



GLOBAL
INFRASTRUCTURE
INITIATIVE

By McKinsey & Company

Singapore 2017 Summit: New Solutions for Global Infrastructure

Outcomes Report
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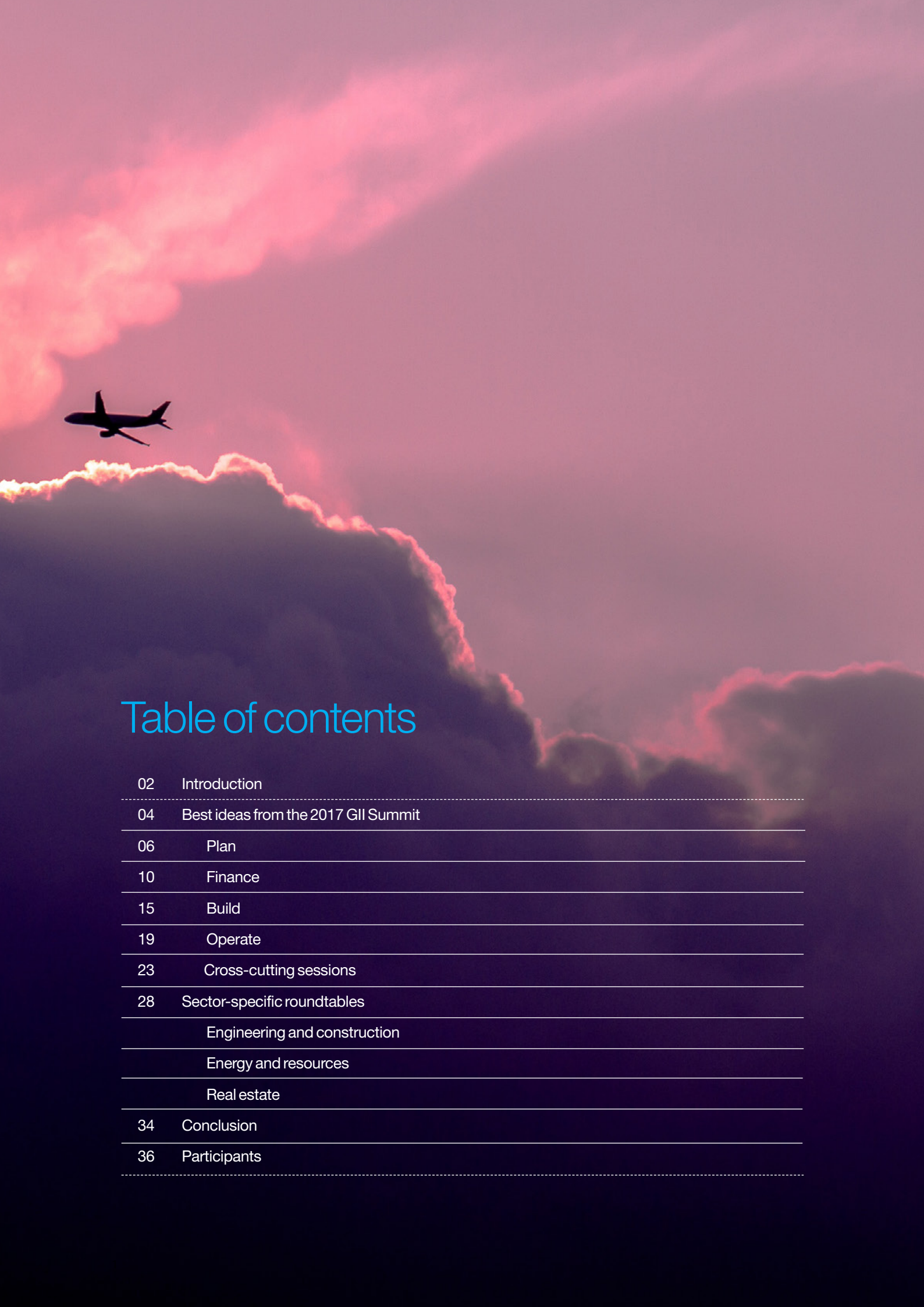


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Introduction

Asia is a megahub for infrastructure and, according to McKinsey's Infrastructure Projects Analytics Tool, has attracted 39 percent of the global spending on existing and pipeline megaprojects, totaling \$10.4 trillion. Asia's infrastructure megaprojects number approximately, 1,100 ongoing and 1,460 in the pipeline, illuminating the region as an infrastructure hot spot. For these reasons, we were excited to host the fourth Global Infrastructure Initiative (GII) Summit in Singapore — our first time in Asia.

Since its inception in 2012, GII has evolved from a summit held every 18 months into a global movement that includes roundtables in cities around the world, innovation site visits to experience the greatest advances in infrastructure and capital projects, and a quarterly digital publication that shares the insights from all our programs with the GII community of more than 5,000 leaders.

GII was established for two primary reasons: to create a forum for global leaders from across the value chain to exchange ideas and to identify ways to improve the delivery of essential infrastructure and get more out of existing assets. While networking and an exchange of ideas are critical first steps, we wanted to set a higher aspiration for GII — to use GII as a means to start improving the performance of infrastructure and the entire industry. Based on our pre-event survey of GII participants, the enthusiastic dialogue at the summit, and the GII community's collective focus on actions, we believe we are making progress.

The latest McKinsey Global Institute (MGI) research suggests that bridging global infrastructure gaps is more important than ever. To keep pace with projected economic and population growth, the world needs to invest an average of \$3.7 trillion annually, or 4.1 percent of gross domestic product (GDP), in economic infrastructure until 2035. That figure is up from our 2016 estimate of \$3.3 trillion annually until 2035. Yet in both the developed and developing worlds, significant gaps persist between this projected necessary investment and actual investment — a gap estimated to be \$5.5 trillion worldwide between now and 2035.


MGI research also shows that this gap will not be closed by increasing infrastructure funding alone. The industry must improve the effectiveness and efficiency of project delivery — an action that could free up a substantial amount of funding for more infrastructure investment. If construction productivity were to catch up with the total economy, for example, the industry could save \$1.6 trillion in value each year.

