elite’ will thrive in the Second Machine Age. The rest would be left behind unless they are quick to learn new technologies and work “with” the machines.

The continuing advances in technology are in some ways easy to predict. But the way our organizations and individuals respond – that is a choice, not a predetermined outcome. As we say in our book, technology is not destiny; we shape our destiny. We can make the choices based on our values. We need to make the right ones.

“
The last ten years were pretty rough. The next ten years will be even more disruptive.
 ”

Rise of the Automatons: ABB and the Evolution of Robotics

ABB is a leading manufacturer of industrial robots and robot systems, operating in 53 countries. Key markets include automotive, plastics, metal fabrication, consumer electronics as well as food and beverage industries. ABB has shipped more than 200,000 robots worldwide. Capgemini Consulting spoke to Dr. Per-Vegard Nerseth, Group Vice-President and Head of Robotics at ABB to understand more about robotics, their evolution and impact on operations.



Dr. Per-Vegard Nerseth
Group Vice-President and Head of Robotics at ABB

“
Western countries are looking at automation as a way to compete more effectively against low-cost manufacturing countries.”

Interview with Dr. Per-Vegard Nerseth,
Group Vice-President and Head of Robotics at ABB

Robotics Industry in Context

How has the robotics industry performed in the last few years?

For many years prior to the global financial crisis, the robotics market was fairly small at roughly 100,000 units. The market was driven primarily by the automotive industry and growth was relatively flat. The industry was badly affected during the crisis. Sales fell by nearly 30-40% and the market declined to about 67,000 units. Since the crisis, however, the robotics market has grown strongly. During 2010 and 2011, the market recovered to above pre-crisis levels. According to the International Federation of Robotics (IFR), the global robotics market stood at close to 160,000 units in 2012. I expect the market to continue to grow strongly going forward.

“
China is the most rapidly growing market for robots in the world.
 ”

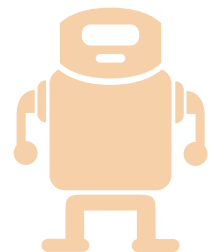
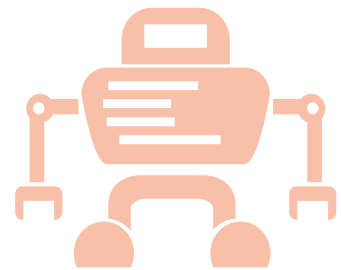
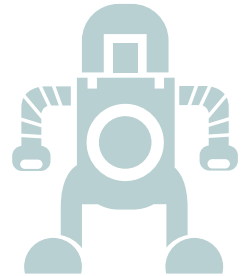
What is driving this dramatic growth in the robotics market?

Companies need to increase productivity and efficiency, both in mature as well as developing markets. Western countries are looking at automation as a way to compete more effectively against low-cost manufacturing countries as well. There are two reasons for this – rising labor costs and high labor turnover rates. Labor costs in China are rising at 10-15% a year. As a result, the traditional cost advantage that China enjoyed compared to the western world is shrinking. And this is true for other emerging markets as well. These countries are looking at robotics and automation to maintain their competitiveness. China, in fact, is the most rapidly growing market for robots in the

world. Between 2005 and 2012, sales of industrial robots in China have grown by about 25% per year on average.

High labor turnover rates are also contributing to the increasing use of automation in emerging economies. The consumer electronics and food and beverage industries, in particular, struggle to maintain a stable workforce. Certain Chinese factories have to manage employee turnover rates of up to 5% a month. The cost of replacing employees, which includes recruitment and training costs, can be quite high. This has become one of the key drivers of automation.

“
The cost of replacing employees has become one of the key drivers of automation in China.
 ”



The Global State of Robot Penetration

The global average robot density* in 2012 = 58



Japan, Germany, Korea and the US – have the **highest** robot densities.*

Korea



396

Japan



332

Germany



273

The automotive industry accounts for the **highest share** of automation

Japan has the highest robot density for the automotive sector:



per



Among non-automotive industries, the 2 **prominent** growth markets for robotics are :



and



* Robot Density: measured as the number of robots per 10,000 employees

The Benefits and Challenges of Automation

What are some of the key benefits secured by companies that have deployed robots?

The cost and efficiency benefits of using robots can indeed be quite significant. This is more so when companies are running high volume productions. A single robot, for instance, can replace several workers on a production line, which brings down operating costs. At the same time, a robot can work faster and with greater efficiency. Franklin Bronze & Alloy Inc. is a U.S.-based producer of ceramic shells that has used robots to dramatically reduce costs and increase efficiency. The use of robots has helped the company cut man-hours from 56 hours a day to 32, while increasing daily production from 140 to 200 parts.

The other key benefit of using robots is higher product quality. A robotized solution can reduce rework, scrap rates and material usage, while delivering higher and more consistent quality levels. In a car paint job, for instance, achieving uniform

thickness through manual painting is difficult due to the human tendency to overspray. A manual paint job for a car usually utilizes 20-30% more paint compared to robotized painting. This means lower quality levels and substantially higher costs.

Another benefit of investing in robots is increased worker safety and improved working conditions. Robots can perform tasks involving hot, dusty or hazardous conditions that would be difficult and dangerous for humans.

“
A manual paint job for a car usually utilizes 20-30% more paint compared to robotized painting.”

What are some of the challenges in increasing the penetration of robots in the EU or US?

There are two challenges that I believe the industry will need to address. The first challenge is to find ways to make robots easier to use. The automotive industry has had a long history

of using robots and as a result, it has built a skilled workforce that can program and manage robots. But for industries that are new to automation, programming robots can be a challenge. We need to find ways to make robots easier to use so that they do not require a very highly skilled workforce to operate. Ease of use is going to be crucial to drive penetration.

The other issue that will need to be addressed is that of safety. The industry is looking at ways to make robots work more closely with human beings, so that they can actually collaborate. Today there are very strict safety rules for robot operations and robots are required to be caged in. But if we want to have a robot working alongside human beings on a production line, we will need to make robots that are safer to work with.

“
We need to find ways to make robots easier to use so that they do not require a very highly skilled workforce to operate.”

Robots, Digital Skills and Jobs

Does the increasing use of automation pose a serious skills issue for companies? Do you see a skills gap becoming a hurdle for manufacturers?

I do see this as a challenge for non-automotive industries, like the food and beverage and electronics industries. Unlike the automotive industry, these industries do not have in-house expertise in programming and handling robots. I think the solution would be for the robotics industry to develop robots that are easier to use, as I mentioned earlier, because I think in the future we will increasingly serve new customer segments with different skill levels and needs compared to the automotive industry.

“The industry is looking at ways to make robots work more closely with human beings, so that they can actually collaborate.”

“We are seeing a shift in mindset among companies toward moving production back onshore.”

Do you think that robots can help the US and Europe bring manufacturing production back onshore?

Yes I do think that is a possibility. A few years back the focus was on shifting manufacturing to locations that offered the lowest production costs. But today, we see growing concern about landed costs and the impact of import duties. We also see a growing need for delivering products at the same time across geographies. These factors are driving a shift in mindset among companies toward moving production back onshore. Some leading electronics companies have openly announced that they have already “reshored” some manufacturing work. And we are seeing this trend not only in customized production but also in mass production.

What are your thoughts on the impact of automation on employment? Do you agree with arguments that say that increasing automation has led to a jobless growth?

No, I do not agree. In fact, the International Federation of Robotics (IFR) published a report last year that shows that countries that invested heavily in automation between 2000 and 2011 actually saw a drop in unemployment. The number of jobs that have been created is far greater than the numbers lost due to automation in manufacturing. This is because companies that have invested in automation are producing more and expanding and entering new markets. As a result, they have had to employ more people in new downstream functions like sales and distribution. The IFR estimates that 300,000 to 500,000 downstream jobs have been created due to the use of robots during 2008-2011.

“300,000 to 500,000 jobs have been created due to the use of robots.”

The other aspect of connectivity relates to telerobotics that opens up several new applications for robots. Remotely controlled or telecontrolled robots can be used to perform complex or dangerous functions that would ordinarily be performed by humans. For instance, working on an oil platform requires a lot of training and also involves safety hazards. Remotely operated robots equipped with vision technology can be made to perform actions such as the handling of components which would otherwise require a human worker to be present on the platform. Telecontrolled robots could also be used to assist surgeons in performing complex surgical procedures. Other examples of telecontrolled robots include unmanned helicopters and submarines. Unmanned helicopters are being used for aerial filming while unmanned submarines are being used to close oil and gas leakages. There are several such ways in which connectivity can extend the application of robots.

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We will increasingly see robots that can program themselves.
 ”

What do you see as the future of consumer or service robots? Is this an area where we might see a lot of traction in the next 5 to 10 years?

The market for consumer or service robots has not taken off in the way it was expected to. So far, we have seen only limited applications for consumer robots, mainly in the form of lawn cutters and vacuum cleaners. The main applications for service robots are in medicine and surgery. We are also seeing the application of robots in pharmaceutical companies where robots are used to move or blend samples in labs. But this is still a small market. I am not too optimistic about the consumer or service robots market taking off in the short term.

In your view, what does the robot of the future look like?

I think we will increasingly see robots that can program themselves. At present, we have robots that need to be trained and programmed. We will see sensor technologies, such as vision and force-sensing, playing a bigger role in helping robots do this.

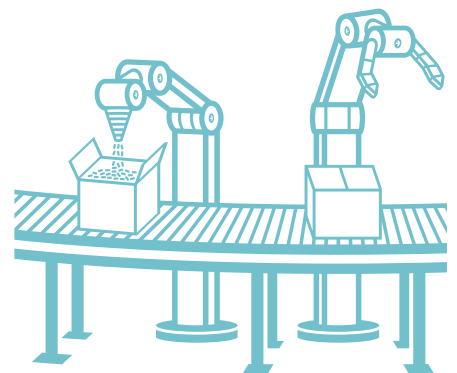
We will also see robots evolve to meet the needs of non-automotive industries. Robots today are built to be highly accurate. But not all industries and applications

require high levels of accuracy. For instance, a bakery may not require 0.02 mm accuracy every time a piece of bread needs to be moved into an oven.

“
We will see robots evolve to meet the needs of non-automotive industries.
 ”

Today’s robots are also relatively heavy. But as new applications of robots emerge in new industry segments, we will need robots made of lighter materials.

Accuracy, stiffness, weight, speed and cost – these are all features that will evolve as new applications of robots emerge.



The Third Dimension: The Implications of 3D Printing for Manufacturing and the Wider Economy

3D printing is gaining significant attention and momentum. Gartner predicts that worldwide shipments of sub-\$100,000 3D printers will grow 49% this year¹. In this edition of our Digital Transformation Review, we focus on Stratasys, one of the leaders in 3D printing. We interviewed David Reis, CEO of Stratasys, to understand the possible implications of 3D printing for the manufacturing industry and on to the wider economy.



Interview with David Reis, CEO of Stratasys

3D Printing: Welcome to the Third Dimension

What are the key reasons for the increasing adoption of 3D printing?

The 3D printing industry is not new. It has been around for almost 25 years and has been evolving ever since. However, it started gaining widespread adoption some four or five years ago when manufacturers realized the potential of 3D printing for design and manufacturing. 3D printers costs have also dropped dramatically: from \$30,000 to \$40,000 three or four years ago to anywhere between \$1,000 and \$15,000, sometimes even lower. 3D printers have also become far more user-friendly in terms of software, man-machine interfaces and network connectivity.

“
The 3D printing industry has been around for almost 25 years, but started gaining widespread adoption in the last 4-5 years.
 ”

¹ Gartner, “Forecast: 3D Printers, Worldwide, 2013”, September 2013

Exhibit 1: PUMA Reduces Its Prototype Creation Time by 75% With 3D Printing

PUMA, a leading sports apparel brand, aims to become the most competitive, attractive and sustainable sports-lifestyle company. This requires a strong focus on style and creativity, a challenge for a company with geographically dispersed design and manufacturing. This involves extensive planning and multiple product iterations, often carried out across several continents.

A lengthy design process

PUMA had an elaborate quality check process that was proving to be time-consuming and tedious. The quality check process involved first designing the shoe and then sending the design for tooling. However, the design and manufacturing teams were based in multiple locations and countries. This made collaboration during the design process difficult. Once the tooling process was completed, a product prototype was created, which would then get sent back to the quality assurance team – a process that would often take several days. PUMA needed a solution that would reduce the time required to create prototypes and improve collaboration across teams.

3D printing enabled more design iterations in less time

As a first step, PUMA switched from outsourcing its prototypes to installing in-house 3D printers at three key sites – US, Germany and Vietnam. The 3D printers enabled the design teams at PUMA to create more design iterations and prototypes in less time. Today, the 3D printers at PUMA produce a prototype of the shoe sole for an initial design review, a second prototype for a construction review and a third model for metal casting. Each team is now able to print the same prototype model for review discussions, thereby helping them to communicate much more easily than before. These teams are now able to reference the same physical model and reach a consensus on overall product design.

Benefits

With 3D printing as an integral part of the prototyping and quality check process, PUMA has been able to reduce the time required to create prototypes by 75%. While creating a single prototype used to take anywhere between three and four days, it now only takes a single day. 3D printing has also resulted in fewer iterations and design mistakes.

“
There are three main applications for 3D printing in manufacturing: Concept Modeling, Prototyping and Manufacturing Tooling.”

What are the key applications of 3D printing?

There are three main applications: Concept Modeling, Prototyping and Manufacturing Tooling.

Concept Modeling allows designers to perfect product designs before taking them to the next stage. In Prototyping, the designer creates a functional prototype in order to verify and evaluate the design before production (see Exhibit 1 on PUMA). The third application, Manufacturing Tooling, includes the 3D printing of tools for manufacturing, such as jigs, as well as the production of end-use parts. For these applications, 3D printing is particularly useful for productions with tight deadlines and when a high level of customization is involved.

How does 3D printing benefit these applications?

In Concept Modeling, after a product is designed, it can be 3D printed and brought to a focus group where design modifications are discussed. Here, 3D printing is used as a means of communication to clearly convey concepts to colleagues, marketers and clients.

“
3D printing enables organizations to build prototypes quickly in-house.”

In the Prototyping stage, 3D printing can help detect product flaws before they reach the manufacturing stage and enable improvements early in the design process (see Exhibit 2 on Xerox). By reducing the scope of error before actual production, manufacturers are able to avoid material waste and save on costs. 3D printing enables organizations to build prototypes quickly in-house, thereby reducing the time it takes for product completion.

