

# the Fed

Operators can remotely load and drive Sandvik's AutoMine Lite, an automated single loader.



PHOTO COURTESY OF SANDVIK



# ge

## Digging In

**The global mining industry** took a heavy hit last year. The sector saw its fixed costs rise and commodities prices fall. If mining companies want to perform well in the current slow-growth cycle, “they’ve got to control costs, they’ve got to control investment, and they’ve got to restrict capacity growth,” Richard Jeffrey, CIO, Cazenove Capital Management, London, England, told Bloomberg.

Mining companies have already taken Mr. Jeffrey’s advice—freezing capital projects, off-loading risky investments and focusing on core assets. However, reactive cost cutting is rarely sufficient or sustainable, according to a 2013 Deloitte report on mining trends.

To turn the current tide of poor productivity, the report says, mining companies will have to recalibrate, chiefly by embracing innovation. That means project innovation in all its forms—not only technology but also talent and stakeholder management. Mining organizations “must take more innovative approaches in their dealings with communities, governments, shareholders, regulators and staff,” the report concludes.

“The entire mining industry is changing,” says André Choma, PMI-RMP, PMP, master engineer for metals and mining corporation Vale in Belo Horizonte, Brazil. “Its projects are not just engineering and construction efforts, but complex and risky endeavors that require a broader view, a more business-oriented leadership style and the conviction that following project management best practices is the right way to go.”

These mining projects are looking to implement innovative practices and improve productivity, while relying upon their project managers to help get it done.

### Software, Hard Work

Iron ore producer Samarco in Minas Gerais state, Brazil has made innovative inroads by using cutting-edge software. Its software-controlled system of conveyor belts and underground pipelines transports product from mines in the interior of the country to processing plants on the coast, a distance of nearly 400 kilometers (249 miles). The system avoids the need for a railway line or a large fleet of trucks and has helped the company stay competitive despite rising fuel costs.

In September 2011, Samarco launched a US\$20 million project to secure and install a new ship-loader machine at the seaport terminal in Ubu, where iron ore is loaded onto ships and then delivered to customers

# 400

The kilometers (249 miles) that iron ore travels from interior mines to coastal processing plants in Brazil via conveyor belts and pipelines

# AU\$471 million

Budget for a new Western Australian nickel mine

# 60%

The portion of a South African company’s coal production that will be replaced or upgraded

across the world. The new machine loads 15,000 tons per hour—an improvement of 5,000 over the old machine. It also comes equipped with state-of-the-art smart components.

“The software reads and controls all the signals from instruments, keys and sensors in the network, facilitating the detection of faults with greater accuracy and speed,” says Paulo Cesar Paiva Martins, PMP, the project manager, in São Paulo, Brazil. Taking the guesswork out of the process not only increases efficiency, it also makes operating the machine much safer.

Mr. Paiva took over the project, owned by mining equipment supply company Sandvik, after supply-chain logistics in China resulted in a six-month delay. “The penalties for rescheduling transport by ship are very high,” says Mr. Paiva, who adds that more upfront planning could have prevented the problem. “A month spent in the engineering phase



**“Mining projects require a broader view, a more business-oriented leadership style and the conviction that following project management best practices is the right way to go.”**

—André Choma, PMI-RMP, PMP, Vale, Belo Horizonte, Brazil

means two months less spent in the factory.” To make sure things went smoothly the second time around, Mr. Paiva traveled to China to oversee the completion of manufacturing and the process of loading the machine onto the transport ship.

When the machine arrived in January, his team worked closely with customs officials to unload it at the port in just one day. “This was a very risky part of the project,” says Mr. Paiva, who was on-site every day to supervise. After unloading the machine, the team had just nine days to complete the installation. “The rest of the installation schedule was divided into hours, and we had a recovery plan for every possible deviation,” he says.

### People Skills, Net Gains

As mining companies look for ways to innovate, project practitioners must move in lockstep with the organization’s strategic vision, anticipating needs at every level, from senior leaders to subcontractors. According to John Matechuk, PMP, the only way to do that is to listen to what people have to say.

Mining explosives provider Orica, headquartered in Melbourne, Australia, hired Mr. Matechuk in June 2012 to oversee a CA\$4 million project to

## DIGGING IT OUT

For today’s mining projects, innovation is the



### 1 NICKEL

**Company:** Sirius Resources

**Project:** Nova-Bollinger

**Location:** Western Australia

**Budget:** AU\$471 million

With oversupply driving down prices, many high-cost, short-term nickel mines are shutting down, raising the risk of future shortages. This mine aims to keep costs low over the long haul to meet future demand. Following a feasibility study early this year, on-site construction and underground development could begin as early as July, with production slated for 2017.

upgrade the explosive manufacturing facilities for its client Copper Mountain Mining Corp., which has a copper mine in southern British Columbia, Canada. The existing explosives facility was operating under temporary permits set to expire. To continue operating at full capacity, Orica needed to construct a permanent manufacturing facility that would meet building, safety and security codes. Due to rules governing the management of explosives, the facility also had to be located within a certain distance of the mine.