Based on the need and opportunity, we selected “New solutions for global infrastructure” as the 2017 GII theme, focusing on the levers and actions that can help close the infrastructure gap and best position global economies to meet increasing demands on their infrastructure. Notably, across our sessions at the summit we heard from leaders about steps they are taking to improve productivity and efficiency and how they are thinking about the potential of digital technologies and analytics to disrupt the industry in a positive way.

What you told us in the GII survey

Plan	<p>44% spend 5%+ of a project's budget on upfront planning and design; 49% have increased spend</p> <p>55% feel governments are doing a better job evaluating and working with new projects</p> <p>71% budget for and track community support of projects; 76% expect this to increase</p>
Finance	<p>48% of organizations always evaluate total life-cycle cost in up-front planning; only 9% never do</p> <p>76% of organizations have re-evaluated their approach to contracting within the last 2 years and</p> <p>63% report using creative contracting frameworks (e.g. relational or performance-based contracts)</p>
Build	<p>46% have piloted a construction innovation in the past five years</p> <p>82% of organisations are attracting the top talent they need and are prioritizing diversity</p>
Operate	<p>58% state that their organisation is using technology and big data to optimise asset usage</p> <p>70% of asset operators earn ancillary revenue; 42% of those earn >3% of annual revenues.</p>

We sincerely thank our partners: Macquarie, Siemens, Spencer Stuart, and Surbana Jurong. We also acknowledge our media partner, TIME, and our institutional partners, IE Singapore, the Economic Development Board, and the Monetary Authority of Singapore. Without their collective support, the 2017 GII Summit would not have been possible.

In this report, we draw on the best ideas of the 2017 GII Summit with the aspiration to help drive positive change across the industry. 

Best ideas from the 2017 GII Summit

The goal of GII is to identify themes, insights, and practical actions that can be applied by stakeholders across the value chain and diverse asset classes. Our hope is that the industry leaders who joined us in Singapore—and the thousands of others throughout the GII community—will use these actions as guideposts as they develop their own strategies to push for a more innovative and productive future for the industry.

We also hope the GII community will join us in driving these actions forward. Through roundtables and site visits over the next 18 months, we will aim to make progress on the ideas and actions that surfaced in Singapore. **We ask that everyone make a commitment to implement at least one of the ideas before we reconvene in Europe in 2018, as progress will only be achieved if all stakeholders take action.**

Here are the highlights from the 2017 GII Summit, followed by an analysis of each.

PLAN

- Reconcile long planning cycles with rapidly changing expectations and usage patterns.
- Make better use of digital technology (especially that which is already proven) to understand needs.
- Evolve the public-sector procurement process to focus on outcomes.

FINANCE

- Improve project bankability by shifting toward the subsidization of individual users.
- Measure, track, and elevate the performance of government organizations in the execution of PPPs.
- Use big data and advanced analytics to better price risk into the underwriting process, enabling capital flows in infrastructure.

BUILD


- Adopt relational contracting to promote a collaborative project environment instead of one based on conflict.
- Make skill- and capability-building activities an ongoing practice.

- Learn from other industries to embrace rapidly evolving technologies and create a culture of innovation.

OPERATE

- Integrate data and leverage technology to optimize project design and drive asset efficiency.
- Develop a digitization strategy that drives productivity and innovation while protecting against cyberattacks.
- Shift from rules-based to outcomes-based procurement.

Cross-cutting sessions

- Embrace gender diversity to tap into the next big skills disruption and drive better performance.
- Make decisions and take action for the long term.
- Consider engaging with the Belt and Road Initiative. 

We'd like to hear from you if any of these ideas inspired changes in your organization and about how your organization is innovating. We also welcome recommendations on areas to focus on at future roundtables or disruptive projects or practices to consider for site visits. Please send your updates, ideas, or suggestions to info@giiconnect.com.



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PLAN

Reconcile long planning cycles with rapidly changing expectations and usage patterns.

Most economists agree that the right infrastructure investment is a vital stimulus of economic development, especially when the outcomes result in improved mobility. However, the long planning cycles are constraining our ability to deliver projects at a pace that keeps up with changing user needs and new mobility models, which are increasingly driven by rapid advances in technology.

For example, it took 12 years to come to a decision on adding a third runway at Heathrow, and it is expected to take another 18 years to complete the project. Meanwhile, the technological advances of smaller jets capable of long-range flights have some questioning the long-term viability of the airport industry's hub-and-spoke model. The speed of change—for example, the commoditization of automobiles, thanks to car-sharing services and the introduction of autonomous vehicles—already exceeds the ability of most planning agencies to react. As one participant observed, “Innovation and cities don’t find each other so often.”

To adapt to ever-evolving technology, infrastructure planners and public officials need to improve the speed of decision making, streamline regulatory or political processes that can cause delays,

and increase the flexibility of their plans. Once in motion, it is essential that they frequently assess the viability of long-term plans to ensure that, once completed, they will have the desired impact. “We need to build infrastructure that retains flexibility for change over time,” said MTR Corporation CEO Lincoln Leong.

“Regarding long-term strategic planning, we need politicians that are visibly willing to take the lead and passionately convince the public against short-term interests.”

—Uwe Krueger, Former Chief Executive Officer, Atkins Global



Make better use of digital technology (especially that which is already proven) to understand needs.

The same technologies that are changing infrastructure usage patterns also deliver a tremendous data-gathering platform to predict what will be needed in the future. Collection of this data, combined with tools that facilitate stakeholder collaboration, offers the potential to make planning more transparent, informed, and inclusive. This approach also allows planners to segment projects into smaller modules, targeting quick wins in user experience that will drive public support for additional investment. Truly “smart” cities will make much more data publicly available to foster a more bottom-up approach to finding the best solutions when planning infrastructure.

“The greatest contribution of new technology is not changing our approaches to the planning process but rather changing our approach to gathering data that informs what communities and users need. So technology will not replace our existing staff. It enables and requires our existing staff to be even better planners.”