In Manufacturing Tooling, traditional technologies such as injection molding are not

always the most cost-effective and efficient. For example, let's say you need to manufacture a limited edition model of a car and later switch to a different model. In this scenario, you need to switch around the jigs used in the assembly process. Here, 3D printing is often more efficient in terms of time and cost in manufacturing these customized parts. By drastically reducing the production time for manufacturing tools, 3D printing offers manufacturers the flexibility to explore new opportunities and respond quickly to production needs.

“
3D printing tools and parts prove to be highly efficient and cost-effective for customized or short-run production.”

3D Printing's Impact on the Wider Economy

You recently mentioned that 3D printing is playing a pivotal role in bringing manufacturing back onshore to Europe and the US. Why do you believe 3D printing is contributing to this phenomenon?

Outsourcing provides availability of cost-effective labor, which is extremely beneficial when large quantities need to be produced. In scenarios where a short-run production² is required for highly customized products, tooling costs tend to be higher. In such instances, the labor advantage becomes irrelevant due to the high tooling costs. For customized or short-run production – which is a key trend in the industry –

the offshore model is not very competitive.

In such scenarios, 3D printing the tools and/or the parts themselves proves to be highly efficient and cost-effective while delivering a high level of accuracy. This highly-customized or short-run production manufacturing can therefore be brought back onshore with 3D printing.

Exhibit 2: Xerox Slashes Costs Around Mold Creation By 91% Using 3D Printing

Xerox is the world leader in business process and document management services. For its package manufacturing process, the company used thermoforming. This process involves heating a plastic sheet to a high temperature to make it pliable. The sheet is then bent into a specific shape using a mold and the excess portions are trimmed, resulting in a usable product. This process, which once was the norm, was proving to be expensive and time-consuming.

Too many iterations with traditional manufacturing processes

In the past, Xerox used wooden molds for thermoforming. These wooden molds were created using traditional manufacturing processes, resulting in several iterations before a satisfactory result could be obtained. Moreover, geometric restrictions often made it impossible to improve the performance and reduce the cost of the thermoformed part. The entire process would typically cost \$1,200 and it would take about a week to produce a single wooden mold. Xerox needed a process that would create molds faster and at a reduced cost.

Using 3D printing to produce molds

Xerox was already using 3D printers to produce prototype parts. The company soon realized the potential of 3D printers in producing fixtures and for assembly tooling in the manufacturing process. Using 3D printing, Xerox was able to do away with its expensive machining process and reduce the cost of producing a single mold by 91% – from \$1,200 to as little as \$100. Xerox was also able to accelerate its thermoforming process by drastically reducing lead time by 93%. Previously, the process would take a week but now it could be completed in just four hours.

² Short-run production connotes the manufacturing of a relatively low volume of parts or products in comparison with high volume or mass production

Do you believe that the prospect of bringing manufacturing back to developed countries is pushing governments to popularize 3D printing?

I think this phenomenon is certainly pushing governments to embrace 3D printing. We are already seeing governments across the globe contributing to the popularization of 3D printing. For instance, the US government has pledged funding of up to \$60 million to the National Additive Manufacturing Innovation Institute (NAMII), which is a public-private partnership aimed at transitioning 3D manufacturing technology to the mainstream US manufacturing sector. In his 2013 State of the Union address, President Obama spoke about the industrial potential of 3D printing and the return of the tech-industry and other manufacturing jobs to the USA. The UK government, as part of its Industrial Strategy, has committed to an investment of £15 million towards the development of 3D printing projects. The EU, in its future industrial policy, identified 3D printing as a top priority for reviving the manufacturing sector.

“
Nokia already allows you to 3D print your own customized cover for selected mobile phones.”

A Multi-Dimensional Future: The Road Ahead for 3-D Printing

What are some of the possible long-term growth areas for 3D printing technology?

In my opinion, ten years down the line, I see three main growth drivers for 3D printing. The first is Direct Digital Manufacturing (DDM), where physical parts are easily created, directly from 3D CAD (Computer-Aided Design) files. For this technology to be widely used, we need to develop both suitable hardware, which, is robust and industrial grade, and better materials. This is important because 3D printed products should functionally and aesthetically mimic the products manufactured using traditional

methods to ensure consistency in design. This is crucial when considering mechanical properties and part reliability.

The second growth driver is the Education sector. For example, many UK schools are proposing to introduce 3D printing as a part of their curriculum. Ten years from now, every high school and university should have more than one 3D printer.

The third growth driver is Prosumers – people actively customizing typically mass-produced goods for their own needs. This market consists of engineers, designers, architects and product manufacturers who use 3D printing either for semi-professional work or as a hobby. Stratasys recently announced its merger with MakerBot, which has become a world leader in this segment by targeting prosumers with relatively low cost, easy-to-use 3D printers.

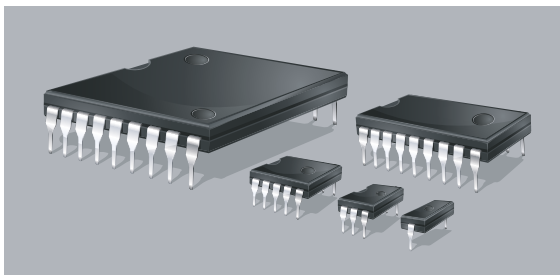
“
3D printing can be most effective when applied to specific parts of the manufacturing process.”

Companies to Watch: View from Silicon Valley

By **Sergi Herrero, CEO, L'Atelier BNP Paribas USA**



TruTag: Beating counterfeit medicines with an edible microtag



The human and financial consequences of counterfeit medicines are devastating. Every year, there are **100,000 fatalities** worldwide on account of counterfeit medicines. The pharmaceutical industry suffers losses of around **a trillion dollars** each year. TruTag helps tackle this enormous issue by providing a unique edible microtag that is directly integrated into a product's infrastructure. Each edible tag is coded and can be scanned with a Smartphone. This data is sent to TruTag, which then provides a variety of product information, such as the product strength, expiration date and country of authorized sale. TruTag was awarded the Technology Pioneer award at the 2014 World Economic Forum in Davos for its role in bringing more safety to the Internet of Things.

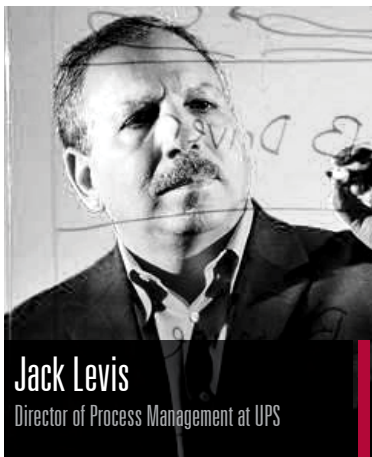
Kcura and Relativity : Transforming how lawyers work



For every legal case, lawyers and corporations spend countless hours reviewing previous cases and legal documentation, which results in huge time and money inefficiencies. 'Relativity' is a new piece of software from Kcura that helps law firms retrieve past cases and information relevant for the purposes of civil litigation. It enables lawyers to optimize their time management by using machine-learning techniques that automate the prioritization of documents for review. Kcura has partnered with more than **75,000 customers** worldwide, encompassing both lawyers and corporations. Kcura works with **95 of the top 100** law firms in the US and has also recently started working with the US Department of Justice.

UPS: Putting Analytics in the Driver's Seat

UPS is a global package delivery company headquartered in Atlanta, USA. The company operates in over 220 countries with over 399,000 employees. In 2012, it had over 8.8 million customers with delivery volume of some 4.1 billion. The company generated \$54 billion in revenue in 2012. UPS has been at the forefront of deploying advanced analytics in optimizing its operations. Capgemini Consulting spoke with **Jack Levis**, Director of Process Management at UPS.



Jack Levis
Director of Process Management at UPS

Interview with Jack Levis, Director of Process Management at UPS

Can you start by giving us a background to UPS and some of the unique challenges that a logistics player of your size faces?

UPS is a business that thrives on managing complexity.

Meeting our high levels of customer service entails complexity. We not only aim to deliver every package on time, but we provide customers with multiple service options to meet their needs. We even allow adjusting of delivery choices while the shipment is in route. Executing this mission means constantly orchestrating orders, adjusting route schedules and following up on package deliveries with a massive fleet of ground and air vehicles. This exercise generates huge amounts of data feeds, from devices, vehicles, tracking materials and sensors. Each of these feeds also comes with its own data format. Our goal is to turn that complex universe of data into business intelligence.

Let me give you an example. We have about 55,000 package car drivers in the US alone and around 106,000 drivers, globally, for our entire vehicle fleet, and we deliver more than 16 million packages daily. When you consider the fact that every driver at UPS has trillions of ways to

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A reduction of one mile per driver per day translates to savings of up to \$50 million a year.

”

run their delivery routes, the number of possibilities increases exponentially. However, not all of these routes are necessarily optimal in terms of fuel efficiency and distance. Consider the fact that a reduction of one mile per driver per day translates to savings of up to \$50 million a year. The question becomes: how do you mine the sea of data from our sensors and vehicles to arrive at the most effective route for our drivers?

Digitizing Operations

How did UPS start its digital transformation journey?

Our digital journey started with an early adoption of data and analytics tools for improving our operations. As our operations became more complex and distributed in nature, the focus has been to improve business processes, increase efficiency and cut costs. We had been following a descriptive¹ and predictive analytics²-based system for a long time but what has recently changed is our shift to prescriptive

analytics³. I can safely say that UPS is one of the few companies to effectively use prescriptive analytics to gain insight for successful optimization.

“
Our digital journey started with an early adoption of analytics tools.
”

You spoke of prescriptive analytics playing an effective role in route optimization. Can you give us more details on its role in overcoming your key challenges?

We have implemented a number of prescriptive analytics projects across our business but the one that stands out from the rest is our route optimization program, based on prescriptive analytics, called ORION (On-Road Integrated Optimization and Navigation). We formally started the ORION project in 2003 and began to roll out the system in 2012. We are very serious about using prescriptive modeling for our routes. So much so, that we have

500 people dedicated to ORION. In fact, ORION is probably one of the largest prescriptive analytics systems ever deployed.

As I mentioned earlier, effectively mining the sea of data from our sensors and vehicles to arrive at the most effective route for our drivers is a huge challenge. It is here that our prescriptive analytics system shines. It hides this large amount of alternative routes while giving drivers clear inputs, thereby taking the guesswork out of the equation. The best part is that the system produces these answers in as little as six to eight seconds. The idea is not to make big changes in driver routes. In fact, the optimized route might look very similar to the driver's normal route. However, the real benefit lies in the distance it helps reduce – a quarter mile shaved here and a half mile shaved there. So, the system keeps looking for ways to deliver minute savings throughout the day.

“
Our analytics system enabled UPS to eliminate 85 million miles driven per year.
”

1 Descriptive analytics refers to a set of techniques used to describe or explore or profile any kind of data.

2 Predictive analytics encompasses a variety of techniques that analyze current and historical facts to make predictions about future, or otherwise unknown, events.

3 Prescriptive analytics represents the final phase of business analytics, which mines data to suggest decision options to take advantage of a future opportunity or mitigate a future risk.

How Analytics Transformed Operations at UPS



The Logistical Complexities at UPS



55,000
package car drivers
in US alone

106,000
drivers globally



16 million
packages daily



One driver = trillions of ways to run delivery routes

Shaving just one mile/ driver
= **\$50 million**
savings a year



The challenge: Arriving at the most optimal route for drivers

Business Benefits of Analytics

Reduction of
85 million ↓
miles driven/ year



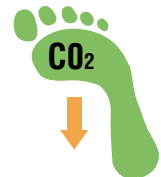
8 million fewer
gallons of fuel used



Reduction in **engine idling time** by **10 million** minutes



Reduction in **carbon footprint** by **6,500** metric tons



Analytics has changed the way UPS functions

What have been the tangible benefits that you realized by deploying analytics systems in your operations?

The deployment of descriptive and predictive analytics systems several years ago enabled UPS to reduce 85 million miles driven per year. That equates to over 8 million fewer gallons of fuel used. Prescriptive analytics adds to those gains.

We were also able to reduce engine idling time by 10 million minutes. This led to significant savings in fuel consumption – around 650,000 gallons – and we have reduced our carbon emissions by over 6,500 metric tons.

Now adding to this, deploying efficient prescriptive analytics systems has enabled UPS to eliminate miles from our routes in 2013. The surprising fact is that we have realized this additional benefit with only 18% of UPS delivery routes deployed.

“
As we deployed analytics, we realized we could not continue relying on old metrics.
”

Implementing and Measuring Digital

What is your approach to launching analytics initiatives?

The business drives technology at UPS. We don't look at initiatives as 'analytics projects', we look at them as business projects. Before launching an initiative, areas where the greatest business need exist are evaluated. We then look at the best way to meet those needs, and often analytics is needed.

Our goal is to make business processes, methods, procedures, and analytics all one in the same. For the front line user, the use of analytics results becomes just part of the job.

With systems that require large process change, we spend significant effort ensuring that the change can actually be attained. This often requires iterative prototyping so that we can successfully achieve the business gains.

We followed this approach for our prescriptive analytics system, ORION. We tested the system over two years. We had to prove

that the program would, indeed, measurably impact costs. Not only were the numbers were impressive, but the fact that front line operators and drivers were supportive got everyone's attention. That helped convince our senior management to test the program at other locations across the country. After testing the system in 15 different locations, final approval for broad-based deployment of the initiative across the company was given.

As part of implementing analytics across your operations, did you have to change the way you traditionally looked at your metrics?

An important thing to note about analytics systems – especially prescriptive analytics – is that change management is required. New ways of operating are being produced and front line employees must be educated and supported. This means changing behavior.

As we deployed analytics, we realized that we often could not continue to measure a new way of doing business with the same old metrics. So, we had to come up with new metrics that enabled effective measurement.

Operational Excellence

Implementation of digital initiatives entails large-scale change management. How did you convince drivers who relied on traditional route planning to shift to new analytical tools?

We adopt a highly collaborative approach with our drivers in implementing these initiatives. We are acutely aware that our drivers aren't automatons who rely on insights from the analytics system. When you have a prescriptive analytics system, usually problems arise because of issues with data. Counteracting bad data requires collaboration with our drivers. This is why we have built-in buffers into our model where we acknowledge that the system is not perfect and that drivers have the opportunity to identify flaws. We let our drivers exercise their discretion. We tell them: if the model has you doing something that won't meet a customer's demand, do what's right.