With so many variables and so many interests at stake, Mr. Matechuk sat down with each stake-



mother lode.



## 4 COAL

**Company:** Sasol

**Project:** Project 2050

**Location:** South Africa

**Budget:** R14.6 billion

Sasol, a South African energy and chemical company, has four mines nearing the end of their life cycle. To extend operations in the region until 2050, it's undertaking a program to replace or upgrade 60 percent of its coal production. A new shaft at the Twistdraai colliery has been completed, while the Impumelelo and Shondoni collieries are on schedule to be operational this year and next, respectively. The modernized, expanded Secunda plant will see greater production and operational flexibility by late 2014.

## 5 LITHIUM

**Company:** Orocobre

**Project:** Olaroz

**Location:** Jujuy, Argentina

**Budget:** US\$229 million

As interest in electric and hybrid vehicles grows, so does the demand for lithium-ion batteries. With lithium in short supply, mining companies are teaming up with auto manufacturers to secure resources for future markets. Orocobre launched its Olaroz project in partnership with Toyota in November 2012, with initial battery-grade lithium carbonate production scheduled for mid-2014.

## 2 GOLD

**Company:** Cayden Resources

**Project:** El Barqueño

**Location:** Jalisco, Mexico

**Budget:** US\$5 million

With gold prices in free fall, Cayden is delaying exploration of more challenging and time-consuming drilling locations to focus on known quantities nearer the surface at this historically productive site. In July 2013, the company more than quadrupled its land holdings in the area. The company later received drilling permits that allowed it to broaden ongoing phase-one project exploration, with the aim of mapping mineral targets.

## 3 COPPER

**Company:** Hot Chili

**Project:** Productora

**Location:** Chile

**Budget:** US\$500-700 million

Located along existing transportation routes, this near-surface prospective copper and gold mine will enjoy access to abundant power and water. Exploratory drilling began in February 2013 and will conclude in the first half of this year. The company plans to follow up with a bankability study and to decide whether to mine by mid-2015.

holder to discuss the project before proceeding. "What success looks like to one stakeholder may be a failure to another," he says. "I wanted to know exactly how each person would define a successful outcome of the project."

Through these meetings, he identified project changes and improvements. By investigating stakeholder suggestions, he determined that a gravel pit on company property would cost less to develop than the original site the company had initially selected. A site supervisor helped him identify an operational shortfall in the system for obtaining tare weights for trucks delivering explosives

to blast sites. By involving Orica in a search for surplus equipment, Mr. Matechuk was able to locate and plan for a scale at the facility, reducing by half the number of trips each truck needed to make. Still another conversation led him to improve worker amenities such as lockers, changing facilities and break areas—potentially boosting employee retention rates.

"In the freezing cold, far from modern conveniences, you'd be amazed at the difference a little thing can make," Mr. Matechuk says.

With big changes sweeping the mining industry, every little thing adds up. —*Kate Sykes*

# AN OLYMPIC EFFORT

**Reports of delays plagued** the Olympic Games in the months before their immovable February start date. Construction delays put the 2014 Sochi Main Olympic Village four months behind schedule. “Of course, this was not possible,” says Dragan Pavelic, managing director of Division Serbia and Russia and neighboring countries, Strabag, the project’s Vienna, Austria-based general contractor.

Faced with a finish line that couldn’t be budged and a delay of more than 220 days before it was handed the project, the team took decisive action: “We made accelerations in our work,” Mr. Pavelic says.

There was, however, a massive amount of work to accelerate—compounded by difficulties securing the needed workers and materials.

The project scope encompassed 58 buildings and 2,711 apartments comprising nearly 1 million square feet (92,900 square meters), plus 65,000 square feet (6,039 square meters) of balconies. “That’s 58 times you have to do foundation work, insulation work, air ducts—everything, all starting from zero,” Mr. Pavelic says. “Controlling and supervising all this work is really quite demanding.”

While Strabag had parallel construction schedules for the project’s six construction zones, achieving a faster speed came down to getting more workers. But a labor shortage in Sochi had major implications for Strabag’s budget of US\$481.5 million, as in-demand subcontractors raised their rates—in some cases by as much as 50 percent, Mr. Pavelic says. “If your goal is to meet your budget, you cannot hire the most expensive companies,” he says. “You have to hire the companies you can get for a reasonable price.”

