



3D MODELLING & INSPECTION



HD SURVEYING



MOBILITY & ADVANCED ANALYTICS



WEARABLES



NOVEMBER 3, 2017

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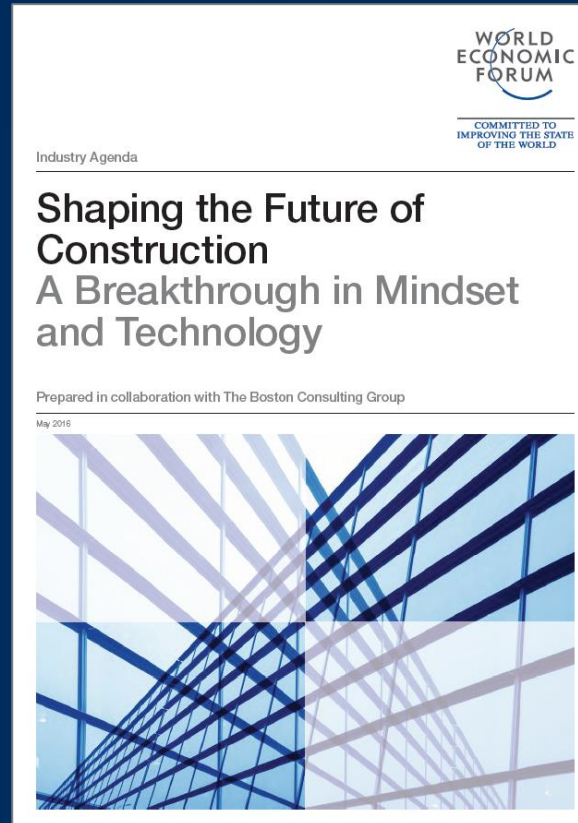
SENIOR VICE PRESIDENT
STRATEGIC BUSINESS DEVELOPMENT

AECOM

GLOBAL SHIFT KEY DRIVERS

- URBANIZATION
- INNOVATION & TECHNOLOGY
- LARGER, MORE COMPLEX PROJECTS
- SUSTAINABILITY

GENESIS & CONTEXT



May 2016



February 2017

MEGATRENDS

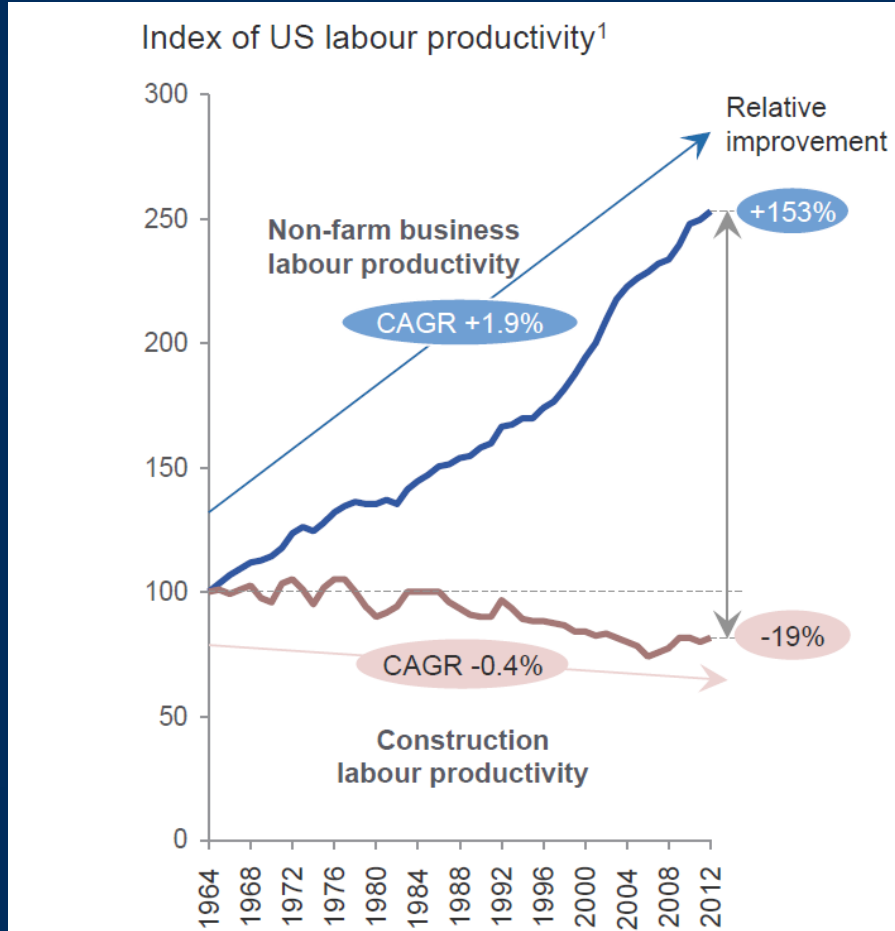
SHAPING THE CONSTRUCTION INDUSTRY'S FUTURE