—Heang Fine Wong, CEO, Surbana Jurong

Internet of Things sensors are also starting to supply tremendous amounts of new information—including operational, usage, and maintenance data—that enable planners to optimize a project’s design for greatest efficiency over the full life cycle of the asset. For example, the Dallas/Fort Worth (DFW) International Airport invested in a new visual occupancy system in the parking garages that uses sensors to determine if a space is occupied or not. This system helps passengers find spots more efficiently, sends data to inside the terminal to predict passenger volumes and staffing needs, and increases parking revenues.

With infrastructure operators aggressively testing new technologies across the world, planners need to be even more attuned to global innovation and the significant benefits of mainstreaming proven technologies. As former Atkins Global CEO Uwe Krueger attested, “Our industry has woken up and is embracing technology in a completely different way. With all the digital tools available today, we can do scenario planning that future-proofs the planning process.”


Evolving the public-sector procurement process to focus on outcomes.

The public sector should move rapidly to tendering for desired outcomes and value provision rather than for specific solutions. For example, in New Zealand, a road project was tendered based on the actual performance of the road instead of the area of pavement laid. In the US state of Maryland, the government went to the market and said, “Whoever provides the best solution to relieve congestion on a 17-kilometer stretch of road will win the \$100 million tender.” The winning plan increased pavement on only 7 kilometers of the road. Combined with the deployment of advanced technology for traffic management, the contractor achieved substantial improvement with less disruption.

“Australia needed to change the status quo—the way it was purchasing infrastructure, the way it was funding infrastructure. But behind all that, we needed to understand the outcomes that we wanted from infrastructure a lot better. Consensus starts when everyone has a broad understanding that there is a problem that needs to be fixed. If you’ve discussed with enough people the outcomes you’re all trying to achieve, you are probably going to win a lot of allies and get a project moving.”

—Mark Birrell, Chairman, Infrastructure Australia

Australia established an independent statutory advisory board, Infrastructure Australia. Through a comprehensive framework of business case development and assessment, Infrastructure Australia creates an evidence-based list of priority projects to be considered for federal funding. By providing transparency to the public's needs and values, an outcomes-based tender can foster a spirit of cooperation between the private and public sectors that would otherwise default to defensiveness and protectionism.

The public sector also needs to consider which risk factors the private-sector players can control and are willing to take. For example, Infrastructure Ontario helps to manage risk by creating a lower-cost insurance pool for contractors and facilitates discussions on projects where the private sector evaluates risk. 

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FINANCE

Improve project bankability by shifting toward the subsidization of individual users.

Many investors participating in the summit shared that they are keen to increase their investments in infrastructure, but they are continually challenged to find the right projects, as not enough emphasis has been placed on developing pipelines of well-planned, bankable projects that are attractive to private investment. One of the biggest hurdles in attracting private capital to invest in infrastructure is the lack of adequate revenue streams that provide sufficient returns.

While project owners can consider an array of funding and financing mechanisms on a project-by-project basis, conversations at GII centered on public-private partnerships (PPPs), which can face challenges in developing the revenue streams needed. This drawback is particularly evident in projects in which users are sensitive to paying fees such as highway tolls. Today, governments often step in and provide project subsidies to lower fees and make projects more accessible to the broader population of end-users. The catch is that in many jurisdictions, subsidizing the system becomes too big a financial burden for the government or it skews the risk-return profile of the project for private capital.

One alternative approach is to subsidize individual users through tax credits, or some other means, rather than subsidizing the cost to build, operate, and maintain the project. Using this approach, the public sector can establish a market-based fee or toll that is attractive to private capital but keeps the system accessible to lower-income members of the population. Arup Group Chairman Greg Hodgkinson reinforced this approach: “Delivery of the infrastructure project is not the end goal—we do so to facilitate the growth of the economy and enable the society.” The role that the private sector plays in that mission is unquestionable, but its participation depends on the market’s ability to ensure funding and sustainable revenue streams.

“We think that it is very important to ensure two things: efficiency and equity. Efficiency is best achieved by having the right price signals. Equity is best achieved not by subsidizing a particular commodity, but by providing broader-based subsidy schemes to help the poorer families.”

– Heng Swee Keat, Minister for Finance, Republic of Singapore



While some countries such as Australia, Singapore, and the United Kingdom successfully operate toll roads and dynamic congestion pricing, the majority of the world has yet to shift their mind-set. A move to user credits may help achieve that mind-set shift and alleviate the concerns that often make user fees a politically unpalatable issue. As Canadian Imperial Bank of Commerce (CIBC) Managing Director Laurie Mahon emphasized, “Acknowledge that user fees are essential. Transport infrastructure should not be viewed as a public good, and users have to pay for it. As long as it is high-class service, they will.”

Measure, track, and elevate the performance of government organizations in the execution of PPPs.

By definition, PPPs require participation from government. However, politics, competing agendas, and a lack of government capabilities can hinder their successful execution. Private capital views these factors as a risk in the PPP process.

Tactical ideas for optimizing government performance to ensure an attractive value proposition for private investment include the following:

- Creating an independent organization that is staffed to work within reasonable timelines.
- Ensuring the government invests in the initial stages of designing and contracting so the market functions well around the project.
- Conducting outcome-based procurement that includes factors such as ability to meet life-cycle cost, schedule, and sustainability goals.
- Future-proofing project planning, as some assets (for example, roads and energy lines) might be used differently over time.



Countries with clear rules, laws, and processes, along with a transparent and collaborative government, are the preferred targets for investors. As Hastings Funds Management CEO Andrew Day concluded, “A good partnership goes a long way to reduce risk and increase the chance of sustainable assets.” To this end, several jurisdictions (for example, Ontario and New South Wales) have created entities staffed with PPP professionals and a clear mandate to deliver PPPs. The capabilities of these teams, their successful track record, and favorable market terms for projects have enabled PPPs to begin flourishing in these jurisdictions.

“When we talk about the factors that have been so key to our success, first and foremost it’s been around ensuring that we have actual, real, competitive processes in place and that our approach is transparent and fair.”

—Mark Romoff, President & CEO, Canadian Council for Public-Private Partnerships

Use big data and advanced analytics to better price risk into the underwriting process, enabling capital flows in infrastructure.