**“Controlling and supervising all this work is really quite demanding.”**

—Dragan Pavelic, Strabag, Vienna, Austria



## 1 CHALLENGE 3 PROJECTS

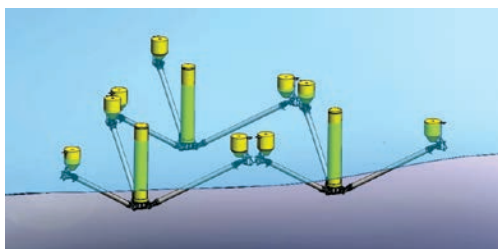
### Sea Change

For more than two centuries, scientists have dreamed of tapping the oceans’ enormous stores of mechanical energy. Only recently, however, have organizations been translating that idea into significant projects. Waves alone could supply 15 percent of the United States’ electricity needs, according to the Electric Power Research Institute. Three innovative projects look to the sea for a clean, renewable source of energy.

—Rekha Radhakrishnan

### 1 Net Gains

Like its namesake, the Squid sends out its tentacles—not to ensnare prey, but to harness energy. Albatern, an energy company based in Roslin, England, is testing a lightweight wave energy converter called WaveNET. It’s made up of multiple, interconnected Squids—units with nodes that sit just below the ocean’s surface. The nodes respond to the pressure of the waves, capturing energy that moves a water pump, then drives generators. The company is constructing a six-unit WaveNET array to be deployed in Galway Bay, Ireland, slated for completion by mid- to late 2014.



Albatern’s distinctive approach to wave energy reduces the operational challenges of deploying larger structures while allowing the devices to be tailored to a particular site. However, that also means extra upfront work: Each system requires site-specific planning and design, which takes time. The process for designing the six-unit array includes a design review after the first and third units, so improvements can be made to the later ones.

“Our experience is that, with a completely new type of device, some elements can only be learnt from trial,” says

Albatern CFO David Campbell. “This can sometimes lead to unexpected results, making planning and executing the trial important to develop the ongoing process. It also requires that this uncertainty is recognized, and budgets and timelines must be built with these contingencies in mind.”

The Main Olympic Village,  
Sochi, Russia



PHOTO COURTESY OF SOCHI 2014 WINTER GAMES

To make sure that low-cost labor didn't result in low-quality work, Strabag imported 360 highly specialized workers to keep up the pace of the project and ensure quality. While this increased costs,

the team made front-end design modifications and incorporated other value engineering solutions that saved money on materials and technology.

The racetrack hurdles didn't end there. With just

## 2 Bottom Feeder

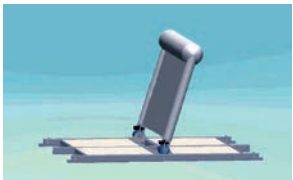
One wave-power initiative is journeying to the bottom of the ocean. Near the coastal town of Yakutat, Alaska, USA, a wave-energy converter called SurgeWEC will sit on the seabed, moving back and forth like a paddle in response to waves that pass overhead. The extracted wave energy will drive a pump that sends pressurized seawater to shore, where a generator will produce electricity for the local grid. If successful, the device will mark

the first commercial wave energy implementation for technology developer Resolute Marine Energy, Boston, Massachusetts, USA.

As part of the project to develop and deploy the device, slated for 2015, Resolute is studying the power generated by waves, the geotechnical features of the seabed, and

the potential impact on fish and wildlife. The compact device will adjust to varying power needs and adapt to different climates.

The project team thus far has learned the valuable lesson of determining when to do it alone and when to get help—or, as Resolute CEO Bill Staby says, “identifying areas of work where finding specialists really makes a difference and areas that we are better off tackling on our own.”



## 3 Island of Opportunity

A project near the Isle of Wight intends to take advantage of the water—and the energy—that's all around it. This year, German maritime engineering firm Schottel plans to launch two tidal turbines on England's largest island. As currents turn the turbines on a moored underwater platform developed by local company Sustainable Marine Energy, an asynchronous generator on board the platform

will convert the energy into electricity brought to shore by a sea cable.

With offshore energy, the challenge is in development costs for tools like sea cables that connect generators to grids, because these projects are often located farther away from major

transmission lines, the project team found.

For a second, large-scale demonstration project (up to 2.5 megawatts) using TidalStream Ltd. platforms, Schottel intends to defray the high expense of offshore production by using a site with a solid economic infrastructure, where revenue generated from electricity could offset costs.