In the past, we used metrics that showed incremental change from year to year. We looked at things such as number of deliveries made per hour, or the amount of time expended for a route vs. a work measurement standard. Those used to be the measure of success for deliveries. But now, after implementing our prescriptive analytics system, the metrics have become far more sophisticated and nuanced. We have moved from looking at lagging indicators that focus on end results only to looking at leading indicators.

We created balanced scorecards that guide the front-line operators on areas to focus. The elements have been carefully selected and weighted. The balanced scorecard measure correlates highly with true business results.

“

The key to managing change in roll out of digital initiatives is to take a collaborative approach.

”

What were some of the biggest issues UPS faced when implementing its prescriptive analytics program?

As I mentioned earlier, our analytics system has been built to tell us the best delivery route for a particular day. If you consider that there are going to be 55,000 different drivers, which means 55,000 different routes the model has to work for – that is a very hard model to build. We would have our parameters and all the dials tuned and the answer would be great on Tuesday. But the same system with Wednesday's data would not work. So, definitely the model needed to have a lot of heuristics, math, and business rules built in. That was a big challenge.

We spent years making our data better and changing the algorithm so it wasn't so sensitive to changes in data. We had to have an algorithm and process that didn't take a rocket scientist to use. In a step-by-step matter we tested not only that the algorithm could be created, but that we could transfer the knowledge to the front line.

“
We now want to use our prescriptive analytics system to offer innovative services to our customers.
”

It is because of this collaborative approach that our drivers are included in the process, which is why there hasn't been much resistance to change when implementing analytics initiatives. In many cases, drivers have said “my stress is reduced”. This is because the system makes thousands of small decisions for them, freeing up the driver to make the larger decisions of servicing the customer.

With the significant shortage of digital skills across industries, how does UPS acquire its analytics talent?

Our challenge hasn't been around identifying analytics talent as much as it has been in determining the best way to train the hundreds of business people

who are using these tools. For this, we provide role-based training that teaches employees how to use the analytics system. When fully deployed, the system will offer our front-line supervisors and drivers the tools to test scenarios and make tradeoffs. They don't need to be data experts, but they need to understand which parameters impact which performance objective. Drivers are graphically shown how the algorithm is deriving different parts of the route so they can compare it with their own experience and attempt to beat it.

“
Our challenge hasn't been around identifying analytics talent as much as it has been in determining the best way to train the hundreds of business people who are using these tools.
”

In our analytics team, we also have people with business backgrounds who understand the overall system objectives from an organizational perspective. So, while an analytics person will sift through algorithms, the software engineer will translate it into code, the business person will ensure that the solution meets the desired objectives.

Digital Future

Looking ahead, what are some of the new digital initiatives UPS is working on to further drive operational efficiency?

Our current analytics systems are still largely static in nature – we need to change that. They do not account for unexpected situations, such as traffic delays or accidents. In such scenarios, our drivers are expected to take a discretionary call. In future, we anticipate moving from a static to a dynamic manifest. For this, we are trying to make our plans more flexible and with provisions for real-time updates.

An End to Data Poverty: How HMRC's Big Data Solution is Helping Transform the UK's Tax System

Her Majesty's Revenue and Customs (HMRC) is the UK's tax authority. HMRC has been one of the early adopters of big data analytics in order to combat tax and welfare fraud. Capgemini Consulting spoke to Mike Hainey, Head of Data Analytics at HMRC, to understand how a public sector department can benefit from big data.



Interview with Mike Hainey, Head of Data Analytics at HMRC

Can you start by giving us some background on analytics at HMRC and how the move to a big data solution started?

HMRC, or Her Majesty's Revenue and Customs, was created out of the merger of two departments – the Inland Revenue and Her Majesty's Customs and Excise. One of the key rationales for the merger was that by bringing information together from both departments, we would gain better insights and provide better service. However, while the fraud and error detection systems were there, they largely existed in silos. For instance, we had separate systems for VAT fraud as well as for self-assessment tax returns. To compound matters, these systems weren't integrated. Therefore, if we wanted to assess risk, we had to dip in and out of these silos and have highly skilled people connect the dots in the different information sets. We were also limited in our ability to play with data. It used to typically take anywhere between a few weeks to a few months in order to set up a new way of looking at data silos. So while the departments had been brought together to improve matters, we were still missing a single view of the customer.

“
Prior to our Big Data analytics deployment, it used to typically take anywhere between a few weeks to few months to set up a new way of looking at data silos.
”

How do you manage the data volume?

Volume is indeed a major issue as we are talking about over a billion records. The challenge is that it is quite dynamic – we have information coming in regularly through tax returns or third-party data that we acquire. Our intent is to have the most up-to-date view of data made available to the 150 Connect analysts who apply profiling and modeling techniques and the 3,200 tax investigators who have access to the visualization tool. The more accurate and up-to-date that view is, the more beneficial it is in terms of decision-making.

How big a challenge is privacy for the data analytics team?

We take privacy issues very seriously. We are tightly bound by government rules. We use a variety of data sources, all that we are legally entitled to see and utilize. All data used is proportionate and appropriate in tackling the range of risks and issues that HMRC faces. We apply rigorous audit against people who use the 'Connect' system and we have strong controls on movement of data from 'Connect' to other environments.

“
Our initial pilot helped uncover £330 million fraudulent VAT repayments enabling us to make a compelling case for broader investments.
”

What is the working model that you have with the Enforcement and Compliance team? How is analytics implemented in practice?

Our analytics solution provides a very high-level view of risks. Based on this analysis, we dig further and go to operational delivery where we can identify some population and the potential risk there. The next step is to actually design an intervention process; this covers a broad range of approaches from light touch advisory communications through to face-to-face enquiry. We need to devise methods to tackle this risk in collaboration with our front-line audit workforce and tax inspectors. Our analytics solution flows and informs at strategic, tactical and operational levels.

Garnering organizational support

How were you able to convince the leadership to set up an analytics team and invest in the big data solution?

Like most good things, we started small. We initiated a pilot to check the potential of analytics solutions. The pilot started to generate real outcomes very quickly. The pilot helped uncover £330 million fraudulent VAT repayments. And this was from a subset of a subset of data. This allowed us to build a strong business case that we took to our leadership. The insights that we could draw, and the amount of fraud it helped uncover, basically compelled us into operationalizing the pilot into a broad rollout.

“
For total investments worth around £45 million, 'Connect' has helped deliver around £2.6 billion as of April 2013.
”

HM Revenue & Customs: the Big Data Approach

Key challenges

28 different data sources

1 billion internal and third-party records



ROI

Pilot helped uncover **£330 million** fraudulent VAT repayments



'Connect' was built at an initial cost of **£45 million***



It delivered **£2.6 billion** as of April 2013

The analytics team

3 skill sets blended together



Operational research



Data specialists



Frontline tax expertise

The next step

Using **Big Data** and **analytics** to improve customer experience



**including running costs over 5 years*



What about additional investment? How do you get funding on an ongoing basis?

A typical challenge in public sector projects is that most investments are made in a build-deploy-forget model. However, in the case of the big data solution we deployed, we were pretty clear right from day one that this is a system that needs to evolve and requires nurturing. One of the big factors that encouraged ongoing investments in the solution was the impressive ROI we realized. We deployed 'Connect' at an expense of around £45 million; this includes running costs over five years. Not counting additional investments, it has helped us deliver £2.6 billion as of April 2013. This is a fantastic return and helps immensely in influencing key decision makers when bidding for additional investment.

“
Data and business specialists deliver best results when they work together.”

Getting the Skills

You are running a dedicated analytics team. What was the rationale behind the creation of this team?

At HMRC, we have always employed analytics talent for a long time. However, most of it was dispersed across departments, working largely in silos, which compromises efficiencies. Over the course of the pilot that we ran, we realized that data and business specialists delivered best results when they worked together. These teams were constantly working with one another on new innovative ideas and exploiting the data.

So, when we decided to launch our big data solution – 'Connect' – we realized that for us to be effective, we needed to bring people from different analytical areas to work together within one community. We blended three skill sets together – operational research, data specialists and frontline tax expertise. This combination has proved effective in delivering results and provided practical insight to evolve our big data solution.

How do you address the scarcity of digital skills?

Big data is a hot topic, and there is a growing skills shortage. We had to rely on finding talent both internally and externally to drive the Connect solution. Internally, we identified people and up-skilled them. Training is absolutely essential in our team. For example, we ensure that people who use 'Connect' are put through a comprehensive one-year training program on all aspects of the tool and broader analytical skills. From a more long-term perspective, we are creating links with academic institutions with a view to support education programs and position HMRC as a leading employer of data analytical talent.

“
We blended three skill sets together – operational research, data specialists and frontline tax expertise.”

Preparing for the Future

Going forward, what other challenges do you foresee?

A lot of the intelligence that our solution provides is a function of how optimally we have linked the data. A big challenge for us is to constantly evaluate different ways of linking up the massive amounts of data that we have to deliver the optimum results.

As digital becomes more pervasive, there are bound to be newer types of fraud. What is your view on emerging types of fraud which do not have historical data?

I agree, there are new types of digital frauds coming up and keeping up with them is indeed a challenging task. We rely on strong intelligence systems to acquire data on such frauds.

Obviously, unlike traditional fraud, we don't have historical data to analyze them thoroughly. So we look at very specific datasets to understand and evaluate the potential impact of emerging types of fraud. It is a constant challenge. By constantly honing our intelligence systems, and then reacting to their output, we hope to stay ahead of digital fraudsters. Once our intelligence gives an indication that there is something we need to be concerned about, then a whole range of techniques can be deployed to actually test that.

What do you foresee as the future of analytics in HMRC?

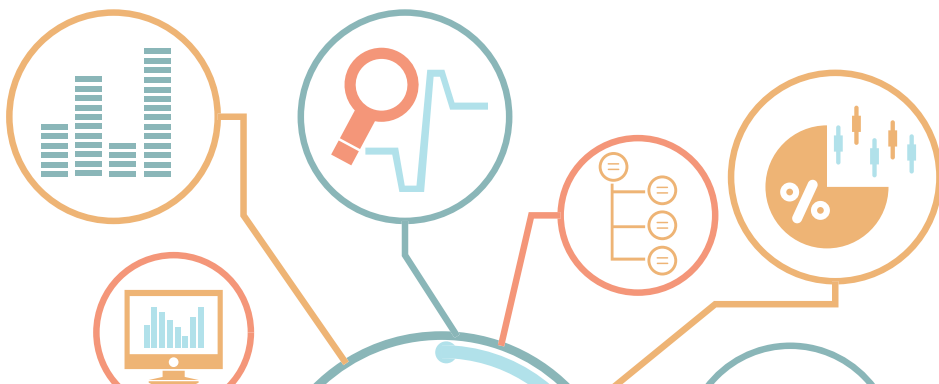
The big data solution, Connect, was built within the Enforcement and Compliance directorate of HMRC. The objective was to better target customers for compliance. We have proved that it can work extremely well. Our ambition now

is to look at analytics in a broader sense. For instance, how it can be used to improve customer support and end-to-end lifecycle of customer handling. So the task going forward is to leverage analytics beyond enforcement and compliance. And big data and analytics will drive this transition.

“

We now want to look at analytics in newer areas such as usage in improvement in customer support and end-to-end lifecycle of customer handling.

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Global Brain Power: edX and the Transformation of Learning through Big Data

edX is a not-for-profit organization, founded by Harvard and the MIT in May 2012, which aims to expand access to education for everyone while improving educational outcomes on campus and online. edX's online learning platform recently launched a series of Massive Open Online Courses (MOOCs), which have sparked widespread interest. We spoke to Anant Agarwal, President of edX, to understand edX's objectives and activities as well as the future of education.



Interview with Anant Agarwal,
President of edX

The Journey So Far

What was the rationale behind the creation of edX?

edX has been created with two objectives in mind. The first is to give access to high-quality education to as many people as possible. We aspire to reach a billion people over the next decade. The second objective is to improve the learning experience on campus by understanding how people learn. We conduct research on how technology can transform learning and the way teachers teach on campus.

“
A key objective of edX is to improve the learning experience on campus by understanding how people learn.
”

Can you give us an idea of the level of success you have seen so far?

EdX has grown rapidly since its launch a year-and-a-half ago. The number of enrollments from our inaugural course – on circuits and electronics – has been phenomenal. Nearly 155,000 students from 162 countries signed up for the course. This is more than the total number of MIT alumni across the university's 150-year history. Currently, we have over 1.4 million users and 2.3 million course enrollments from around the world. Our learners vary from those who want to audit a course to those who want to obtain a certificate (25 to 30%). Approximately 7% of the overall pool achieves a certificate.

“
Nearly 155,000 students signed up for the inaugural course – more than the total number of MIT alumni across the university's 150-year history.”

What are the courses that you offer on this platform?

We have extended our course offerings across a wide range of disciplines. From science to art to technology, you can find it all on edX. The courses now range from fields such as neuroscience to Chinese history, from American poetry to linear algebra.

We now have 29 universities as members of our group of partner universities, collectively called the 'xConsortium'. And we keep adding more universities.

“
We aspire to give access to high-quality education to a billion people over the next decade.”

Recently, the French Ministry of Higher Education announced that France is creating a national online learning platform called 'France Université Numérique' based on the open source platform from edX. Over 100 higher education institutions throughout France are expected to participate in this initiative. Similarly, a consortium

of leading Chinese universities selected the open source platform from edX to power China's largest online learning portal, XuetangX.

“
25 to 30% of our learners want to obtain a certificate. 7% of the overall pool achieves a certificate.”

Applying Analytics to Transform Higher Education

You mentioned collecting and analyzing data to enhance the overall learning experience. What type of data do you typically gather?

We look at students' clickstreams, which are essentially recordings of when and where users click on a particular page. We record every click that a student makes as they navigate through a course's resources, including assessments, e-texts, and online discussion

forums with their fellow students. Then, we also analyze students' homework, exam and lab scores, and student comments on discussion forums. We also collect users' demographic data such as age, region, degree status and reason for taking a course when they register on edX.

“
We record every click that a student makes as they navigate through a course's resources, including assessments, e-texts, and online discussion forums with their fellow students.

”

This demographic data helps us customize courses according to the age bracket. We also observe the number of attempts students have made before they got an exercise right, and if they got it wrong, what alternatives they used to try and find a solution.

For instance, did they go to the textbook, go back and watch the video, or did they go to the forum and post a question?

Analyzing behavior patterns of students helps us understand what solutions students turn to when they are faced with a problem. This helps us focus on prioritizing student-preferred solutions over others. There are over 1.4 million students on edX, so collecting all this information creates a large dataset. We analyze all this big data to gain insights into how students learn and collaborate, and then aim to use these insights to enrich the quality of courses we offer.