 Market and customers	 Sustainability and resilience	 Society and workforce	 Politics and regulation
<p>Demand in developing countries</p> <p>65% of the next decade's growth in construction will happen in emerging countries</p>	<p>Resource scarcity</p> <p>No. 1 consumer of global raw materials is the construction industry</p>	<p>Urbanization and housing crisis</p> <p>200k people are added daily to urban areas and need affordable and healthy housing</p>	<p>Complex regulatory requirements</p> <p>25 different procedures are required for a typical warehouse construction permit in India</p>
<p>Globalized markets</p> <p>1 in 2 E&C companies plan to move into new geographies</p>	<p>Sustainability requirements</p> <p>50% of the solid waste in the United States is produced by the construction industry</p>	<p>Health/comfort needs of citizens</p> <p>2-5x higher than outside are the levels of volatile organic compounds found inside US homes</p>	<p>Stricter HSE and labour laws</p> <p>10% of the workforce in a public project in California had to come from the "otherwise unemployable"</p>
<p>Bigger, more complex projects</p> <p>123km (76 miles) is the length of the Undersea tunnel that will connect Dalian and Yantai in China</p>	<p>Energy and climate change</p> <p>30% of global greenhouse gas emissions are attributable to buildings</p>	<p>Talent and ageing workforce</p> <p>50% of general contractors are concerned about finding experienced crafts workers for their workforce</p>	<p>Slow permit and approval process</p> <p>\$1.2tn of infrastructure could be added by 2030 if all countries committed to specific time limits for approvals</p>
<p>Ageing infrastructure</p> <p>1 in 3 German railway bridges are more than 100 years old</p>	<p>Resilience challenges</p> <p>3x as many disasters were reported last year as in 1980</p>	<p>Stakeholder pressure and organization</p> <p>67k signatures were collected opposing the construction of the Stuttgart train station</p>	<p>Geopolitical uncertainty</p> <p>18 Turkish construction workers were kidnapped by militants in Baghdad in September 2015</p>
<p>Massive financing need</p> <p>\$1tn annual investments are needed to close the global infrastructure gap</p>	<p>Cyberthreats</p> <p>90% of firms agree that information controls have an impact on front-line employees</p>	<p>Politicization of construction decisions</p> <p>In 2011 the Portuguese government cancelled a 165km (103 mile) high-speed train line project as an austerity measure</p>	<p>Corruption</p> <p>49% of survey respondents believe corruption is common in a Western European construction market</p>

Source: World Economic Forum; The Boston Consulting Group

CONSTRUCTION INDUSTRY FACTS

US INDUSTRY PRODUCTIVITY & PERFORMANCE 1964 - 2012



Construction industry
accounts for

6%

of global GDP

1%

Increase in worldwide productivity
results in

\$100B

In annual savings

HOW DO WE MEET THE CHALLENGE?