When applied, technology, big data, and machine learning are increasing the accuracy of long-term demand forecasts, reducing revenue uncertainty, and giving better insight into capital expenditure (capex) and operating expenditure (opex) requirements over the life of an asset. These advances will significantly increase the predictability of outcomes for an asset with a 50-year (or longer) life span and improve investors’ comfort level. Improved predictability and reliability result in better risk transparency and pricing, and therefore investors are likely to require lower returns to support their investments.

“When approaching a new build project that may take decades, it’s important to take a view of the technological risks which will arise over the period of that investment. If building a toll road for example, this could include taking a view on the future of electric cars and automated driving. The impact of all these new technological shifts need to be built into the investment thesis.”

—Martin Stanley, Global Head, Macquarie Infrastructure and Real Assets

Will the availability of such analytics open the door to better-structured and standardized transactions? The desire for such an outcome is apparent and likely achievable in some countries. The creation of a central repository of granular project data that is powered by advanced analytics could enable deep benchmarks, helping investors evaluate risk and returns and helping construction companies execute projects with greater certainty. However, as Multilateral Investment Guarantee Agency (MIGA) CEO Keiko Honda put it, “One size does not fit all, especially emerging markets.”



Given the rate of technological progress and evolution, technology is no longer the primary limiting factor in capitalizing on the opportunities offered by big data and advanced analytics. The change management process and collaboration with diverse stakeholders are the main hindrances. 🌐

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BUILD

Adopt relational contracting to promote a collaborative project environment instead of one based on conflict.

The default contractual approach to construction projects is one founded on risk rather than collaboration. This flawed practice has been a root cause of low productivity in the industry, with stakeholders focused on protecting their own interests instead of working together to develop the best outcome. Owner organizations are often guilty of focusing on risk transference to contractors instead of viewing their supply chain as a strategic partnership.

However, there are examples of closer collaboration generating substantial benefits. In particular, relational contracting is starting to become more prevalent in Australia, the United Kingdom, and the United States. And leading Southeast Asian energy company PT Energy Indika saved 10 percent of its costs thanks to a collaborative approach. Participants noted that collocating the entire design and build team has hefty advantages. For London's Heathrow Airport, for example, bringing together the deep domain expertise of a large energy and construction firm and the client's intimate knowledge of the asset helped produce quality technical results quickly.

Private-sector project owners are leading the move toward greater collaboration. For the public sector to fully engage, it will need to move away from relying on punitive contracts and develop the capabilities to ensure that public interest is being protected. Across both the public and private sectors, this transformation will require owner organizations to become more sophisticated contributors in the design and construction process. To realize the benefits, this change will also require more data transparency and the involvement of stakeholders earlier in the project.

“The pace of change of innovation and technology growth has to be matched by an adequate improvement in the pace of process innovation and sophistication as well. And we’re seeing the emergence or the need for a common platform for owners, developers, contractors, and subcontractors to speak a common language, function around a common contract, and have common incentives.”

—Mukund Sridhar, Partner, McKinsey & Company



Make skill- and capability-building activities an ongoing practice.

The construction industry has a series of capability gaps that need to be resolved to improve productivity and performance. Currently, young engineers tend to be moved from one project to the next, without exposure to the wider project ecosystem. They

are thus unequipped for weathering challenges associated with building and leading a successful team. In particular, participants cited stakeholder management, conceptual thinking, and owner project management skills as core areas where improvement is needed.

Organizations should start looking at different ways of upskilling their workforce by supporting employees' participation in continuing education such as MBA or apprenticeship programs in a range of industries. Participants expressed optimism that these young employees are more likely to stay in the industry when equipped with the right skills to perform.

“I think it’s very clear that organizations need to think about changing their culture. I think they need to develop a learning culture, a purpose-driven culture, and a collaborative culture.”

—Greg Stanmore, Partner, Spencer Stuart


Learn from other industries to embrace rapidly evolving technologies and create a culture of innovation.

Participants discussed increasing evidence of construction projects innovating with processes, technologies, and new materials. They unanimously agreed that the industry is on the verge of disruption as advanced materials, connectivity, data and analytics, and technologies such as Building Information Modeling (BIM), 3-D printing, and augmented reality/virtual reality (AR/VR) are poised to dramatically change how owners and contractors approach work across the project life cycle. MGI research shows that greater adoption of such technologies could support the step-change in productivity so greatly needed across many parts of the industry.

For example, off-site modular construction has become prevalent in the affordable housing market. In the United States, Katterra has dramatically reduced materials waste by moving work from construction sites to manufacturing facilities. At the other end of the spectrum, Bechtel's Curtis Island development successfully deployed industrial modularization, enabling the construction of a project that would have been significantly more complex through conventional means. We are also seeing technological developments—such as drone-enabled 3-D models being used throughout the life cycle in some countries, including China and India.

“Digitalization through 5-D BIM technology combined with prefabrication in modular construction will be the keys to helping our industry catch up with advanced industries.”

—Thomas Wolf, Chief Executive Officer, RIB Software

To create a step-change, companies need to embrace a culture of innovation. The construction industry should learn from sectors or other industries that have successfully made this shift. For example, the mining and resources sector uses automation of trucks and sensor-enabled processes extensively. Infrastructure industry leaders need to aggressively adopt this change to ensure that it filters down to the smaller players. Experience demonstrates that if owners and contractors agree to use a system, the rest of the ecosystem will follow. To facilitate the process, the government could establish an independent body to provide guidance and recommendations on various practices and technologies, as has been successfully done in other industries. 

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OPERATE

Integrate data and leverage technology to optimize asset efficiency.

New technologies and analytics are being used more frequently in the industry to save money, reduce risk, and improve the reliability of assets. Since the development and adoption of this smart-asset management, several industries have changed the way they design and construct assets. However, there is room for the capital projects industry to catch up.

Currently, project owners and contractors still favor the use of bespoke designs for each project. These designs tend to focus on construction and operations specifications outlined at the start of a project rather than long-term needs or even secondary uses of the space, such as commercial or residential space on top of a rail station. The use of data and analytics—from historical operations and maintenance data to trends in consumer behavior—enables owners to optimize assets at the outset of a project to be more cost-effective and better support user needs throughout their life cycle.