What are the preliminary insights that you have already gathered from all this data?

We found that more than half of the students in our inaugural circuits and electronics class started working on their homework before watching video lectures. It appears that students get more excited about learning when they try to solve a problem – it's almost like a puzzle. We are now looking at whether professors should assign homework or in-

class assignments before the lecture, instead of after.

We also found that a student who worked offline with someone else in the class – or with someone with expertise in the subject – scored almost three points higher than someone working alone. Basically, collaborating with another person, whether novice or expert, strengthens learning.

“
Analyzing the Big Data from the students' clickstreams allows us to gain insights into how students learn and collaborate.

”

edX : Transforming Education Digitally

Gathering Online Student Data to Improve Learning Outcomes


Over **1.4 million** users,
with **2.3 million** course enrollments
globally, **generating data on:**



Applying Big Data Analytics Already Revealed Key Insights



> 50% of students
worked on their homework
before watching lectures.

Students collaborating
offline with others
scored **3 points** 
higher than students
working alone.

Classroom sessions focusing
on **collaborative problem
solving** are more beneficial than
understanding
basic concepts.



The Future: A Blended Mix of Technology and Classroom

Flipped Classrooms

Students learn new content online and use classroom
sessions to solve problems collaboratively.



Continuous Learning

Students taking online courses before they join
universities and continue learning as alumni.

Are you experimenting with new forms of campus learning based on these findings?

Our research findings indicate that classroom sessions should focus more on collaborative problem solving, rather than on understanding the basic concepts of the course. The University of California, Berkeley, among other xConsortium members, is already experimenting with this “flipped classroom” method of teaching. In this emerging format of classroom learning, students learn new content online by watching video lectures, and studying the background materials. The classroom learning focuses on solving problems under the guidance of the professor and through interaction with other students, thus creating a collaborative environment to strengthen learning.

“
A key finding is that classroom sessions should focus more on collaborative problem solving, rather than on understanding the basic concepts.”

Online Learning through MOOCs

MOOCs have seen tremendous success in recent times. Is it possible that MOOCs will cannibalize the traditional residential education system?

MOOCs will not replace a conventional on-campus education. But we do foresee a revolution in the way education is implemented on campuses; especially with the increasing use of digital technologies in traditional classrooms. We believe the future of classrooms will be a blend of traditional and online learning approaches. Some of our early research around these so-called blended or hybrid courses suggests that learning outcomes improve when they are used on campuses. For instance, teachers can leverage the edX platform to make their courses more accessible by referring students to specific online courses to supplement their skills and stay up-to-date. Overall, I think digital learning will help improve both on-campus and online learners globally.

“
MOOCs will not replace a conventional on-campus education. But we do foresee a revolution in the way education is implemented on campuses.”

Being a not-for-profit venture, how do you plan to make edX sustainable?

We are establishing revenue models across both the B2B and B2C segments. In the business-to-business segment, edX is establishing a business model by providing platform support and services to a wide variety of organizations including corporations that use our platform for internal training and intergovernmental organizations like the IMF and even governmental institutions like France’s Ministry of Higher Education.

Organizations are facing a severe shortage of digital skills. Do you think MOOCs can help companies alleviate this problem?

Yes, I think so. There are two main hurdles to improving the skills of an active workforce. The first is the unavailability of the right courses. To tackle this, we are currently working with several organizations to enable our platform to offer corporate training sessions. For instance, we collaborated with the International Monetary Fund (IMF) to offer online courses on economics and finance. The IMF designed these courses and edX provided the hosting support and associated educational services.

The second hurdle is logistics. Currently, most executives have to travel and stay for about one or two weeks to take a course. This can serve as a deterrent to learning. What we intend to do, instead, is to allow employees to be able to take courses without having to travel, without disruption in their lives and jobs. We have already created solutions for this arrangement and we will make relevant announcements in the future.

I also expect that as MOOCs become more accepted, companies will become more comfortable

with employees trained by this technology. For instance, when employers hire candidates with digital skills gained from MOOCs and start to see success, they will be more likely to give value to MOOCs certificates.

“
MOOCs can help companies alleviate the shortage of digital skills.
”

How do you foresee education changing over the coming years?

This is a time of disruption and experimentation in education. Things are going to be moving very quickly. In the short term, I anticipate on-campus universities to increasingly use digital technologies and MOOCs as part of their curriculum.

In the long term, I visualize a movement towards what I call ‘continuous education’. This would question an existing model – for instance, why should students attend university for four years at the beginning of their careers? As part of the new arrangement, before students go to university, they would take

a few online courses, perhaps from the same university. Then they would experience on-campus study, attend blended courses, interact with professors and conduct research. After graduating from university they would undergo ‘continuous education’ by taking online courses as alumni from the same or another university. For instance, we have started an initiative called ‘BostonX’ in partnership with the city of Boston to create learning centers in neighborhood community centers where people can meet, take courses online from local universities. Professor and student volunteers may visit these community centers and lend support so that continuing learners can take courses in their interest areas and form communities.

“
This is a time of disruption and experimentation in education.
”

Companies to Watch: View from Silicon Valley

By **Sergi Herrero, CEO, L'Atelier BNP Paribas USA**



Augmedix: Reworking the doctor-patient relationship with a digital app



American doctors spend about 25% of their workday dealing with administrative errands such as reimbursement, coding and Electronic Medical Records. Augmedix is an early-stage company that builds health-centric applications for Google Glass. The app leverages the audio and video capabilities of Google Glass and enables doctors to digitally recall relevant patient information as they conduct exams. Instead of spending time on their computers to retrieve information, doctors can now use these apps to boost doctor-patient relationships. It is a prime example of the foray of wearable devices into the healthcare industry.

Oyster: Changing the way we read eBooks



New York-based startup Oyster wants to revolutionize the **e-books business** by providing a subscription-based platform for e-books. With sales of e-books in the United States estimated to be worth over \$3 billion in 2012 – an increase of 44% in just one year – e-books represent a growing market. While several platforms already offer e-books, the market is clearly led by Amazon. All of the existing services, however, have the same pay-per-unit pricing model, except for Amazon with its Kindle FreeTime Unlimited, which is targeted at young children. Oyster is a platform that offers a subscription-based model for e-books. Oyster offers unlimited access to its collection of e-books for a monthly fee of just under \$10. The **subscription-based model** has already received huge success for video content with companies such as Netflix providing on-demand movies and TV for a subscription fee. Oyster hopes to replicate this model for e-books and drive it to success.

Digitizing Operations:

In Focus



The Missing Link: Supply Chain and Digital Maturity

By **Mathieu Dougados, Capgemini Consulting**

mathieu.dougados@capgemini.com

Digital Technologies Offer a Shot in the Arm for Traditional Supply Chains

Kimberly-Clark Corp., the US-based personal and healthcare products group, built a demand-driven supply chain using data analytics to gain better visibility into real-time demand trends. This enabled the company to make and store only the required amount of inventory needed to replace what consumers actually purchased, instead of manufacturing based on forecasts from historical data. Kimberly-Clark utilized point-of-sales (POS) data from retailers such as Wal-Mart to generate forecasts that trigger shipments to stores and guide internal deployment decisions and tactical planning. It also helped the company to create a new metric for tracking forecast error. This

metric, defined as the absolute difference between shipments and forecast, and reported as a percentage of shipments, effectively tracked stock-keeping units and shipping locations. Evaluating daily forecast using this metric, Kimberly-Clark has seen a reduction in forecast errors of as much as 35% for a one-week planning horizon and 20% for a two-week horizon. Reduction in forecast errors translated into one to three days less safety stock. More accurate forecasts and the corresponding reductions in safety stock have helped Kimberly-Clark reduce its finished-goods inventory by 19% in the last 18 months¹. This is only one instance of digital technologies coming to the fore in transforming supply chain operations.

Digital technologies have been rapidly making their way across organizational functions. Customer-facing functions have been among the early adopters of digital technologies. These technologies also hold several

benefits to back-end operations in general, and supply chain operations in particular.

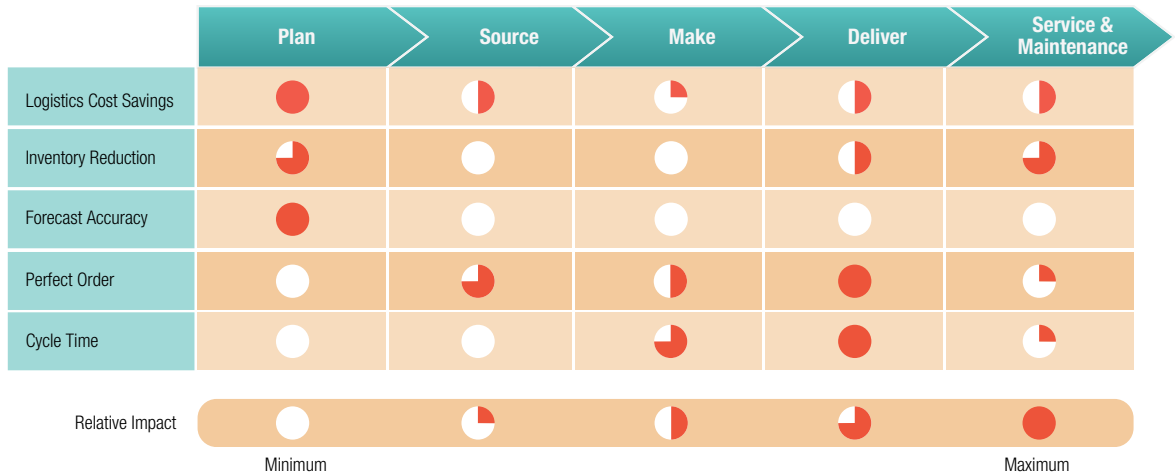
“
A demand-driven supply chain helped Kimberly-Clark reduce its finished-goods inventory by 19% in 18 months.
”

So, what does a digital supply chain offer?

A digital supply chain enables the integration of supply chain tasks and collaboration across functions and partners. It provides a single real-time view of supply chain processes, improves operational performance and enables better cost management (see Figure 1).

¹ Supply Chain Quarterly, “Kimberly-Clark connects its supply chain to the store shelf”, January 2013

Figure 1: Key Impacts of Digital Technologies Across Various Supply Chain Processes



Source: Capgemini Consulting Analysis

Digital Technologies Enable Effective Internal and External Collaboration

A digital supply chain offers a number of advantages. Digital technologies enable effective collaboration. This allows channel partners – which may be suppliers, intermediaries, third-party service providers, or customers – to

share information on a real-time basis with the organization. Proactive supplier collaboration and raw material flow visibility improve **order quality** and have the potential to **reduce costs** in sourcing. For instance, cosmetics company L’Oréal is rolling out a cloud-based collaboration tool for all its suppliers. The aim is to have faster sharing of information².

Similarly, consider the case of Zara. Inditex-owned Zara’s ‘fast-fashion’ business model is supported by its unique buyer-driven supply-chain capabilities³. The company follows a pull model in its inventory and supply chain management. Designers and the commercial team at the company’s headquarters monitor real-time information of customer spending

² Supply Chain Movement, “L’Oréal and suppliers collaborate in cloud-based Control Tower”, July 2013

³ IPR Plaza, “Zara: A Case of Rapid-Fire Fast Fashion Strategy”, December 2012

in the store to create new designs and price points. Standardization of product information enables Zara to quickly and accurately prepare computer-aided designs, with clear manufacturing instructions. The cut pieces are tracked with the help of bar codes as they flow further down the supply chain. Zara also leverages the close proximity of production to the central distribution facility, which reduces supply chain risk and lead-time. Its distribution facility functions with minimal manual operations as optical readers sort out and distribute more than 60,000 items of clothing every hour. The complete control over its value chain helps the company to design, produce and deliver new apparel to stores in around 14 days, where other industry players typically spend about nine months. Zara also produces smaller batches of products, which leads to higher short-term forecast accuracy and lower inventory cost and rate of obsolescence. Unsold items at Zara account for 10% of stock, as compared to the industry average

of 17% to 20%, lowering the sale mark-downs and contributing to higher profit margins. This is a direct result of the close collaboration that it has with its suppliers.

“
Strong digital collaboration within its supply chain enables Zara to deliver new apparel to stores in 14 days compared to nine months for other industry players.
 ”

Digital tools also allow for more effective internal collaboration by enabling various functions such as Purchasing, Storage, Demand Forecasting, Sales and Customer service to come together on a common platform and streamline processes. Digitized internal and

external collaboration improves forecast accuracy and thus cuts overall inventory levels.

Digital Technologies Ensure Data Consistency

Consistency of data is a matter of significant concern for most supply chain organizations – an issue that digital technologies can help resolve⁴. One key approach to achieve this is through Master Data Management (MDM). MDM represents a set of processes, standards and tools used for defining and managing master data. Deploying an MDM solution has a positive impact on order quality, order cycle times and production costs. For instance, Qualcomm faced challenges in improving decision making, enhancing operational efficiency and reducing time-to-market for new technology. Post the deployment of an MDM solution, Qualcomm was able to shorten development time by up to 95%. It also boosted performance through a single integration metadata catalog⁵.

4 Supply Chain Quarterly, “Master data! Master data! My supply chain for master data!”, June 2013

5 Informatica Case Study

Technologies Such as Big Data Analytics Have the Potential to Transform Entire Operations

The use of advanced digital technologies such as big data analytics offers significant potential for overall operations. This is particularly true when organizations embrace them fully rather than embarking on piecemeal deployment. UPS, a global logistics company, has been an early adopter of analytics solutions to streamline the daily deliveries of about 16 million packages. The company is rolling out a route optimization system, ORION (On-Road Integrated

Optimization and Navigation), to derive insights and drive efficiency in its delivery operations. In the last four years, ORION has been rolled out to around 50 UPS sites and it will be rolled out throughout the organization in the next five years⁶. So far UPS has saved about 85 million driven miles per year, which equates to 8.5 million gallons of fuel saved. The onboard sensors installed on UPS trucks help calculate when the truck should be turned on and off during the delivery process, reducing 1.6 million hours of truck idling time⁷. Similarly, by running advanced analytics solutions,

UPS's process management team is now able to anticipate when a given part is about to fail, helping in preventive vehicle maintenance.