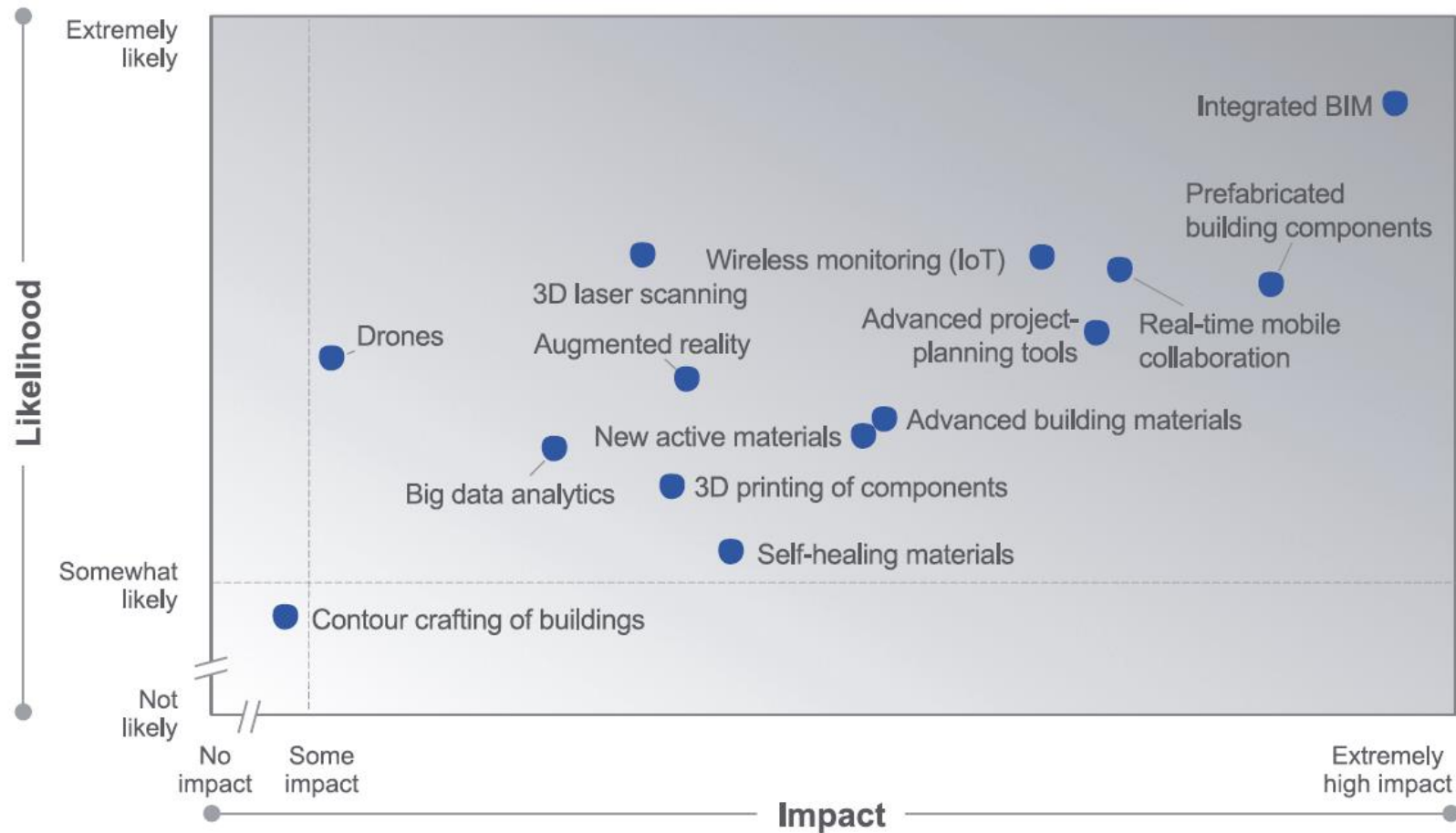
(Future) Best practices

Company level	2.1 Technology, materials and tools			2.2 Processes and operations		
	Advanced building and finishing materials	Standardized, modularized and prefabricated components	(Semi-)automated construction equipment	Front-loaded and cost-conscious design and project planning	Innovative contracting models with balanced risk-sharing	A common and appropriate framework for project management
	New construction technologies, e.g. 3D printing	Smart and life-cycle-optimizing equipment	Digital technologies and big data along the value chain	Enhanced management of subcontractors and suppliers	Lean and safe construction management and operations	Rigorous project monitoring (scope, time, cost)
Sector level	2.3 Strategy and business model innovation			2.4 People, organization and culture		
	Differentiated business model and targeted consolidation and partnerships	Sustainable products with optimal life-cycle value	Internationalization strategy to increase scale	Strategic workforce planning, smart hiring, enhanced retention	Continuous training and knowledge management	High-performance organization, culture and incentive schemes
Government	3.1 Industry collaboration			3.2 Joint industry marketing		
	Mutual consent on standards across the industry	More data exchange, benchmarking and best-practice sharing	Cross-industry collaboration along the value chain	Industry-wide collaboration on employer marketing	Coordinated communication with civil society	Effective interaction with the public sector
Government	4.1 Regulation and policies			4.2 Public procurement		
	Harmonized building codes/standards and efficient permit processes	Market openness to international firms and SMEs	Promotion and funding of R&D, technol. adoption and education	Actively managed and staged project pipelines with reliable funding	Strict implementation of transparency and anti-corruption standards	Innovation-friendly and whole-life-cycle-oriented procurement

Source: World Economic Forum; The Boston Consulting Group

NEW TECHNOLOGIES

Impact-likelihood matrix of new technologies



Source: World Economic Forum; The Boston Consulting Group

Shaping the Future of Construction

Inspiring innovators redefine the industry

Prepared in collaboration with The Boston Consulting Group

February 2017



INNOVATION CASE STUDIES

— State-of-the-art implementation —



The Edge – the world’s most sustainable office building



New Karolinska Hospital – the largest hospital PPP for a leading health-care institution