## LONDON LEGACY

For lessons learned on how to give Olympic facilities a second life, the Russians can look to London. "Our premise was, we're designing for legacy, and, oh, yes, we happen to be accommodating the games first," Ken Durbin, a technical director with CH2M Hill, one of the London Games' three project management firms, told *Fast Company*. The legacy has begun:

### 1. OLYMPIC STADIUM

**Olympics:** 80,000 seats for the opening and closing ceremonies

**Second life:** Future 54,000-seat home of West Ham United Football Club

### 2. BASKETBALL ARENA

**Olympics:** A temporary structure for the games. (Basketball has yet to catch on in England.)

**Second life:** To be seen: It's for sale for US\$3.3 million.

### 3. ATHLETES' VILLAGE

**Olympics:** Nearly 3,000 units without kitchens (to accommodate more athletes)

**Second life:** With kitchens installed, the Village is now East Village, a neighborhood that saw its first residents in mid-2013.

### 4. AQUATIC CENTER

**Olympics:** Most of its 17,500 seats were in detachable wings.

**Second life:** With glass walls where the wings used to be, the facility now seats 2,500 and opened for local use early this year.



one main road into Sochi, deliveries were highly regulated and restricted, so the Strabag team stockpiled materials on-site. The team also had to reconcile Russian building codes with International Olympic Committee standards, all while dealing with a burdensome permitting process.

With its extra resources and flexible approach, the project team delivered the Village within budget in December 2013—more than a month before the Opening Ceremony on 7 February 2014.

### Critical Thinking

The Village's completion probably won't be enough to silence the Sochi Olympics' critics, however.

The Russian government has encountered accusations of corruption and collusion that resulted in kickbacks from the construction industry, inflating the cost of the Sochi Olympics. At US\$50 billion, it's the most expensive Olympics ever. Meanwhile, environmental activists have accused the Olympics of environmental degradation, while labor advocates say construction crews faced adverse working conditions and unpaid wages.

According to Mr. Pavelic, Strabag responded to environmental concerns with appropriate protections, and to political concerns by maintaining a strict code of ethics for its employees.

"There were several allegations against construction companies, and we faced many inquiries regarding this topic," Mr. Pavelic says. "In Sochi, we tried to work with subcontractors whom we could trust and who have proven to fulfill their liabilities. However, on a site like the Main Olympic Village in Sochi, with numerous projects ongoing, it is inevitable that we have to work with subcontractors who do not have a track record with us."

Strabag did not have as much control over its subcontractors as it would on typical projects, Mr. Pavelic says: "The structure of our contractual arrangements with our employer [Russian investment group Basic Element] did take some liberty of choosing subcontractors away from us."

Yet Mr. Pavelic cites the project's positive reception in the community, where it's hoped the Olympics' legacy will turn the coastal city of Sochi into a year-round tourism destination.

"The feedback from the people, authorities and local journalists has been very positive," he says. —*Matt Alderton*

# Philippines Rising

**With wind speeds of 300 kilometers** (186 miles) per hour, Typhoon Haiyan would've been destructive anywhere. But the storm was even more devastating because it hit the Philippines—where poor infrastructure both forces people to live on the coast and hampers relief efforts. Haiyan, known as Yolanda in the Philippines, killed more than 6,000 people, displaced 4.4 million and caused PHP571.1 billion in damage.

Seventy-four percent of the roads in the Philippines are unpaved, which encourages people to remain on the coast and rely on fishing, agriculture and remittances to survive. These shantytown communities were particularly hard-hit by Haiyan. After the typhoon, relief organizations had to use flights and ferries to reach damaged areas because the roads that do exist were blocked or bridges were broken. As those groups tried to coordinate volunteers, they also struggled with poor cell phone coverage.

“Undeniably, higher-quality infrastructure or better coverage prior to the disaster could have facilitated recovery and relief,” says Ramesh Subramaniam, deputy director general, Southeast Asia department, Asian Development Bank, Manila, the Philippines. “However, it is the scale and magnitude of the disaster that have posed more major challenges.”

The November typhoon is merely the latest in a regular string of natural disasters hitting the country. Six to nine typhoons make landfall each year, almost 900 earthquakes occur annually, and the islands are home to 20 active volcanoes. Poor infrastructure means natural disasters here tend to be more deadly: The Philippines led the world in disaster mortality in 2012 with more than 2,000 people killed, while China, in

**“Haiyan has clearly shown the need for boosting resilience.”**

—Ramesh Subramaniam, Asian Development Bank, Manila, the Philippines

Laguna de Bay, the Philippines, during Typhoon Haiyan





second place, had 802 deaths, according to the Centre for Research on the Epidemiology of Disasters.