“
Advanced analytics technologies helped UPS save about 85 million miles per year.
 ”

Intel and the Digitization of its Supply Chain

Intel has digitized multiple aspects of supply chain management, such as demand forecasting, production planning, order fulfillment, warehousing, and logistics. Instead of relying entirely on forecasting demand, Intel is deploying systems that are sensitive to consumption and replenishment signals. It achieved a 32% reduction in inventory and 50% faster order-to-delivery time through automation and use of vendor-managed inventory hubs. 'eCustoms', Intel's Web-based invoicing system, enables suppliers to bill electronically and has helped reduce invoicing issues by 75%. The company benefited with 300% faster response to customers' orders and change requests through an integrated ERP system and the automation of various steps in the order management and planning business process.

Source: Gartner, "Intel Takes Its Supply Chain to the Next Level", April 2012; Intel IT Whitepaper, "Transforming Intel's Supply Chain to Meet Market Challenges", January 2012

⁶ Wired.com, "The Astronomical Math Behind UPS' New Tool to Deliver Packages Faster", June 2013

⁷ Fast Company, "Brown Down: UPS Drivers Vs. The UPS Algorithm", January 2013

Supply Chains in Most Organizations Lack Digital Maturity

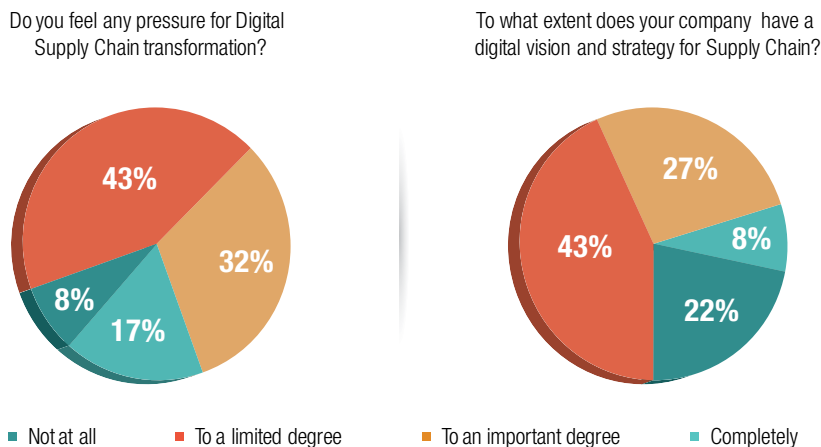
With all these benefits, and clear examples of best practices, do we see more companies transforming their supply chains to better leverage digital technologies? We conducted a global survey with 130 companies to answer this very question⁸.

Supply Chain Organizations Realize the Importance of Digital But Don't Take Much Action

Our study revealed that about half of the companies (49%) are experiencing immense pressure to digitally transform their supply chains. However, the bigger challenge is that over 65% of the companies have not started or have only partly framed a digital vision and strategy for their supply chain (see Figure 2). In essence, despite feeling the pressure for transformation, many supply chain leaders have not taken much action.

“
One out of every two companies is under immense pressure to digitally transform its supply chain.
 ”

Figure 2: Supply Chain Organizations and Their Inaction on Digital



Source: Capgemini Consulting Analysis

⁸ Capgemini Consulting conducted a web survey and in-depth face-to-face interviews during Q2/Q3 2013 to get insights in the digital supply chain maturity of the Manufacturing, Consumer Packaged and Retail (CPR), and Transport sectors. In total 130 companies from Europe and North America participated in this survey.

“
Over 65% of the companies have not started or have only partly framed a digital vision and strategy for supply chain.
 ”

Most Digital Supply Chain Initiatives are Only Standalone Tools

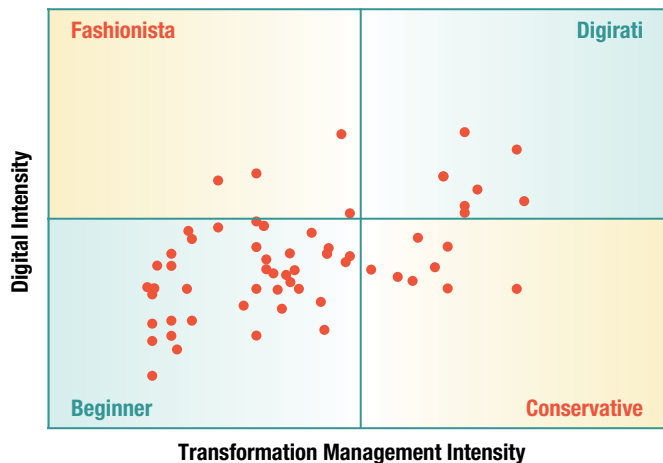
Our survey also revealed that many initiatives that organizations believe are in support of a digital supply chain strategy are actually standalone tool implementations. For instance, some 63% of respondents had one or more projects planned to support the implementation of a digital supply chain strategy. However, most of the projects mentioned were direct implementations of standalone digital tools and not holistic solutions. These include

tools such as Advanced Planning and Scheduling Systems, Warehouse Management Systems, and Transportation Management Systems, among others. This was opposed to more holistic solutions around master data management, network optimization or order orchestration.

Most Supply Chain Organizations Show Low Digital Maturity

Digital transformation in many organizations has been concentrated around sales and marketing functions with a focus

Figure 3: Digital Supply Chain Maturity Matrix



Digital intensity measures how advanced digital initiatives are within the supply chain organization

Transformation management intensity measures senior executives' capability to drive change throughout the organization. This includes creating and communicating a clear vision, establishing governance mechanisms, facilitating cross-silo coordination, and building a digital-ready culture.

Source: Capgemini Consulting Digital Supply Chain Survey.

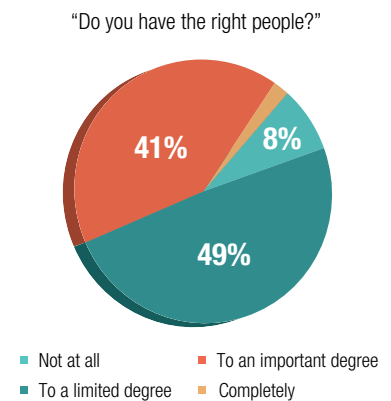
on building an enhanced customer experience. As a result, internal operations have been neglected. Recent research we conducted with the *MIT Sloan Management Review* revealed that 15% of companies globally are ‘Digirati’ or digital leaders while 65% are ‘Beginners’¹⁰ in their digital transformation¹¹. However, results from the survey we conducted with supply chain professionals indicates that the performance of supply chain organizations lags even more. We found that only 11% of companies can claim to be a ‘Digirati’ and an overwhelming 69% were ‘Beginners’ when it

came to digital maturity of their supply chain (see Figure 3).

Lack of People Capabilities is a Key Factor in the Low Digital Maturity of Supply Chain Organizations

A significant 57% of companies in our survey acknowledged a competency gap in the people they have who can support a digital supply chain transformation (see Figure 4). Most companies agreed on the need for having people that have an understanding of the end-to-end scope, have a strong focus on the emerging digital customer, and strong analytical capacities.

Figure 4: Supply Chain Organizations Need More Digital Talent



Source: Capgemini Consulting Digital Supply Chain Survey.

Macy’s Implemented RFID to Assist its Direct-to-Consumer Fulfillment Program

Macy’s Inc., a leading US-based department store chain, integrated its physical stores more closely with its e-commerce operations in order to transform itself into an “omni-channel” enterprise. Macy’s Logistics and Operations unit centrally manages the efficient and timely flow of goods to the stores, bulk merchandise to customer’s homes, and fulfillment of Internet catalog orders. Faced by direct-to-consumer fulfillment challenges, the company equipped its stores to fulfill online orders both from inventory at warehouses and from stores. Currently, 292 of Macy’s 844 stores are set up to fulfill orders for online purchases, up from 23 stores in 2012. The company aims to include 500 stores by end of 2013 to offer faster delivery, even same-day delivery of online orders. The retailer is also applying item-level RFID chips at source to better track and manage inventory and expand its direct-to-consumer fulfillment capabilities. This helped Macy’s to conduct inventory audits 20 times faster than manual methods, with over 95% accuracy rates. By the end of 2013, 90% of Macy’s inventory will be visible to sales associates on hand-held devices, which will help in assisting customers to find and deliver the right product anywhere from the company’s network of stores.

Source: Internet Retailer, “Online sales surge 41% in 2012 for Macy’s”, February 2013; Retail Info Systems News, “Macy’s Takes the Lead in Tech-Enhanced Shopping”, May 2012; Retail Info Systems News, “Macy’s Omni-channel Strategy on the Move”, May 2012; Retailwire, “Omni-Channel at Macy’s: It’s About Inventory Too”, April 2013

¹⁰ Beginner companies have been slow to adopt advanced digital technologies.

¹¹ Capgemini Consulting – MIT Sloan Management Review, “Embracing Digital Technology: A New Strategic Imperative”, 2013

Rio Tinto Implemented Cloud-Based Solution for Sourcing, Supplier and Tender Management

Rio Tinto, a leading global mining and metals company, operates complex supply chain operations with over \$19 billion in spend across 200 locations and 40,000 suppliers. Managing large volume of data from a wide range of systems and sources and generating real-time information presents a significant challenge for the company in effective decision-making related to procurement and logistics. Rio Tinto has, among other projects, implemented cloud-based solutions to support sourcing, supplier management and the tender process. In a year of deploying upstream sourcing solutions across 700 users in 49 locations, Rio Tinto has run 4,900 sourcing projects resulting in \$475 million in savings. The company also uses an internal social networking platform and has seen greater use of bar-coding technology for its supply chain operations. Rio Tinto also developed ‘Suppliers Centers’ to educate supply partners about new processes and technology tools. The company intends to leverage greater involvement and engagement of its suppliers through initiatives such as master data management to drive further automation and efficiency in supply chain. Rio Tinto is now focusing on adopting technologies such as electronic data interchange (EDI), paperless processing, electronic invoice presentation and payment, and mobile applications to streamline the process and eliminate paper-based tasks.

Source: Presentation by Rio Tinto’s Head of Procurement, “Global Procurement Transformation in the ‘cloud’”, April 2011; The Sydney Morning Herald, “Big companies count on technology for supply chain future”, October 2012

“
57% of companies agreed that they had a competency gap in carrying out a digital supply chain transformation.
 ”

There is Poor Alignment between Technical and Supply Chain Teams

We also found that only 40% of the companies think that their technical teams and supply chains are sufficiently aligned – in terms of vision, priorities, and actual fulfillment of business needs. This can be traced to the lack of an overall digital vision and strategy for the supply chain. Moreover, the continued focus on ad-hoc digital tool implementations – as opposed to supply chain-wide transformation using analytics or

order orchestration – is also to blame for the poor alignment and subsequent low digital maturity.

The state of digital maturity in supply chain organizations is a matter of concern for organizations that are readying themselves to transform at an organizational level. In the next and concluding section, we propose some actions that organizations should take in order to drive the digital maturity of their supply chain.

How Can Organizations Scale-Up the Digital Maturity of their Supply Chain?

Digitization has affected all aspects of the supply chain through the integration of supply chain management systems, distributed order orchestration, and other technologies such as collaborative platforms, data analytics, RFID and GPS sensors.

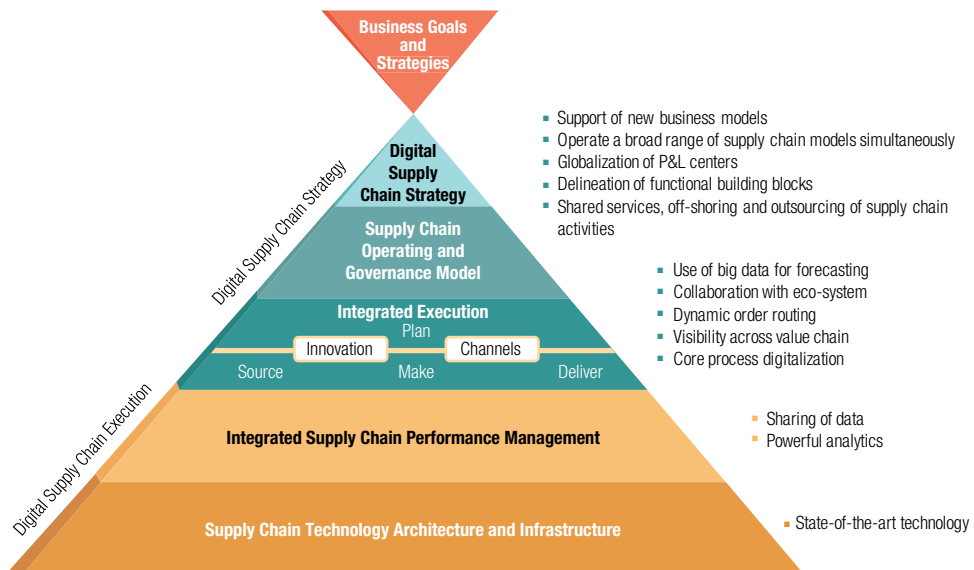
As we have seen from the results of our survey, supply chain organizations are not leveraging the full benefits that digital technologies have to offer. So, what areas should they focus on? In our opinion, organizations need to consider five dimensions to successfully implement a digital supply chain transformation (see Figure 5).

Organizations need to create a clear **digital supply chain strategy**. A key element in defining this strategy is a comprehensive analysis phase. This phase will highlight the

value creation potential in the existing supply chain. Typical outcomes of such an analysis are the identification of instances of broken processes and the amount of visibility on customer/product profitability. A synthesis of these findings will lead directly to the design principles and value potential of a digital operating model.

The next step is to arrive at a **supply chain operating and governance model**. A digital operating model supports a more flexible organizational design as it means information is no

Figure 5: Framework for Digital Supply Chain Transformation



Source: Capgemini Consulting analysis

longer location dependent. In order to arrive at such a flexible organizational design, companies must take a closer look into internal alignment committees and procedures, service level agreements, and transfer pricing schemes. Once these artificial barriers are done away with, companies will start realizing the benefits. For instance, demand forecasting and supply network planning require the integration of information and processes across functions and regional units. If this is systematically done, it unlocks the hidden synergies in manufacturing and logistics networks alike.