Anglian Water’s @One Alliance – a leading industry alliance in the water sector



Moladi – one of the world’s most scalable, affordable and socially accepted housing systems



Burj Khalifa – the world’s tallest building

— Startups & pilot projects —



Record holder for fastest construction of a 50+ storey skyscraper



Creator of the world’s first 3D-printed steel bridge



Disruptive innovator automating building design



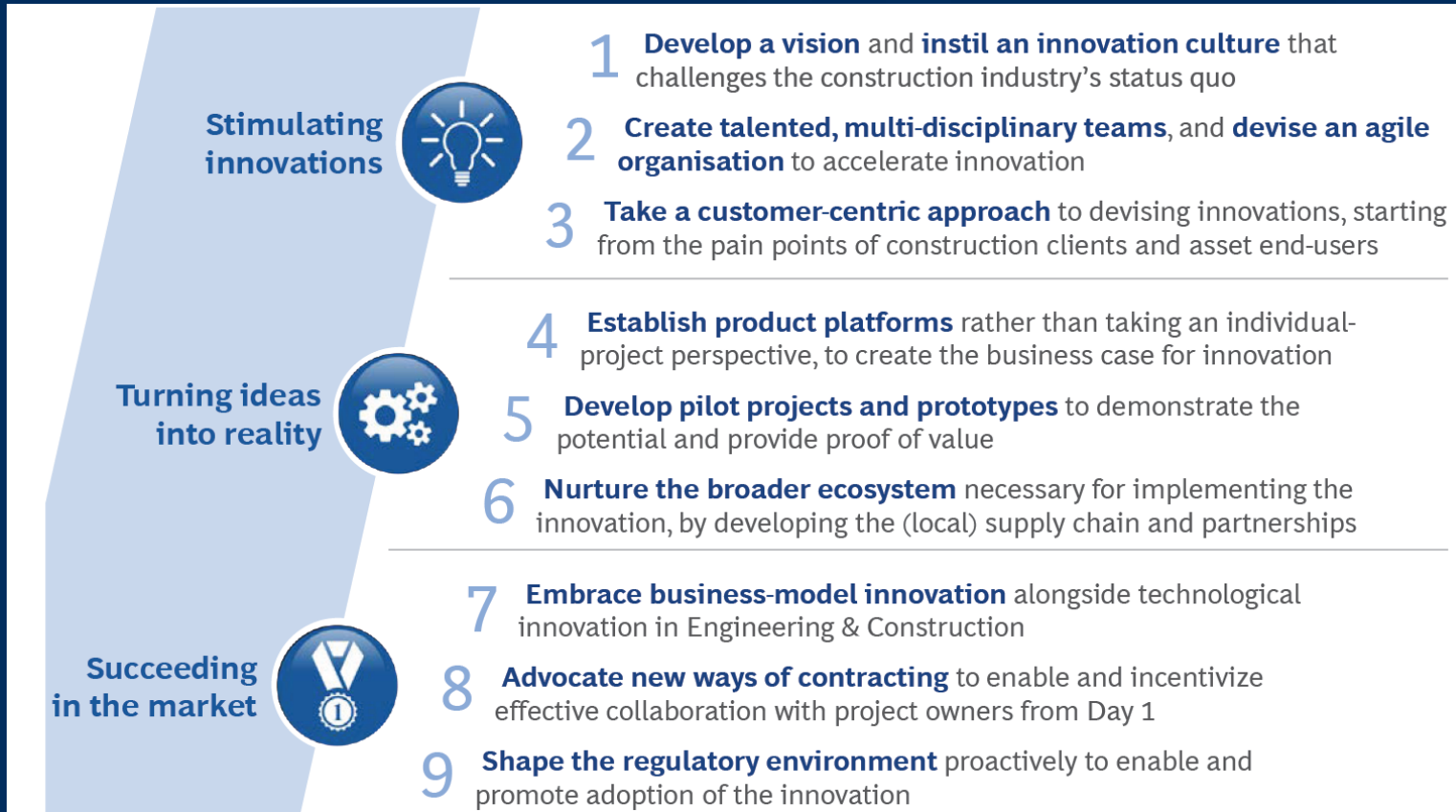
Pioneer of 3D-printed houses at scale



Predictive Analytics startup – Forbes’s hottest startup of 2015

Source: World Economic Forum; The Boston Consulting Group

9 KEY SUCCESS FACTORS FOR INNOVATION



Source: World Economic Forum; The Boston Consulting Group