Data analysis can also be used to help standardize certain design elements and even design modular components, creating greater predictability and less variability. The use of modular

features will help to future-proof designs, as assets will be more easily upgraded using exchangeable features—an ability that will become a necessity given the increasing speed of change in technology and user behaviors.

As GE’s Association of Southeast Asian Nations (ASEAN) CEO Wouter Van Wersch put it, “For a typical gas-fired power plant in ASEAN, capex represents around 30 percent and opex around 70 percent of the total spend over the life cycle of the asset. Despite this, many owners still view power generation as a capex-only investment, which is a recipe for disaster. Optimizing the operational efficiency during the design process with the right operating platform and analytics is key for better outcomes and optimum performance.” Asset developers and operators can capitalize on this opportunity by deploying an integrated asset data approach and by building the internal capabilities to extract the most value out of the information.



The availability of data also allows asset owners and operators to take a more customer-centric approach. For example, detailed network analysis on congestion and how customers are using roads has enabled a better understanding of where maintenance or new design solutions are needed. Such advances have also enabled real-time transparency—both for users in determining which route to take and for operators in designing traffic lights and using dynamic pricing.

“Technology is going to disrupt the way we do construction, the way we do property management, the way assets are run, and the way customers interact with developers and owners.”

—Subbu Narayanswamy, Senior Partner, McKinsey & Company

Develop a digitization strategy that drives productivity and innovation while protecting against cyberattacks.

The ability to access and analyze data has mushroomed over the past decade, sending organizations scrambling to figure out their digital strategy for capitalizing on these opportunities. However, as companies pursue more ambitious digital strategies, they potentially become more vulnerable to cyberattacks that can cripple operations and cause reputational damage.

As highlighted by Microsoft Senior Director of Global Security Strategy and Diplomacy Paul Nicholas, “The question is not if you will be attacked, but when. Hence, having a clear strategy on prevention and mitigation is key, especially around recovery of critical systems. Readiness, responsiveness, and resilience represent the virtuous cycle for every company to focus on.” As organizations develop a digitization strategy, they will need to make cybersecurity a fundamental design decision in the underlying technology architecture.

The unanimous consent among cybersecurity experts, responding to participant concern, was that cloud computing should be embraced and ultimately provides a safer option than other solutions. Nicholas stated, “The scale of cloud can help recognize an attack and allow development and rapid deployment of protection that rapidly protects and defends everyone.” Participants observed that the recent WannaCry ransomware attack was largely due to connected equipment that had not been updated with current security patches—an issue the cloud could easily solve. The only caveat was that core systems for critical infrastructure (for example, national energy grids) should be kept in an isolated and physically accessible location with 100 percent control maintained by the operators.

“The next wave of productivity for our society will be driven by digitalization and connectivity of all devices. And the threat of cybersecurity should not prevent us from achieving that goal.”

—Siemens AG Chief Technology Officer and Member of the Managing Board Roland Busch

Shift from rules-based to outcomes-based procurement for operations providers.

Globally, governments spend trillions of dollars procuring services from its local private-sector providers to operate its infrastructure assets. Given the nature of the public funds, a great deal of time and effort is spent ensuring that each transaction is compliant with myriad rules, regulations, checks and balances. While compliance and costs are critical decision factors, too often pressure for short-term savings can lead to long-term challenges. GII participants agreed that a procurement approach focused on outcomes and value, with quality-related decision criteria such as past performance, ultimately achieves more for the project owner and the public.

Incorporation of quality dimensions is a change owners can make nearly immediately, but the discussion also surfaced some longer-term opportunities. Notably, this included the introduction of functional and outcome-based deliverables, such as uptime, availability and functionality goals, rather than specific tasks. For example, a maintenance contract for green surfaces along a roadside might require that a contractor ensure sightlines remain visible and drainage unhindered, rather than specifying a lawn be mowed once per month. This revised approach opens the door for innovation, but requires a change in most procurement departments. Participants also noted that long-term operations procurement and contracting must incorporate flexibility to evolve as needs change over the life span of an asset.

Additionally, the nature of these policies will vary based on the level of government development. “In developing countries, regulations and processes are not sufficiently mature to support consistent development,” noted Nigeria’s Minister of Transportation Chibuike Rotimi Amaechi. “Many of the building blocks are still in flux.” 



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Cross-cutting sessions

Embrace gender diversity to tap into the next big skills disruption and drive better performance.

While a deficit of leadership skills may be the biggest bottleneck to infrastructure delivery in the future, the industry is not tapping into a large subset of the potential—women. Despite substantial McKinsey research showing that diversity is good for the bottom line, women currently hold under 16 percent of senior leadership roles in the industry.

Participants agreed that diversity drives better performance and is a competitive advantage, but acknowledged that systemic change is necessary to change the status quo. Diversity is also an important aspect to clients, and diversity requirements are increasingly factored into procurement decisions. However, progress is slow, and compliance programs rarely succeed. Driving gender diversity in the near term will require persistent and committed executive action. Some proven suggestions include:

- Ensuring pay equity to close the wage gap; Lara Poloni of AECOM shared there's still a 22 to 30 percent gap in many cases.

- Rebranding the industry around delivering impact as a way of attracting women leaders.
- Working with educational systems to ensure a strong pipeline of women engineers.
- Opening the leadership path to generalists as opposed to promoting only from the technical ranks.

“First and foremost, take the diversity agenda and put it outside HR. It has to be a CEO and Operations issue.”

—Bruno Roy, Chief Financial Officer, WSP Global

- Embedding diversity criteria into the procurement process to speed up the market forces.
- Finding opportunities to build diversity and advance gender equity within the GII community.



Make decisions and take action for the long term.

With sluggish economic growth and rising inequality across much of the world, long-term investment in infrastructure is critical to shift countries onto more sustainable, inclusive growth paths. But too often, governments fail to act—and the chasm between what’s needed and what actually gets done continues to widen. Participants considered the question: how do we find fresh ways to set priorities, build consensus, and develop alternatives?