Integrated execution, where different supply chain functions are integrated, plays a key role in enabling access to the right information to all employees to enable straight-through processing. It is important

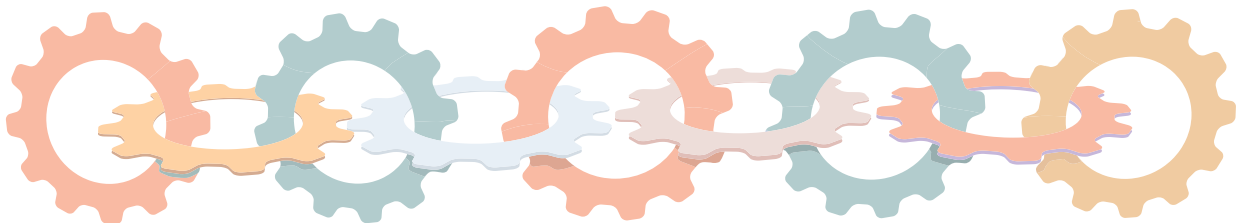
to integrate the different supply chain functions such as product development, procurement, production, maintenance, and logistics across locations in order to minimize “waste” or non-value added activities. These include double entry of data, the reconciliation of information from different sources or the correction of customer invoices.

An **integrated performance management system** helps leaders in better decision making. Using digital technologies, every order or transaction can be traced in a digital operating model. Tagging technologies such as barcodes or RFID provide real-time data feeds for physical movements. Virtualized data centers make available information that was concealed, until now, by processing and storing data for multi-function and multi-location supply chains.

Combining this operational data with financial information, along with data from external sources such as market data or benchmark information, will help in better decision-making compared to the reporting techniques often used today.

And finally, though many technology requirements may already be in place, the challenge is to select and implement **technologies that employ reusable and exchangeable components** with minimal investment in time and effort.

Digital technologies bring multiple benefits and opportunities to supply chain organizations. As more functions across the organization embrace digital technologies, it is up to the supply chain leaders to ensure they are not the missing links in their organization’s overall digital maturity.



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Backing Up the Digital Front: Digitizing the Banking Back Office

By **Jean Coumaros** and **Phil Falato**, Capgemini Consulting

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Banks Cannot Hold Back Any Further on Digitizing the Back Office

Most Banks Have Been Focusing on Customer Experience

Digital technologies and the banking industry are no strangers. Our research with the MIT Center for Digital Business showed that over 94% of executives see digital transformation as an opportunity¹. And indeed, most banks are investing in digital transformation in a big way. For instance, in 2011, banks globally set aside nearly \$13 billion for investments in digital channels with a third of their total digital budget dedicated to mobile banking². However, most banks have been focusing on transforming the customer experience using digital technologies. In doing so, they are missing a potentially bigger

opportunity that they have, right in their backyard – the digitization of their operations.

While banks have been focused on retail channels, their core systems have continued to run on legacy architecture that is typically expensive to maintain. Globally, many banks continue to rely on core legacy IT systems originally implemented in the 1970s and 1980s. Estimates indicate that 90% of the technology budgets of North American and European financial institutions are spent on managing and maintaining legacy systems. Such legacy systems also impede the ability to have a unified view of data across silos and isolated software stacks³.

However, the Back-end Legacy Systems that Banks Operate are Fraught with Challenges

Banks have neglected the digitization of their operations for a variety of reasons. Firstly, banks' legacy systems are complex and replacing them without impacting running operations is

a challenging task. Secondly, they are expensive to upgrade.

A typical solution many banks have adopted to avoid replacing legacy systems is to build additional applications that provide customer interface, straight-through processing and point-of-sale functionality around the legacy core. Such upgrades have resulted in disconnected silos of information and duplicative processes. For instance, retail banks today have, on average, between 300 and 800 back-office processes to manage and monitor⁴. These processes leave the front and back-office staff to deal with redundant tasks, excessive manual processing, and slow response times (see Figure 1).

“
*Globally, banks
continue to rely on
core legacy IT systems
originally implemented
in the 1970s and 1980s.*
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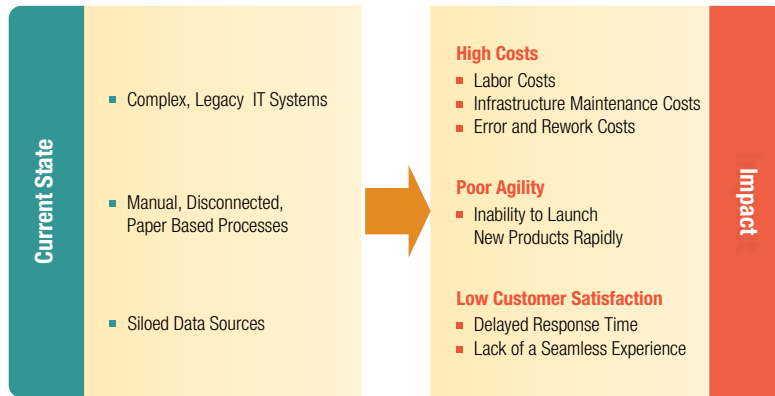
1 Capgemini and MIT Center for Digital Business, “The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry”, November 2012

2 Capgemini, “Trends in Retail Banking Channels: Meeting Changing Client Preferences”, 2012

3 JWG, “FS infrastructure: ready for G20 Reform?”, March 2012

4 Tibco, “Automating the Back Office”, 2011

Figure 1: Current State of Back Offices



Source: Capgemini Consulting Analysis

The Current Back Office is Overly Reliant on Paper and Manual Processes

Current back-office operations are manually intensive. An average mortgage application goes through 35 manual handoffs before completion⁵. Manual processes coupled with constant changes in the regulatory environment have also led to a

surge in paper-based transactions at banks. For instance, in 2010, JP Morgan saw its paper consumption increase by nearly 55%⁶. According to TD Bank, an American bank, the current benchmark of office paper per person is 10,000 pages per year⁷. Many banks lack the automated processes that can help mitigate the risks of human error and reduce paper consumption costs.

Manual Effort Results in Operational Inefficiencies and Significant Costs

The heavy reliance on manual effort makes bank processes vulnerable to errors and re-works costs. For instance Australia-based Bank of Queensland had to refund \$34.5 million to its customers after interest rate and fee errors dating back almost a decade were discovered. The bank also expects to incur an additional \$11.5 million in costs to clean up the problems that impacted 4% of its customers. The errors were caused by overly complex products that required too many manual processes⁸.

Research indicates that more than 50% of submitted paper work associated with account opening is rejected, leading to increased costs associated with time and resources⁹. Our own research with the MIT Center for Digital Business indicated that only 30% of banking executives agreed that processes and initiatives were coordinated between silos indicating that opportunities exist for process integration and efficiency¹⁰.

5 Trivaeo, "Automating Back Office", March 2013

6 American Banker, "Banks Use More Paper Despite E-Statements' Popularity", August 2012

7 Idatix, "Financial Services: Helping the Environment & Going Paperless, Properly", July 2012

8 The Sydney Morning Herald, "BoQ to refund customers after errors", August 2013

9 Quadron Data Solutions, "Operational Inefficiencies—Horror in the Front, Middle and Back Office", December 2012

10 Capgemini and MIT Center for Digital Business, "The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry", November 2012

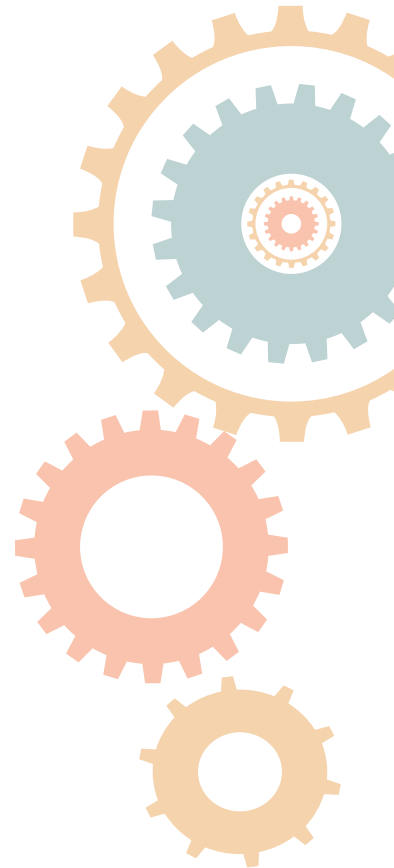
All this complexity comes with a cost – the cost of manual effort needed to compile and interpret data along with the cost of people to maintain these multiple systems. For instance, the top 10 global investment banks employ two middle and back-office staff for every front-line staff member¹¹.

These Inefficiencies In Turn Have a Significant Impact on Customer Experience

Such inefficiencies in the back office in turn impact customer satisfaction and the overall customer experience. For instance, a survey found that 60% of customer dissatisfaction sources originated in the back office¹². It is also estimated that 10–20% of all transaction volumes in a contact center are the result of execution issues in the back office¹³.

Most banks also believe their current operational processes are not adaptable to new demands. Our research with the MIT Center for Digital Business revealed that only 30% of banks' executives felt that their operational processes could adapt quickly to external changes¹⁴. Banks are facing increasing pressure to bring new products and services to market quickly; however, the existing IT systems hinder product development and time-to-market.

The need to address these operational inefficiencies is compelling banks to digitize their back-office operations. In the wake of increasing compliance, shrinking margins and the evolving customer demands, banks can expect digitization of processes to be a major lever to improve productivity and reduce costs.



11 Financial News, “Back office pushed to the front of the cost-cutting queue”, December 2012

12 Verint, “The Back Office: The Next Competitive Battlefield”, 2008

13 Verint, “The Back Office: The Next Competitive Battlefield”, 2008

14 Capgemini and MIT Center for Digital Business, “The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry”, November 2012

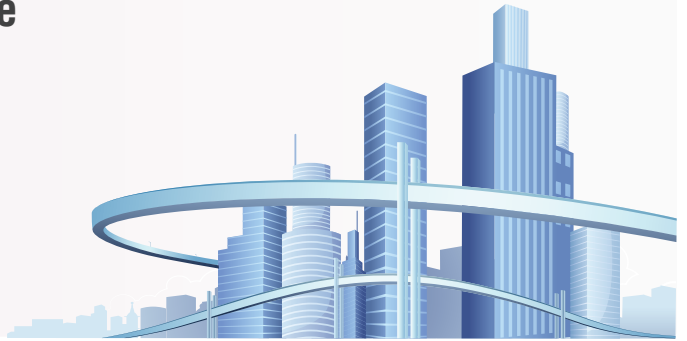
The State of the Banking Back Office

Back-end Systems Continue to be Legacy Based

Maintaining legacy systems consume



of technology budgets



Legacy Systems have Resulted in Inefficient Manual and Paper-based Processes

Paper consumption of **10,000** pages per person per year



of submitted paper work in account opening gets rejected

Top **10** global investment banks



=



1 front-line staff

2 middle/back-office staff

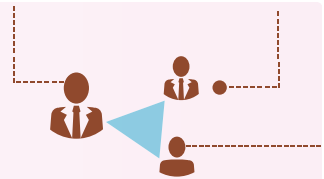
These Inefficiencies Have a Significant Impact on Customer Experience



of customer dissatisfaction sources originate in the back office

10-20% of contact center volumes are a result of execution issues in the back office

Only **30%** of banks' executives feel that their operational processes can adapt quickly to external changes



Automating Back-Offices can help banks realize overall cost savings of **30%**



9%

Core Banking replacement



6%

Document Management Systems



15%

BPM

What Technologies Can Banks Use to Automate the Back Office?

Digital technologies can help banks effectively streamline their processes and achieve substantial cost savings. These technologies can broadly be categorized as strategic, transformational and tactical solutions based on the

quantum of annual savings they deliver and the level of investment required to implement them (see Figure 2).

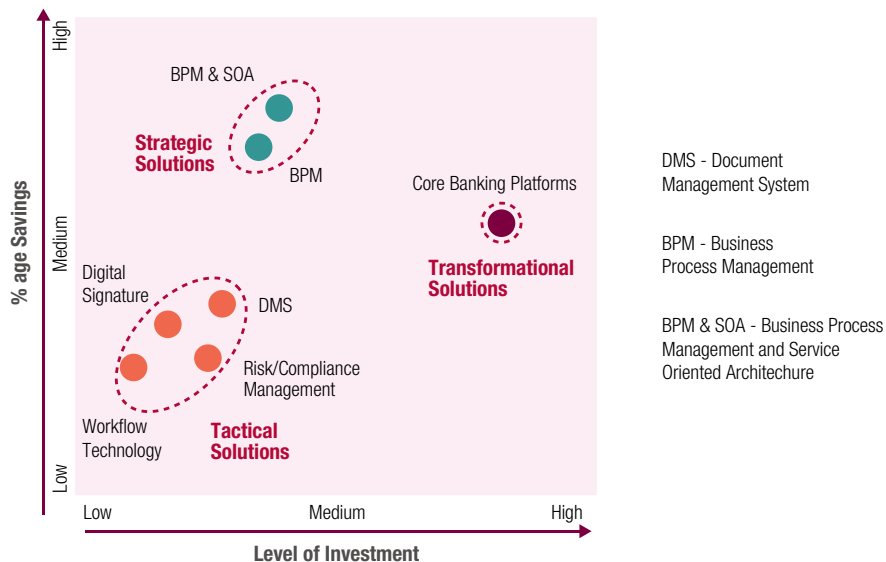
Tactical Solutions: Document Management Systems (DMS) and Digital Signature Enable Banks to Streamline Paper-Intensive Business Processes

Tactical solutions require low levels of investment and can be implemented without a massive overhaul of existing infrastructure

and IT systems. Tactical solutions streamline basic activities such as account opening, mortgage and loan processing, and document printing, and deliver rapid returns, typically in less than a year.

Among tactical solutions, DMS and Digital Signature generate the highest savings by enabling banks to significantly reduce paper-related costs.

Figure 2: Automation Technologies for the Back Office



Source: Capgemini Consulting Analysis

Document Management Systems Lower the Costs and Risks of Paper-Based Processing

It is estimated that information workers spend up to 20% of their time filing and searching through paper documents¹⁵. Our estimates indicate that a DMS can reduce time spent locating, retrieving and filing documents by nearly 75%. Further, it is estimated that organizations spend as much as \$120 on finding a misfiled document and \$220 to reproduce a lost document¹⁶. A shift from a paper-based to a digitized system reduces costs associated with lost and misplaced documents as well as printing and distribution costs. It also lowers error and rework rates. Our analysis indicates that a DMS typically delivers close to 6% in cost savings annually.

Digital Signature Cuts the Costs and Delays Associated with Manual Signatures

The financial services sector continues to be heavily reliant on manual signatures.

“
A Document Management Solution can reduce time spent locating, retrieving and filing documents by nearly 75%.”

Recent research indicates that 80% of businesses print documents need to be signed, with the figure rising to 94% for the financial services sector. The use of a Digital Signature solution can dramatically reduce paper costs. For instance, France-based BPCE Group launched a pilot electronic signature scheme that enables customers to read and sign their contracts on tablet devices in their own branches¹⁷. The initiative is expected to save the bank nearly one billion sheets of paper every year¹⁸. Digital signature solutions can also drive higher conversion rates.