### The Roads Ahead

Infrastructure development has been front and center since President Benigno Aquino III took office in 2010. Spending on roads, public works and airports rose 47 percent in the first eight months of 2013.

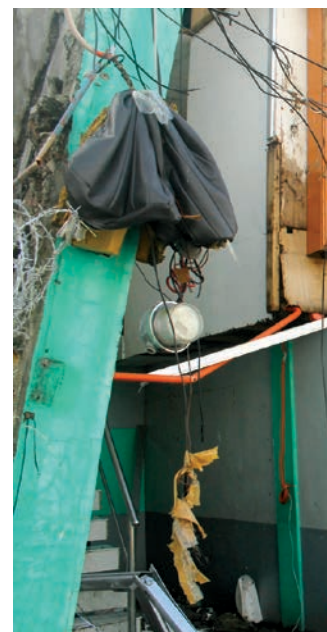
Following Haiyan, infrastructure project plans accelerated: The government has unveiled ambitious plans to rebuild within four years. “We know that we cannot allow ourselves to be trapped in a vicious cycle of destruction and reconstruction. We know that it is more efficient to prioritize resilience now, rather than to keep rebuilding,” the president announced.

The Reconstruction Assistance on Yolanda (RAY) plan, based on lessons learned from previous disasters in the Philippines and elsewhere, prioritizes transportation and power infrastructure, housing, and water and sanitation systems for the first six months. Road repairs are slated to be completed in one year, with priority given to national primary arterial roads and bridges.

A more controversial proposal by the government designates “no build zones” in disaster-prone areas.

“This can get very politically charged, since you tend to see lower socioeconomic groups living along the coastline in squatter settlements and shanties,” says Michele Devlin, a Red Cross volunteer in the Philippines and professor of public health at the University of Northern Iowa, Cedar Falls, Iowa, USA.

The government estimates PHP361 billion is needed for rebuilding, with PHP28 billion for



## A FRAMEWORK FOR U.S. GOVERNMENT IT

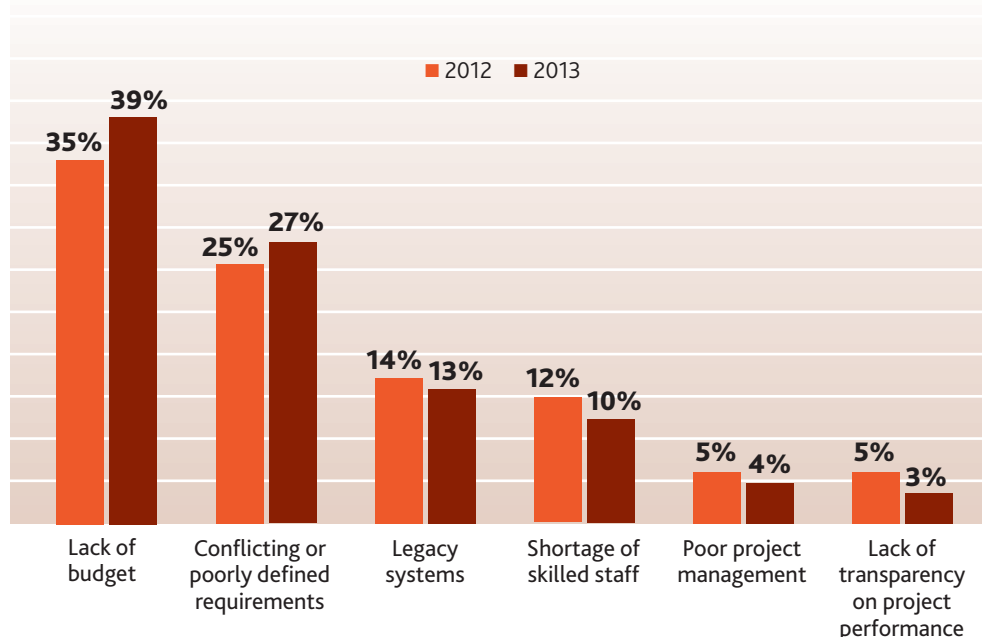
Cyberattacks are grabbing the headlines—but that’s not the only issue for U.S. government IT leaders. While they’ve made progress, there’s still work ahead. *By Margaret Poe*

### TOP PRIORITIES

U.S. Federal IT Leaders’  
Top Five Priorities

- 1 Cybersecurity
- 2 Disaster recovery planning
- 3 Data records management
- 4 Virtualization
- 5 Data center consolidation

### BIGGEST BARRIERS TO IT PROJECT EXECUTION





public infrastructure alone. This includes money for projects that would offer stronger protection from future disasters. “Haiyan has clearly shown the need for boosting resilience,” says Mr. Subramaniam.