Singapore's Minister for Finance Heng Swee Keat made two relevant points about the Singaporean infrastructure experience. First, Singapore plans and acts with a 100-year horizon on its infrastructure developments and then puts the plan into legislation. In contrast, most countries, states, and cities plan for one term of government—although some progressive jurisdictions will plan ten years out. Second, infrastructure is bigger than just roads, bridges, and tunnels; infrastructure plans should consider schools, hospitals, economic zones housing, and other needs that contribute to a thriving society.

In other government-initiated capital mobilization efforts, participants cited Australia's national civic dialogue on long-term infrastructure investment, maintenance, and operation as a good example of a government-led process that is facilitating greater private investment. Participants perceive Australians to be eager to challenge the traditional views that government alone should fund public infrastructure. Canada studied Australia's success in developing its recent proposal for a national infrastructure bank with contributions of \$35 billion from the government and a target of \$200 billion from the private sector.

Caisse de dépôt et placement du Québec (CDPQ) has found success in the space between the traditional brownfield and greenfield models with a “khaki” investment strategy. Khaki investment balances risk and reward for the long term by developing greenfield projects on brownfield sites such as Terminal 5 at Heathrow. CDPQ CEO Michael Sabia discussed the investor's proof-of-concept greenfield project to plan, finance, build, own, and operate Montreal's new 68-kilometer metro system. With a projected return of between 8 and 9 percent, this scheme is the first of its kind for a pension fund. As such, CDPQ's leadership of this project creates a “virtuous circle”: every time a passenger buys a pass for transit on the new system, they will be contributing directly to their pension fund – their retirement security.

From an operator's perspective, MTR Corporation CEO Lincoln Leong drew on MTR Corporation's 40 years of experience, advising that successful long-term PPPs are built on well-designed risk transfer, ensuring adequate investment in opex. MTR Corporation assumed risk management for operating costs, thereby encouraging its ongoing investment in maintenance. Leong also noted that Hong Kong took responsibility for fare revenue

(patronage) and established a government-backed formula for fare increases. The formula created funding predictability and shifted any political discussions on fare increases from “allocating new funds” to “robbing expected revenues.”

Governments and companies that focus on the long term are finding fresh ways to set priorities, build consensus, and develop alternative financing mechanisms. They are showing that mobilizing private capital requires bankable projects that capture value and create an understanding of the private sector’s requirements and expectations.

Consider engaging with the Belt and Road Initiative.

Changi Airport Group and Surbana Jurong Chairman Liew Mun Leong began his closing keynote address by declaring that, with the collapse of the Trans-Pacific Partnership, “The world is left with only one potential collective vision that can be the engine of world economic growth.” He was referring to the China’s Belt and Road Initiative (BRI), which aims to create economic, physical, and maritime corridors connecting China to most of Africa, Asia, Europe, and the Middle East.



As the world’s top exporter and second-largest source of foreign direct investment, China has much to gain from encouraging world markets to remain open. One option is to ramp up its spending on overseas infrastructure. The scale of BRI—which is 12 times the size of the post-World War II Marshall Plan—has attracted attention from companies outside China. Liew believes that, in time, it could become the largest global platform for economic cooperation.

While some have reservations about whether China can deliver BRI fairly and transparently, Liew noted that China’s economic transformation over the last 35 years demonstrates its capacity to successfully steward such an initiative. According to MGI, from 1992 to 2013, China invested more in its economic infrastructure—transport, water,



power, and telecommunications systems—than North America and Western Europe combined—an average of 8.6 percent of its annual GDP.

Acknowledging the geopolitical concerns around BRI, Liew said, “It may be that BRI will increase China’s dominance and influence. Any country that invests or trades heavily with another country is bound to have some degree of political and cultural impact on the host country.” He continued, “Having a plan or vision is better than having no plan.” 🌐

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Sector-specific roundtables

This year, for the first time, the GII Summit hosted three sector-specific roundtables on engineering and construction, real estate, and energy and resources. These sessions were added, based on feedback from previous years' participants, who requested the opportunity to delve further into the topics of their specific sectors. Some highlights from these roundtables are below.

Engineering and construction: Use advanced analytics to improve project planning, design, and delivery.

Today's low-performing construction and capital-projects ecosystem is ripe for overhaul. Many industries are making huge advances by applying advanced analytics to help improve productivity, reduce risk, and monitor performance. This roundtable focused on how the industry can better collaborate and use advanced analytics to mitigate repetitive problems experienced in megaprojects. It also asked what steps all leading engineering and construction companies should be taking now.

Some of the key takeaways included the following:

1. [Follow the lead of existing use cases where advanced analytics in construction have demonstrated clear value.](#) During the construction of Crossrail—Europe’s largest construction project—the analysis of data from multiple sensors was used by the project team to reduce the instrumentation and monitoring costs of the project, and to track the earth settlement across the tunneling project. Additionally, the M25—a major highway in the United Kingdom—used predictive analysis to identify how to reduce operational maintenance costs.
2. [Use analytics to better consider the full life cycle of a project.](#) The use of advanced analytics can improve the performance assessment of a project through its life cycle. With the increased ability to embed sensors into buildings and structures, we can better understand the trade-offs made during the construction process to reduce up-front capex. Given that operational costs over the life of a project typically greatly exceed the upfront construction costs, this strategy is a real opportunity to improve how projects are conceived.



3. [Acknowledge that advanced analytics will drive an increase in transparency that could lead to transformational change.](#) The experience of other industries has demonstrated how strategically gathering and analyzing data has transformed how that industry operates. For example, ride-sharing companies have transformed the private car-hire

business due to their ability to analyze vast quantities of data in a customer-friendly manner. Participants agreed that the construction industry needs to lead this movement to prevent being upstaged by new entrants.

4. **Commit to an enterprise-wide shift to develop an advanced analytics capability.**

Implementing an advanced analytics capability in an organization requires buy in from the CEO and senior management. The exercise must be led by the business and focus on solving business challenges, rather than trying to leverage technology for technology's sake. While this course of action will require a meaningful change in both capabilities and business processes, organizations can launch the change in achievable steps and see significant opportunities quickly.