For instance, the combination of digital signature and straight-through processing helped a leading UK-based bank achieve cost savings of over £6.5 million per year and significant increase in overall sales volumes¹⁹.

The use of manual signatures also results in delays in processing transactions. Research shows that 72% of organizations experience delays due to the need to collect signatures²⁰. Digital signature solutions reduce these delays, while being less prone to fraud compared to manual signatures. The returns from a Digital Signature implementation can be realized rapidly. A survey indicated that 81% of respondents reported seeing a 100% payback within 12 months, and 25% reported seeing an ROI in just three months²¹.

15 IDC through Laserfiche, “5 Easy Ways to Show ROI for Document Management Software”, 2012

16 Association for Information and Image Management; Edge Systems, “Document Management Return On Investment”

17 BPCE, “Groupe BPCE: results for the first quarter of 2013”, May 2013

18 Youtube, “La signature électronique en agence”, April 2013

19 Capgemini Consulting client

20 Global Banking and Finance Review, “SIGNATURES – THE WEAK LINK IN THE CHAIN”, November 2013

21 Global Banking and Finance Review, “SIGNATURES – THE WEAK LINK IN THE CHAIN”, November 2013

Using Digitization to Navigate Regulatory Challenges

The banking industry faces significant regulatory challenges. The industry needs to respond to increased regulatory scrutiny and provide accurate reporting on risk exposure. The current systems in use at banks are complex and inflexible making it difficult to respond to regulatory demands. For instance, in the UK alone, non-compliance fines amounted to £66 million in 2011. The cost of compliance failure is escalating with fines increasing by at least 300% during the second half of 2012. Compliance failure not only impacts the bottom line but also results in loss of trust from customers and regulators.

Digitization helps banks to effectively manage, monitor and report on regulatory compliance. Back-office digitization simplifies document storage, search and retrieval, and enables banks to furnish compliance-related information more easily to regulators. By doing so, banks can also gain the confidence of the regulators on their commitment to transparency and control.

Source: JWG, "FS infrastructure: ready for G20 reform?", March 2012; Banking Technology, "Financial crime: compliance and failure", November 2013

static implementations, a BPM solution works on the principle of continuous improvement. As a result, processes are monitored and optimized continuously which results in higher and more sustainable savings. BPM tools also provide real-time insights on business operations, which allow banks to detect process bottlenecks and take rapid corrective action. As such, they increase productivity and help banks better address the needs of their customers. BPM can also significantly reduce the amount of human intervention needed in banking processes. The resulting unused employee time can be re-allocated to more productive purposes. For instance, a Dutch bank that provides services to institutional investors used a BPM tool to reduce its settlement desk's manual operations. By automating the processing of its settlement requests, the bank minimized manual effort and in the process was able to achieve a 75% reduction in labor costs²².

“
*BPM united with
Service Oriented
Architecture has
compounded benefits.*”

Strategic Solutions Such as BPM Help Banks Raise Productivity and Customer Satisfaction

Strategic solutions such as Business Process Management (BPM) significantly extend the process efficiencies delivered by tactical solutions. A BPM solution is an integrated platform that combines real-time process monitoring, modeling and

optimization capabilities. Many banks have, over the years, implemented multiple cost reduction programs. Nevertheless, more often than not, the costs start creeping back into the system. A BPM solution addresses this issue by delivering cost reductions that are sustainable over the long term. Unlike tactical solutions, which are usually

22 Forrester, "Using BPM To Improve Operational Efficiency", July 2008

UK's Lloyds Banking Group deployed a BPM solution as part of a four-year technology program aimed at streamlining processes. BPM was used to help eliminate duplicate, redundant and scattered core systems and processes²³. The bank saw a substantial increase in process efficiency as a result of the program (see insert).

Our estimates indicate that a BPM solution delivers savings of nearly 15% annually. Banks can typically realize a return on investments from their BPM solution in two years.

BPM Based on Service Oriented Architecture (SOA) Principles Delivers Enhanced Benefits Compared to Pure-Play BPM Implementations

When combined with Service Oriented Architecture²⁴ (SOA) principles, the benefits of BPM are compounded²⁵. SOA provides a flexible architecture for adding new services. For instance, BPM platforms can easily build new services into a business process if a bank has already implemented SOA. Additionally, SOA enables the elimination of many of the high costs that are

often associated with integrating solutions thus leading to a greater ROI for applications.

Germany's Degussa Bank introduced a BPM system to increase transparency and gain better knowledge of its processes. The bank used a combination of SOA and process management to industrialize and optimize its customer service process. The

model allowed the bank to tailor its offering to the customer's needs and achieve efficiency savings of 30% per annum as a result of the optimised customer-centred process. The agility offered by a SOA and BPM combination also allowed the bank to incorporate new regulatory requirements, products or pieces of customer information into a process without any business disruption²⁶.

Lloyds Banking Group – Automation Drives Increased Efficiencies

Lloyds Banking Group invested in a four-year technology program (including BPM software) starting in 2011 that involved automating and simplifying complex manual banking processes. These initiatives helped achieve annual savings of £352 million, and a 7% reduction in total costs. The bank is further aiming to save £1.7 billion in 2014. The program reduced the number of unique business processes from 700 to just 23, thus helping to halve the number of manual errors.

- Lloyds cut the time it took its staff to close old accounts from 30 minutes to 3 minutes.
- The time required for customers to transfer money to Individual Savings Accounts (ISAs) reduced from a couple of days to within 24 hours.

Source: Computer World, "Lloyds on track to reach savings target after back office consolidation", May 2012; ComputerWeekly.com, "Lloyds customer complaints plummet after automating manual processes", June 2013

23 Bank Systems and Technology, "Lloyds Banking Group Keeps It Simple With BPM", June 2013

25 Gartner, "Overview: SOA and BPM Are Better Together", March 2007

26 Future Banking, "Optimum banking"

Transformational Solutions Offer Benefits that Extend Beyond Cost Savings and Position a Bank for a Digital Future

The impact of transformational solutions is felt across the organization at all levels. These solutions enable the development of customer applications and products, either online or mobile, which create new opportunities to enhance customer experience and increase revenue potential. For instance the Commonwealth Bank of Australia undertook a six-year core modernization program. The effort has allowed the bank to deliver innovations such as a mobile app on real-time settlement and banking. The bank has also launched a SmartSign service that allows customers to execute loan documents electronically using a secure online portal²⁷.

Transformational solutions demand high investments and the payback periods are longer compared to strategic solutions. Our estimates indicate that the payback period for a core banking implementation is around 4.5 years while annual cost savings are around 9%. However, these

solutions need to be viewed as investments that target benefits beyond just costs. Core banking systems integrate back-office systems across operations such as retail, corporate and private banking, consolidate data from disparate systems, and enable a unified view of transactions. Consequently, they allow banks to respond rapidly to changing market requirements and provide a seamless customer experience.

US-based bank BBVA Compass undertook a \$360 million replacement of its legacy core that yielded benefits far beyond cost savings alone. The initiative helped the bank achieve 13% savings due to greater straight-through processing, reduced back-office operations requirements and improved productivity benefits. Importantly, the project has reduced time-to-market for new products by up to 75%²⁸. The move to a new core platform also helped the bank provide a differentiated customer experience by delivering greater account transparency and a seamless, multi-channel experience²⁹.

“
Lloyds Banking Group’s four-year technology program including BPM software helped achieve annual savings of £352 million.
”

How Should Banks Approach Back-Office Digitization?

Digital technologies afford many options for banks. However, they will need to prioritize their focus areas of investments in back-office automation in light of several constraints. Key among these would include investment horizon as well as technology, process and organizational readiness (see Figure 3). Each of these areas has the ability to skew priorities for or against a particular technology rollout option.

27 ZDNet, “Commbank promises more tech innovation”, August 2013

28 Banking Technology, “Core renewal gets BBVA picked as Model Bank”, March 2013

29 Ovum, “Will BBVA Compass kick-start core banking transformation in the US?”, December 2012

Automating Back Offices Can Help Banks Realize 30% Cost Savings

We analyzed the potential cost savings that banks can realize by adopting automation solutions. For our analysis, we selected one representative solution from each technology category and assessed its impact on cost savings.

We assessed the impact of the automation solutions on labor, error remediation, training, and distribution costs, among others. Our analysis revealed that by choosing a portfolio of solutions that covers each of the three technology categories, banks can realize significant savings.

Illustrative Technology Solution Mix and Potential Cost Savings

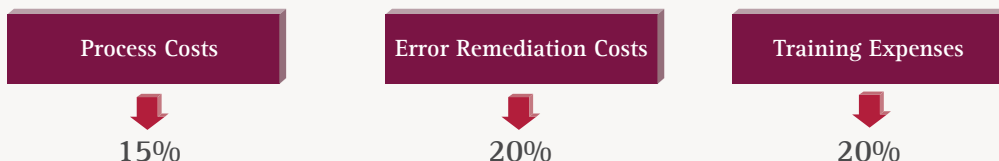
Technology Category	Solution	% Annual Cost Savings	Total Annual Cost Savings
Strategic	BPM	15%	30%
Transformational	Core Banking Platform	9%	
Tactical	Document Management Systems	6%	

Assessing the Benefit Impact of Chosen Portfolio of Technology Solutions

Business Process Management

Our calculations show that BPM solutions can contribute to 15% of overall cost savings annually.

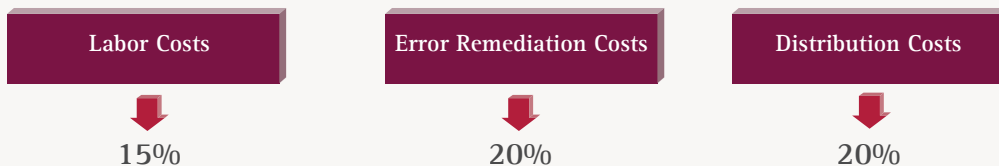
Impact of BPM on Specific Expense Categories



Document Management Systems

Our analysis shows that Document Management Systems can generate 6% cost savings annually.

Impact of DMS on Specific Expense Categories



Our analysis indicates that core banking transformations can contribute a significant 9% annually to overall cost savings. The savings accrue from reduced IT infrastructure maintenance costs and an overall reduction in operating costs due to increased process efficiencies.

We have not considered the usage of cloud technologies in this mix. Using cloud technologies can only increase the overall realizable cost savings, based on the extent of their deployment.

Note: This analysis is an illustration of potential benefits from automating back offices in banks.

Assess the Interoperability of New Solutions While Planning an Increase in Automation Levels

Over the past few years, many banks have deployed a variety of automation solutions, but often in an ad-hoc fashion. Such ad-hoc implementations have resulted in disconnected silos of information and duplicative processes, limiting the full impact of automation. Banks need to conduct a technology readiness assessment to determine where they stand, the percentage of legacy systems that still exist in their back office and their current level of investment in automation solutions, before rolling out new solutions. This is critical to ensure that new solutions are interoperable with existing systems, so that workflows are optimized rather than duplicated, and data sources are unified.

“
Disconnected silos of information and duplicative processes have limited the full impact of automation.
”

Deploy Tactical Solutions to Rapidly Address Low Levels of Process Readiness

Banks should assess their current state of process readiness before implementing new automation solutions. Process readiness should be evaluated based on the proportion of manual versus automated processes and the degree of process duplication in the organization. Banks with a higher percentage of manual and duplicate processes should look to adopt tactical solutions as a quick-fix towards addressing basic process inefficiencies. For instance, the rollout of tactical digital solutions such as a Document Management System can deliver immediate benefits by reducing the costs and inefficiencies that are inherent in paper-based operations.

Evaluate Suitability of Strategic or Transformational Solutions Based on Investment Horizon

Strategic and transformational digital solutions are typically time-intensive, both during deployment, as well as in seeing returns. Additionally, transformational solutions require significant investment upfront.

As such, banks should closely base their choice of solution in light of availability of budgets, expected payback period, and the overall estimated returns. A combination of these parameters will help banks determine the first choice between strategic and transformational solutions.

“
A process readiness assessment helps determine the proportion of manual versus automated processes.
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Obtain Management Buy-In and Establish Support Systems before Implementing Transformational Solutions

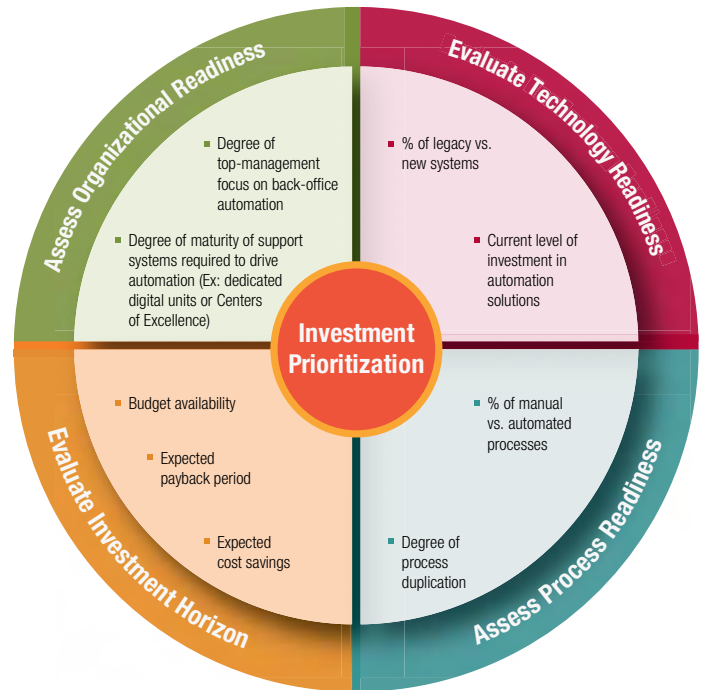
Banks need to consider the amount of cultural change that will accompany transformational initiatives for process digitization to be successful. Transformational solutions need the backing of management at all levels because they bring about radical changes in a bank's operations.

“
Management Buy-In is critical prior to embarking on a digital transformation program.”

The key is to introduce the practice of end-to-end process ownership, adopt new ways of working and better integrate the different organizational entities – such as the business, IT and change management units. Banks should appoint a digital czar or a digital steering committee with top management representation in order to help drive acceptance of transformational programs across the organization. Banks should also set up digital units or centers of excellence to promote the re-use of business processes and best practices across the organization.