Much of the financing for the reconstruction program will come from the private sector. Still, the Philippines will need help from outside organizations to avoid undercutting much-needed infra-

structure investments elsewhere in the country, the RAY plan states.

In January, a project to build temporary bunkhouses for thousands of displaced residents suffered a temporary setback after construction had started. The bunkhouses’ design changed in response to feedback from international experts who had visited the devastated areas. “At least 10 different organizations” weighed in on the project plan, Rogelio Singson, public works and highways secretary, told *The Wall Street Journal*. Feedback incorporated into the modified project plans includes the need for increased living spaces and better ventilation. It will take at least three years to complete the housing project, Mr. Singson said.

In these areas and in cities across the country, banners have been raised that say “bangon,” which loosely translates to “rise up” in Tagalog—a call to action to help rebuild. —*Ambreen Ali*

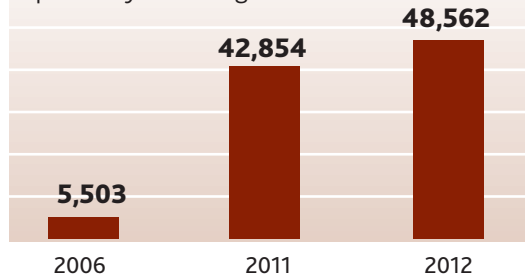
The government estimates

**PHP361 billion**

is needed for rebuilding, with **PHP28 billion** for public infrastructure alone.

#### NUMBER OF CYBERSECURITY INCIDENTS

Reported by federal agencies



**US\$82 billion**

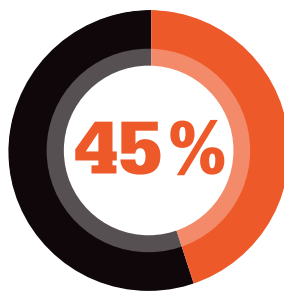
The U.S. government’s investment in IT services in 2014—up 2.1% from 2013

**US\$13 billion**

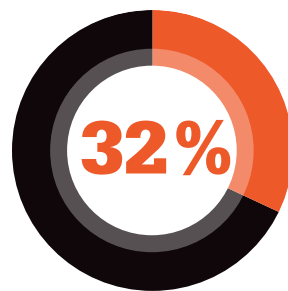
Value of cybersecurity programs in the 2014 federal IT budget—nearly 16% of the total

**US\$148 million**

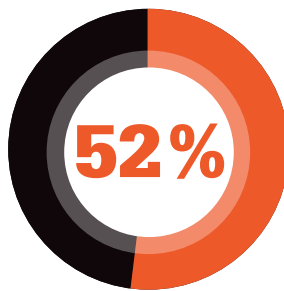
Money risked per US\$1 billion spent on government programs due to ineffective program management—nearly 10% more than in the private sector



... of federal organizations have a strategic IT plan that they follow.



... of U.S. tech leaders say their agency has metrics in place to demonstrate ROI of IT investments.



... of government program managers frequently focus on department objectives rather than strategic goals.



**1 in 4**

... government organizations has a defined career path for project and program management—17 percentage points lower than the global average.

Sources: InformationWeek; U.S. Government Accountability Office; *The Washington Post*; *Pulse of the Profession*®, PMI, 2013



# Carbon Cars

**Thinner than paper yet tougher than steel,** carbon fiber might represent the future of the electric-car industry. German auto brand BMW has spearheaded a carbon-fiber project that industry analysts say could signal the biggest shift in auto manufacturing since the first all-

aluminum car frames were made in the 1980s, according to Bloomberg.

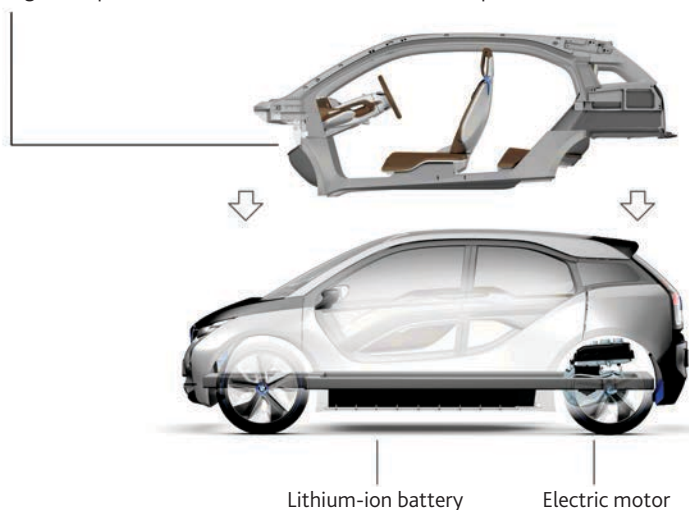
In November 2013, BMW released its i3 electric car, the first mass-produced vehicle with a passenger cell made entirely of carbon-fiber-reinforced plastic (CFRP). Electric cars made of traditional