Energy and resources: Deliver next-generation resource projects faster and cheaper.

Due to increased volatility in resource and commodity prices, stakeholders from across the value chain are having to adapt to a sustained low-price environment. Given this new normal, participants considered the following questions: what are resource companies doing to adapt their capital outlay, strategy, and execution to low commodity prices? What lessons can companies learn from other industries? How will digital technologies change the way resource projects are designed and constructed? And what will the project organization and supply chain of the future look like?



Some of the key takeaways included the following:

1. **Accelerate delivery to bring down the costs of energy and resources projects.** Many companies are facing increased cost pressure on their projects and see opportunities to accelerate delivery with the improved handling of regulatory, public procurement, and permitting challenges. Such improvement requires the industry to attract more diverse talent, including better stakeholder management and collaboration skills.
2. **Incentivize contractor performance using creative contracts.** Some participants have been able to better incentivize contractor performance using, for example, competitive Front End Engineering and Design (FEED) and alliance contracts for larger projects. Participants agreed that owners should be more thoughtful and clear on which risks can and should be transferred to the contractor and how to ensure that the deal is fair. Additionally, the industry should focus more on setting up “opportunity meetings”—for example, exploring a new technology to improve productivity—instead of just focusing on risks.
3. **Use technology to better plan, build, and operate assets.** Technology is already being used to manage and monitor the costs of existing assets over their life cycle, thereby allowing for better scoping for new assets. Technology can also drive faster and better planning, facilitate stakeholder management, and improve project performance. Compounding the case for technology, participants agreed that a broader adoption of new construction technology would significantly increase safety performance and perhaps help attract the younger generation to the sector.

Real estate: Embrace customer centricity and fast-delivery techniques.

The real estate roundtable tackled two topics that are essential to improving performance in the sector: tapping into customer centricity and developing a new paradigm for construction.

With global real estate markets becoming increasingly competitive and regulated, winning over customers is paramount. Customer centricity is likely to be the new differentiator—but the sector has significant room for improvement. Some of the key takeaways included the following:

1. **Start building relationships and trust with customers today.** A McKinsey survey of global home buyers revealed an urgent need for the sector to improve brand affinity and loyalty. This rapport can be accomplished by focusing on customers’ end-to-end needs, refreshing the marketing approach and channels, and using new technologies to engage customers in the design process. Understanding and delivering on the specific needs of the buyer results in loyal customers who, by sharing their experience, create a multiplier effect for the developer.

2. [Use virtual reality to create a quantum leap in the buying experience.](#) As demonstrated by the Squint/Opera production company, virtual reality is evolving fast and is highly relevant in the sector. Giving the developer and the customer an opportunity to imagine and experience the space, before it gets built, offers a win-win outcome.
3. [Use digital tools more aggressively in engaging both customers and channel partners.](#) Property developer China Vanke shared its digital customer-decision journey approach, which includes four broad platforms: addressing potential buyers before the purchase; alignment with real estate agents; support for the internal sales force; and post-purchase property management services for customers.




4. [Involve customers in the design before the developer finalizes their plans.](#) As shown in McKinsey's customer research, customers want to be more involved in the design process. Consulting agency designaffairs stressed the importance of deep customer insight and subsequently, tailoring individual spaces like kitchens, balconies and bathrooms to build customer loyalty.

5. [Use social media to connect with customers](#). Digitization is a necessity to interact with millennials and has fundamentally changed the business and interaction model. Social media has a unique and dominant place in real estate marketing—not only to advertise properties but also to build a connection with customers and brand loyalty. To measure this word-of-mouth channel, the ultimate metric is the number of “shares,” not “likes.”

Simultaneously, the application of high-speed construction and digital technologies has the potential to reduce the time and cost of construction, and change the entire real estate business model. Some of the key takeaways follow:

1. [Pre-fabricated, Pre-finished Volumetric Construction \(PPVC\)](#) is a proven method for constructing residential towers and hotel structures, demonstrating cost and time savings. PPVC also unlocks value for owners by providing savings on maintenance costs. Global construction company Dragages-Bouygues shared that it built 100 percent of the interiors of the Crowne Plaza Changi Airport extension in a factory, assembling them on-site.
2. [3-D printing](#) offers tremendous precision, it is fast, and it requires significantly less labor than traditional manufacturing. Shanghai-based WinSun explained how it printed a villa in one day with a cost-savings potential of up to 50 percent. While rapidly becoming mainstream, 3-D printing offers a path to mass production of real estate, especially in markets where the cost of materials and labor is high or speed is of essence.
3. [Collaborative contracting](#) is a solution to the dysfunctional design-bid-build (DBB) low-cost bidding culture in construction. Alternatives include, for example, integrated project delivery, which incentivizes collaborative behavior for all parties involved, with risks and rewards shared through a transparent and fair process. DPR Construction discussed a case study in which the project came in significantly under budget and ahead of schedule. However, for this to work, the owner must be convinced to evolve the bidding process away from DBB.

We closed the discussion by concluding that real estate developers need to adopt a two-pronged approach. First, they can experiment with these strategies by incubating a small new real estate company within their existing structure. Once these new ways of working demonstrate results, the next step is for developers to upgrade their entire core business. 

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Conclusion

GII aspires to stimulate leaders to improve the way that they deliver critical infrastructure and to get more out of existing infrastructure and capital projects. Based on the discussions at the 2017 GII Summit, we believe this development is happening; the infrastructure industry is making progress in implementing the 25 actions identified at the 2014 GII Summit in Rio de Janeiro.

The evolving focus of GII discussions is evidence that change is occurring rapidly in the industry. At our first GII Summit in Istanbul in 2012, many participants were reluctant to embrace the potential of technology to improve existing infrastructure assets. Just five years later, asset optimization through technology and analytics was the focus of our Innovation Site Visit to GE's Digital headquarters and was a cornerstone of the dialogue in Singapore. Similarly, the topic of construction innovation has gained momentum at each summit, and we have shifted from talking about the realm of possibility in 2014 and 2015 to learning from proven concepts with broad applicability in 2017.