Process digitization is as much a people journey as it is a technological one. Its impact will be felt across the organization through better, faster and more efficient ways of doing things from launching and marketing new products, to delivering compliance, and tracking benefits delivered on large programs.

Figure 3: Assessment Parameters for Investment Prioritization



Source: Capgemini Consulting Analysis

“
Budget availability, expected payback period and overall returns drive choice for strategic and transformational solutions.”

The possibilities offered by process digitization, therefore, are not limited only to achieving

efficiency in the process itself, but expand into the significant opportunities of managing the business on a close to real-time basis. It could, for those who seize this opportunity, lead to a new culture and ultimately a new bank.

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Companies to Watch: View from Silicon Valley

By **Sergi Herrero, CEO, L'Atelier BNP Paribas USA**



AliveCor: Tackling cardiac health issues through mobile phone sensors



AliveCor has developed a mobile phone case with embedded sensors that enable patients or their doctors to obtain an **electrocardiogram (ECG) reading** within seconds. Users simply have to hold their Smartphones horizontally and place their fingers on the case in order to obtain their ECG readings. They can then send the report to their doctor or to a health institution. The AliveCor Heart Monitor device can be used in emergencies by doctors and patients alike, as well as for **preventive monitoring**. It has primarily been created for patients who have already suffered from a heart attack and who can now monitor their heart rate from home. AliveCor has already been approved by the FDA and can be licensed by doctors to their patients. It will soon be available over-the-counter across pharmacies.

Learning Catalytics: Challenging the way we learn



In most classrooms, discussions and opinions form the backbone for meaningful interactions and idea generation. However, most students tend to pair up with the same set of friends, which can make idea generation and meaningful discussions counterintuitive. Education startup Learning Catalytics suggests suitable pairings across students based on their answers. This cloud-based learning analytics and assessment software enables teachers to pose open-ended, critical-thinking questions to students. The software uses the answers provided by the students and then suggests suitable pairings between students. With the Learning Catalytics software, teachers can group students according to opposing ideas and opinions. The result: students are now compelled to defend their original idea and contribute to the discussion. The software is accessible across all mobile devices. The company was recently acquired by Pearson, a leading educational publishing company.

Special Guest



Putting Digital at the Heart of Europe: An Interview with Neelie Kroes

Neelie Kroes is Vice President of the European Commission, leading the flagship Digital Agenda for Europe program. The Digital Agenda for Europe aims to help Europe's citizens and businesses to get the most out of digital technologies. Neelie Kroes is a strong advocate of using digital technologies to put Europe at the forefront of economic and inclusive growth. Capgemini Consulting spoke with Neelie Kroes to understand how companies in Europe have approached digitization and some of the key initiatives that the European Commission is taking to drive the digital agenda.



Interview with Neelie Kroes,
Vice President of the European Commission

The State of Digital Europe

How would you rate the digitization of European public sector? Are you happy with the progress, or do you think we are still scratching the surface?

“
There is no room for complacency in the fast-moving digital world.

”

Tremendous progress has been made in the past few years. Nine of the 10 countries with the most broadband access are European. In Denmark, for example, all communications between businesses and public authorities are now conducted online and it is becoming the norm for citizens as well. Denmark now reports that interacting with citizens online is 30 times less expensive than face-to-face interaction. Italy is another example: the introduction of electronic medical prescriptions alone is saving the national budget €2.5 billion per year. Spain is the European leader in Massive Open Online Courses, showing that education is now part of this digital revolution.

However, there is never room for complacency in the fast-moving digital world, and we recognize there is still a lot more to do. One example is digital citizen engagement. According to the recently published [eGovernment Benchmark 2012 Report](#), less than half of internet surfing EU citizens (46%) use eGovernment services and satisfaction with eGovernment services lags behind that of eCommerce services.

“

In Italy, the introduction of electronic medical prescriptions alone is saving the national budget €2.5 billion per year.

”

What do you think European governments should do to fight any complacency?

I believe we should focus on three areas: open data, collaboration, and cross-border connectivity.

First, we need to facilitate the [re-use of public sector information](#) (PSI). Opening the wealth of data held by public bodies to third parties creates new business

Neelie Kroes Digital Heroes

I particularly admire the way Estonia has embraced the digital challenge and has managed to embrace digital technology and make it work for its people in just a few years.

I also find inspiring [the way people in the village of Alginet](#), near Valencia, have used an EU-funded research project, [NOBEL](#), to help them become the owners of energy distribution in their area. They have installed smart meters in all homes in their village. To manage the data coming from the smart meters, they started using the services provided by the local telecom operator; but very soon they also became Internet service providers themselves in order to be independent from and to beat the prices of the operator.

Another interesting example is the “Digital Poland of Equal Chances” program, which uses “Digital Lighthouse-keepers”. These are 2,600 volunteers/scouts – in effect local digital champions – who have been recruited to draft [Local Plans for Digital Education](#). This program is the result of a Broad Alliance for Digital Skills in Poland, involving government, civil society and the private sector.

opportunities, estimated at €40 billion in direct economic value. This could provide valuable information and new, value-added services to all Europeans.

Second, as public services need to become more efficient and effective, governments have to consider innovative ways of developing and organizing the public sector for creating public

value. At the same time, the younger generation is leading the way towards a collaborative and participative society. We have to transfer this mindset to the public sector and encourage technology-enabled collaborative production of public goods and services.

Third, to increase the take up and usage of eGovernment services, we need to ensure that

services are digital by default and also work cross-border by default. This is why the EU and member states have worked together to establish a core set of digital service infrastructures for online public services, such as interoperability of [eID](#), [eSignature](#) and [eDocuments](#). The financial support for the Digital Services Infrastructures (DSI) is part of the forthcoming EU-funded [Connecting Europe Facility \(CEF\)](#), which has allocated up to €1 billion euros over seven years to support platforms providing seamless digital public services in Europe.

“
European governments should focus on open data, collaboration and cross-border connectivity.”

How about the private sector? How do you think it has approached digitization?

Similar to public sector, I believe a lot of progress has been achieved. Digital manufacturing technologies are radically transforming manufacturing and

will have a major impact not only on efficiency and sustainability, but also on the geographical distribution of industrial production world-wide. However, again, this positive image is not uniform across Europe. In fact, the considerable progress already achieved could have been a lot greater had it not been for the lack of a digital single market in Europe.

Take the case of the healthcare industry. As a result of the current fragmentation of a continent that should be fully connected, we often see health authorities, hospitals, even doctors introducing their own systems, ignoring useful eHealth tools and services that could communicate with each other and draw on others' experience to achieve better results. In fact, a [survey](#) on eHealth shows that hospitals are not yet deploying technology to their full potential; although most hospitals are connected to broadband, only 4% of them grant patients online access to their medical data. We are currently implementing a dedicated [eHealth Action Plan](#) that, by 2020, should allow Europeans to reap the vast potential ICT can bring to health systems, including in the area of mobile health applications. Digitization not only cut costs for the health systems, it makes

access to healthcare much easier and faster, which is especially important for the chronically ill or patients living in remote areas.

“
Digital technologies allow the creation of ‘virtual’ value chains that are geography-independent.”

Let's talk specifically about the manufacturing sector. It has been quite slow to adopt new digital technologies. How can the EU encourage key sectors to leverage digital technologies to transform?

It is true that some member states have lost a big part of their manufacturing base and their economies have experienced more significant declines than others. This is largely due to the traditional way manufacturing is organized. Less developed regions thus had little chance to participate in value creation. Digital technologies reverse this trend; they allow the creation of 'virtual' value chains independently from the geographical location of its actors, which means exploiting the potential of skilled labor forces

How Digitization Can Help Unlock the Potential of the EU Economy

The Digital Goldmine

Open data can create
€40 billion
in direct economic
value every year



e-Procurement can
save **€100 billion**
a year

Additional **10%**
broadband penetration can
deliver **1%** of EU GDP

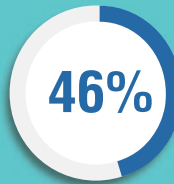


The Challenge

Only **4%** of
hospitals grant patients
online access to their
medical data



Only **46%**
citizens
use e-Government
services



By 2015, there will
be a **shortfall of**
900,000
digital (ICT)
professionals

Key EU Digital Initiatives

€9.2 billion
to provide fast broadband
access to **45 million** households

Grand Coalition for Digital Jobs
to produce more digitally
skilled professionals

€77 million
to help SMEs benefit from
latest digital technologies

Startup Europe
to help web entrepreneurs
start their own business



in other regions, often at lower cost. In this context, the member states have a strong incentive to adapt their regional policy and to support EU-wide platforms, which can make them part of Europe's wider manufacturing base. So yes, I do believe there are huge challenges ahead and the manufacturing sector is far behind exploiting the full potential of the digital factory.

“
The manufacturing sector is far behind exploiting the full potential of the digital factory.
 ”

However, I also believe the EU is already doing a lot to reverse the declining role of the manufacturing industry. We have launched a series of initiatives (see insert) to achieve this. I believe Europe can build on its world-leading position in many areas such as industrial robotics and factory automation, embedded digital systems, enterprise and design software, and 3D- and laser-based manufacturing.

Key Initiatives for Spurring Digital in the Manufacturing Industry

- Factories of the Future public private partnership - It consists of a research program of €1.2 billion to support the manufacturing industry in the development of new and sustainable technologies
- A €77 million innovation initiative called I4MS (innovation for manufacturing SMEs) for the manufacturing sector, and in particular its high-tech small and medium size enterprises (SMEs), to profit from newest advances in digital technology.
- European Electronics Strategy, to maintain Europe at the leading edge in the design and manufacturing of micro and nanoelectronics, and to provide benefits across the economy.

Digital innovation

What is your view on startups in Europe? What is the Commission doing to encourage their creation?

We've already seen, and, indeed, I believe we will keep seeing, brilliant Europeans gain international acclaim thanks to their innovative ideas. Skype, Dailymotion, Rovio, Klarna or Withings are some examples. Take the case of Rovio. It reminds us that Web companies create economic impact through both direct effects (as a result of their

day-to-day operations within Europe), and indirect effects (by accruing to third parties that work in the same business ecosystem). Rovio is a company that recruited 625 employees, but which works indirectly with 30,000 other people. This creates significant global impact and economic value through enabling ecosystems.

“
Big Data is like the tide that lifts all boats.
 ”

We'd like to see more such companies grow. That is why, a few months ago, the European Commission launched [Startup Europe](#), an initiative that aims at helping Web entrepreneurs start their own business in Europe and flourish in doing so. We've also taken other steps in this direction, such as the [Europioneers Challenge](#) and [Tech All Stars](#), which awards Europe's best technology entrepreneurs and start-ups. We also have the [Leaders Club](#), an independent group of tech entrepreneurs who act as role models to European Web entrepreneurs, providing networking and other activities such as studies and research.

“
More than 80% of jobs need digital skills these days.
 ”

How is Europe positioned in fast-growing areas, such as Big Data and 3D manufacturing? Do you believe Europe has a realistic chance of wresting back the initiative that it has lost in Web technologies?

Big Data is like the tide that lifts all boats: because the scope of the opportunity is growing very quickly, there is a lot of space for

multiple companies to come in and generate value for themselves and their customers. And we see a lot of European businesses that already thrive in this field. For example, we see European businesses making the first steps towards a [business model](#) where mobile telephone operators don't just sell minutes to consumers, but also sell consumer insights to marketers.

3D manufacturing is another fast-growing area. Europe is currently strong and dominant in specific 3D manufacturing technologies, such as medical devices. So, although competition from the US, Japan and China is strong, Europe is in a good starting position to exploit its leadership at least in these specific areas and capture 30% or more from the worldwide market.

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We can't escape the digital skills gap, but if we race we can almost close it.
 ”

Hurdles and Way Ahead

The shortage of digital skills in areas such as Big Data is a major issue for both European governments and companies. What are the measures you are taking to address the digital skills gap in the EU?

Indeed. We're facing a situation where more than 80% of jobs need digital skills these days, and there will soon be one million ICT vacancies in Europe. That's crazy at a time of high unemployment. It has to be tackled at all levels.

We can't escape the digital skills gap but if we race we can almost close it.

The [Digital Agenda for Europe](#) recognized the growing policy importance of lacking digital skills for growth, employment and inclusion by devoting one of its seven pillars to policy and actions in this area.

In 2013, the Commission launched a "[Grand Coalition for Digital Jobs](#)", bringing together important stakeholders from government, industry, education providers and so on to take direct action to alleviate the growing shortage in qualified ICT professionals. This coalition

has attracted a lot of interest and 40 pledges from companies and training organizations.

Beyond skills, what are some of the other key challenges holding back Europe in its Digital Agenda?

In addition to the shortage of digital skills, there are a number of other challenges restraining Europe's wider digital economy in the global race: fragmented digital markets, a lack of investment in high-speed networks, a lack of interoperability, rising cybercrime and low trust, insufficient R&D and fragmented answers to societal challenges.

That is why we are introducing a series of measures aiming at making Europe a truly Connected Continent. In this package, we are simplifying regulations, so that telecom operators can offer services anywhere in Europe dealing with one regulator and one set of rules. We are offering Europeans more spectrum so that telcos can develop pan-EU business models. We are facilitating new harmonized "access products" that should allow companies to obtain a similar access to fixed networks in member states where they do not have their own network. We are promoting an open Internet,

which will safeguard innovation, competition and choice. We are doing away with roaming, which could help the market grow by giving consumers something they really value. And finally we are enhancing consumer protection, where plain language allows for more comparable information and greater rights to help people switch if they want to. I am really looking forward to working on implementing this ambitious package, which could finally offer Europe a true digital single market.

Illustrative Benefits and Savings from eGovernment services

- The adoption of e-invoicing in public procurement across the EU could generate savings of up to €2.3 billion per year.¹
- Switching from paper to fully automated invoicing can cut the costs of receiving an invoice from €30-€50 to €1.²
- Contracting authorities that have made the transition to e-procurement commonly report savings of between 5 and 20% of their procurement expenditure (i.e. each 5% would save €100 billion per year).³
- The UK has estimated savings of nearly £2 billion per year thanks to the introduction of online service delivery by default.
- Up to €300 billion of economic value per year and 0.5% of annual productivity growth can be realized over the next 10 years through use of open and big data in the Public Sector.

¹ http://europa.eu/rapid/press-release_IP-13-608_en.htm

² http://europa.eu/rapid/press-release_IP-13-608_en.htm

³ http://europa.eu/rapid/press-release_MEMO-12-265_en.htm

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Digital Transformation Review

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