The BMW i3

IMAGES COURTESY OF BMW GROUP

Passenger compartment made of carbon-fiber-reinforced plastic



steel tend to be slow-moving due to the heavy battery pack needed to hold a charge for at least 100 kilometers (62 miles). Carbon fiber reduces a typical electric car's weight by 250 to 350 kilograms (550 to 770 pounds). "And that more or less compensates for the weight of the battery," Daniel Schaefer, who oversaw development of the i3 production, told ExtremeTech.com. The i3 weighs in at 2,700 pounds (1,225 kilograms)—20 percent less than the world's best-selling electric car, the Nissan Leaf.

"This is really the first time we're seeing a traditional premium brand automaker offering dedicated products that are designed from the ground up to be an electric vehicle, rather than taking the existing vehicle platform of a conventional car and adding batteries and an electric

motor to it, which other companies have been doing for quite some time," says Thilo Koslowski, vice president and automotive practice leader based in Santa Clara, California, USA for IT research firm Gartner. "Using carbon for the entire vehicle structure in a mass-produced vehicle is very innovative and new."



**"Using carbon for the entire vehicle structure in a mass-produced vehicle is very innovative and new."**

—Thilo Koslowski,  
Gartner, Santa Clara,  
California, USA

Faced with tightening emissions regulations, auto manufacturers are looking to electric cars and CFRP to help them stay competitive. "As the automotive industry inches closer to meeting the U.S. Corporate Average Fuel Economy targets and Euro emission norms, CFRP as a solution offers a whole new range of opportunities," says Vishwas Shankar, an automotive and transportation senior consultant for Frost & Sullivan who is based in Detroit, Michigan, USA.

That could mean big (but light) things for electric-car projects in the future.

"Other car manufacturers are taking a close look at how sustainable carbon-bodied cars are from a profitability and longevity perspective," Mr. Koslowski says. "If the lessons learned are positive, then I expect other vehicle manufacturers will follow suit." —Rachel Bertsche

The i3 weighs  
in at 2,700  
pounds (1,225  
kilograms)—  
**20**  
percent  
less  
than the  
world's best-  
selling electric  
car, the  
Nissan Leaf.



## OIL SLICK

The United States—long the world's largest consumer of oil—is set to become the leading global oil producer by 2015, according to an International Energy Agency report. Hydraulic fracturing and horizontal drilling technology have allowed companies to tap reservoirs across the country—and helped the United States add nearly 1.2 million barrels per day of oil production capacity from 2008 to 2012.

Now, organizations are in need of the pipelines, processing facilities, maritime vessels and barges to transport that crude and refined oil. Nearly US\$1 trillion in expected petroleum infrastructure projects will be funded between 2014 and 2025, according to a report by IHS Global Inc. More than half of that investment will be in the South.



## BREAKING NEW GROUND

The Middle East is getting a major makeover: By 2030, it will complete 117 megaprojects—each with a budget of at least US\$1 billion. *By Margaret Poe*

# US\$1 trillion

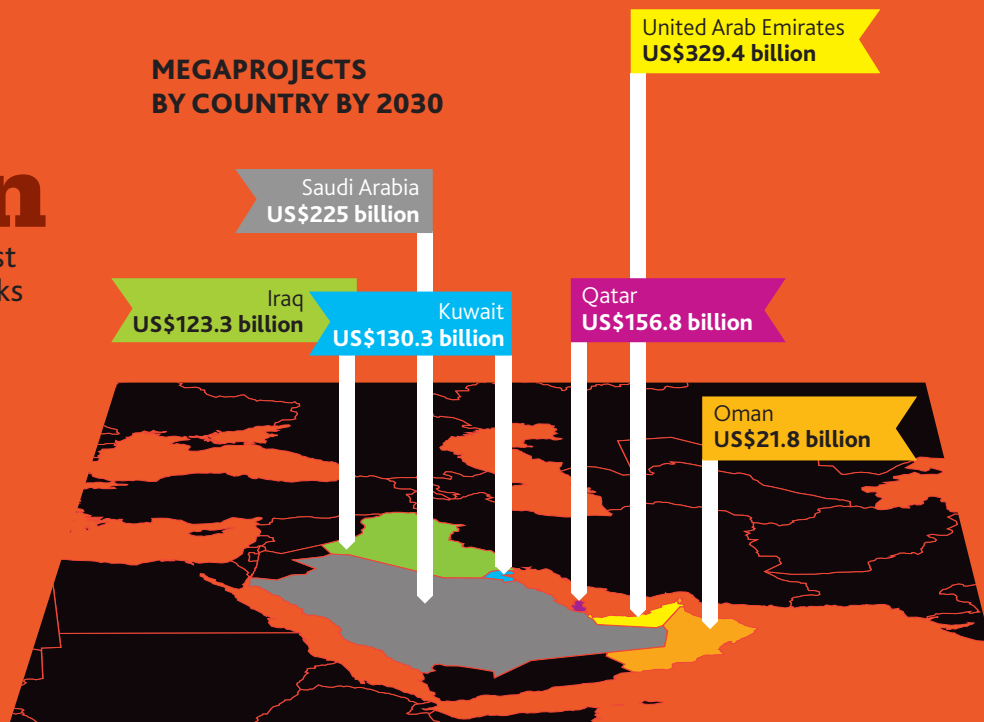
Total value of Middle East megaprojects in the works