But much remains to be done if the industry is to embrace innovation, collaborate more effectively, and take the bold steps necessary to deliver 21st-century infrastructure. We are optimistic that the ideas that emerged during the summit will help to create change in how we approach infrastructure and capital projects around the world. As we prepare for the 2018 GII Summit in Europe, we will continue to identify new solutions and stimulate change through our GII regional roundtables and innovation site visits. These and more insights from industry leaders will be shared with you in our quarterly digital editions of Voices on Infrastructure.

We thank those who attended the 2017 GII Summit for their energy and insights. We look forward to staying in touch—and to continuing the conversation. 

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Measuring progress

One action from the 2014 GII Summit in Rio de Janeiro was to “improve collaboration between designers, owners and contractors, and have common key performance indicators (KPIs) and incentives for all contractors.” Since then, the concept of relational contracting has increasingly emerged at our roundtables around the world as a priority for the industry. Our survey of Singapore participants revealed that 76 percent of organizations have reevaluated their approach to contracting within the last two years and more than 60 percent report using creative contracting framework.



Participants

Over 200 world leaders in infrastructure and capital projects joined us in Singapore to discuss novel solutions to the industry's most pressing challenges. A full list of the 2017 participants:

Zoher Abdoolcarim—Asia Editor, Time, Inc.

Anwar Syahrin Abdul Ajib—Chief Executive Officer, UEM Sunrise Berhad

Tony Adams—Chief Investment Officer, EastSpring Investments

Hans-Martin Aerts—Managing Director & Head of Infrastructure Investments, Asia Pacific, APG Asset Management

Anton Affentranger—Chief Executive Officer, Implen AG

Nazir Alli—Resident Adviser, J & J Group

Chibuike Rotimi Amaechi—Minister of Transport, Federal Republic of Nigeria

Rosemarie Andolino—President & CEO, Manchester Airport Group USA

Jose Antonio—Chairman & CEO, Century Properties Group

Adil Anwar—Chief Executive Officer, Infrastructure Project Development Facility

Naaman Atallah—Chief Executive Officer, Dubai Properties

Alice Au—Senior Partner, Spencer Stuart

Roger Bailey—Asset Management Director, Tideway

Dominic Barton—Global Managing Partner, McKinsey & Company

Claus Baunkjær—Chief Executive Officer, Femern

Greg Bentley—Chief Executive Officer, Bentley Systems

Michael Berkowitz—President, 100 Resilient Cities, Pioneered by The Rockefeller Foundation

Chinta Bhagat—Executive Director, Khazanah India Advisors

John Bianchini—Chief Executive Officer, Hatch

Mark Birrell—Chairman, Infrastructure Australia

Clorivaldo Bisinoto—Chief Executive Officer, Andrade Gutierrez Engenharia

Ricardo Bisordi—Director of Airports, CCR Group

Jean-Serge Boissavit—Business Development Director, Vinci Construction

Graham Bradley—Chairman, Infrastructure New South Wales

Guy Bradley—Chief Executive Officer, Swire Properties

Armin Bruck—President & CEO, Siemens Singapore

Jan Bunge—Managing Director, Squint/Opera

Roland Busch—Chief Technology Officer and Executive Member of the Managing Board, Siemens

Cyril Cabanes—VP, Head of Infrastructure Transactions, Asia Pacific, CDPQ Asia Pacific

James Cameron—Co-Head of Asia-Pacific Infrastructure and Real Estate Group, HSBC

Bill Cashmore—Deputy Mayor, Auckland Council

Raymond Ch'ien—Chairman, Hang Seng Bank

Patrick Charbonneau—Managing Director, Infrastructure Investments, PSP Investments

TC Chew—President of Global Business & Operations, Samsung C&T

DooWhan Choi—President & CEO, Posco ICT

Andrew Claerhout—Senior Vice President, Ontario Teachers' Pension Plan

Greg Conlon—Vice President, KBR

Justin Dahl—Principal, Westney Consulting Group

Andrew Day—Chief Executive Officer, Hastings Funds Management

Zia Dean—Director, Chaucer Capital

Isabel Dedring—Global Transport Leader, Arup

Michael Della Rocca—Partner, McKinsey & Company

Arnaud Despierre—Partner, Spencer Stuart

Sean Donohue—Chief Executive Officer, Dallas Fort Worth International Airport

Christophe Dossarps—Chief Executive Officer, Sustainable Infrastructure Foundation

Tyler Duvall—Partner, McKinsey & Company

Wolfgang Eckert—SVP Critical Infrastructure & CFO Nuclear Generation, EnBW Energie Baden-Württemberg

Mia Egron—Chief Operating Officer, PT Plaza Indonesia Realty TBK.

Heinz Ehrbar—Head of Major Projects Management, Deutsche Bahn

Mark Elliott—Chief Executive Officer, Northwest Rapid Transit

Julien Esch—Managing Director, Dragages Singapore

Roberto Fantoni—Senior Partner, McKinsey & Company

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Grandhi Kiran Kumar—Corporate Chairman, GMR Group

Huyen Ha Thi Thanh—Vice General Director, Vin Marketing Communications

Chan-Kun Han—Chief Executive Officer, POSCO Engineering & Construction

Michael Hassing—President & CEO, Ports America

Chris Heathcote—Chief Executive Officer, Global Infrastructure Hub

Heng Swee Keat—Minister for Finance, Republic of Singapore

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Global Infrastructure Initiative

Since 2012, McKinsey & Company's Global Infrastructure Initiative (GII) has convened many of the world's most senior leaders in infrastructure and capital projects to identify ways to improve the delivery of new infrastructure and to get more out of existing assets. Our approach has been to stimulate change by building a community of global leaders who can exchange ideas and find practical solutions to improve how we plan, finance, build, and operate infrastructure and large capital projects.

Our initiative consists of a global summit, regional roundtables, innovation site visits, and a quarterly digital publication. The fourth GII Summit took place in Singapore on May 24–26, 2017. Our theme explored new solutions for global infrastructure and capital projects. Participants shared the latest data, global best practices, and innovative approaches to develop, deliver, and operate large projects in the 21st century.

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