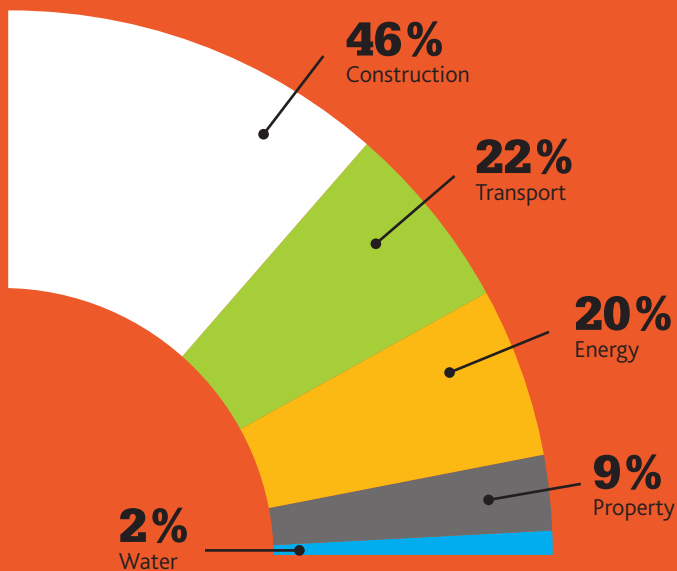
# 73%

Valued above  
US\$10 billion

### MEGAPROJECTS BY COUNTRY BY 2030



### MEGAPROJECTS BY SECTOR



# US\$144 billion

Scheduled construction in  
2016—twice that of 2013

## POTENTIAL RISKS

### LABOR SHORTAGES

**69%** of Middle East CEOs say access to skilled talent poses a potential threat to growth.



**1.2 million** construction workers needed from 2014-2019, plus 135,000 professional staffers



**20,000 to 44,000** workers needed per US\$1 billion spent—including consultants and managers

### INFLATION



Construction inflation could peak at **16-20%** from 2016-2019.

### BUDGET AND SCHEDULE OVERRUNS

**64%** of Middle East capital projects ran over budget in 2012.

**80%** were delayed in 2012—and nearly half the projects were behind more than 6 months.

## SECTOR SPOTLIGHT



### HEALTHCARE

**US\$22.5 billion**

Healthcare projects under construction in the region

**US\$21.3 billion**

Regional healthcare projects to be awarded by 2016

**Project Spotlight** Sidra Medical and Research Center, Doha, Qatar

The 227,000-square-meter (2.4-million-square-foot) complex will include three hospitals and a research center and will hire 4,500 medical staff members.

**Budget** US\$7.9 billion

**Schedule** 2008-2015



### TOURISM

**US\$23 billion**

Expected economic impact of the Dubai Expo 2020, which could draw 25 million people

**US\$20 billion**

Qatar's planned investment in its tourism infrastructure by 2022, when it will host the FIFA World Cup

**Project Spotlight** Bluewaters Island, Dubai, UAE

The mixed-use development will feature retail, residential and entertainment, including the world's largest Ferris wheel, the 210-meter (689-foot) Dubai Eye.

**Budget** US\$1.6 billion

**Schedule** 2013-2018



### TRANSPORT

**US\$35 billion**

Rail and metro projects awarded in the Middle East in 2013

**US\$155 billion**

Regional metro and rail projects to be completed by 2030

**Project Spotlight** Haramain High Speed Railway, Saudi Arabia

The 449.2-kilometer (279-mile) network will link major cities and pilgrimage sites with trains running up to 360 kilometers (224 miles) per hour.

**Budget** US\$16.5 billion

**Schedule** 2009-2015