RECO7609: Technology and Innovation

Presentation 02: Digital Technology and Innovation Context

October 2019

WORLD ECONOMIC FORUM

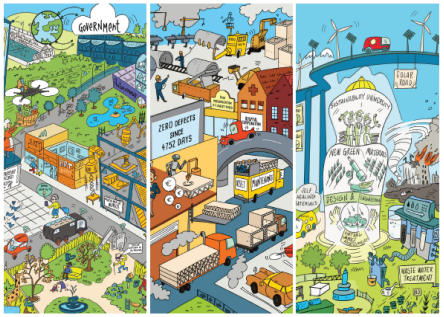
COMMITTED TO IMPROVING THE STATE OF THE WORLD

Shaping the Future of Construction

Future Scenarios and Implications for the Industry

Prepared in collaboration with The Boston Consulting Group

March 2018



cdbb

Centre for Digital Built Britain

Developing the Capabilities for a Digital Built Britain

A Summary of the 'Capability Framework and Research Agenda for a Digital Built Britain'

July 2019

McKinsey & Company

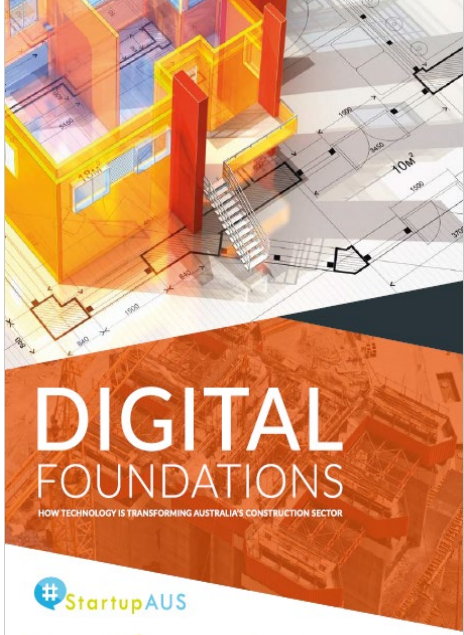
Capital Projects & Infrastructure Practice

Decoding digital transformation in construction

Few engineering and construction companies have captured the full benefit of digital. Five practices can help E&C companies move beyond isolated pilots and unlock digital's value across their enterprises.

by Jan Koeleman, Maria João Ribeirinho, David Rockhill, Erik Sjödin, and Gernot Strube

August 2019



McKinsey&Company

Seizing opportunity in today's construction technology ecosystem

A new analysis of the construction technology ecosystem finds emerging trends, constellations of solutions, and an ever-increasing universe of technology use cases that are disrupting the way we plan, design, and execute projects.

Jose Luis Blanco, Andrew Mullin, Kaustubh Pandya, Matthew Parsons, and Maria João Ribeirinho

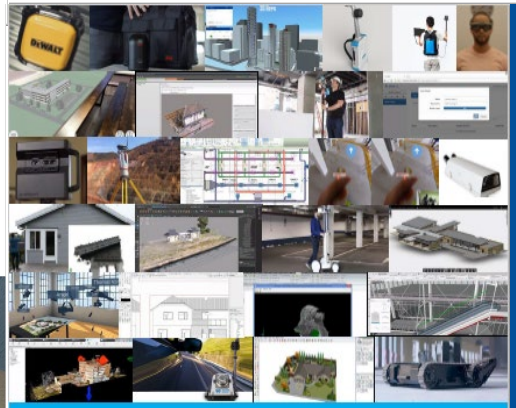
SEPTEMBER 2018 • CAPITAL PROJECTS & INFRASTRUCTURE

OLIVER WYMAN

DIGITALIZATION OF THE CONSTRUCTION INDUSTRY: THE REVOLUTION IS UNDERWAY

MARSH · GUY CARPENTER · MERCER · OLIVER WYMAN

MARSH & McLENNAN COMPANIES



AEC Tech Gamechangers:

26 Essential Technologies for 2019

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Future-Ready Index

Leaders and followers in the engineering & construction industry

Global Construction Survey 2019

KPMG International

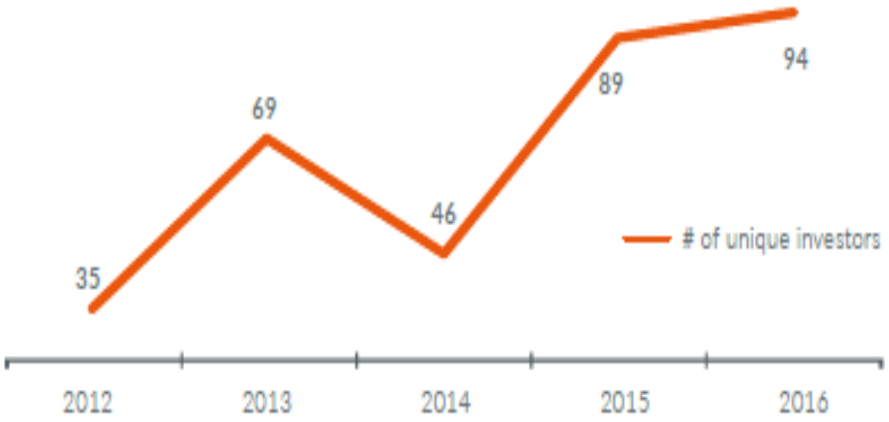
kpmg.com/gcs

GLOBAL INTEREST IN CONSTRUCTIONTECH IS GROWING RAPIDLY

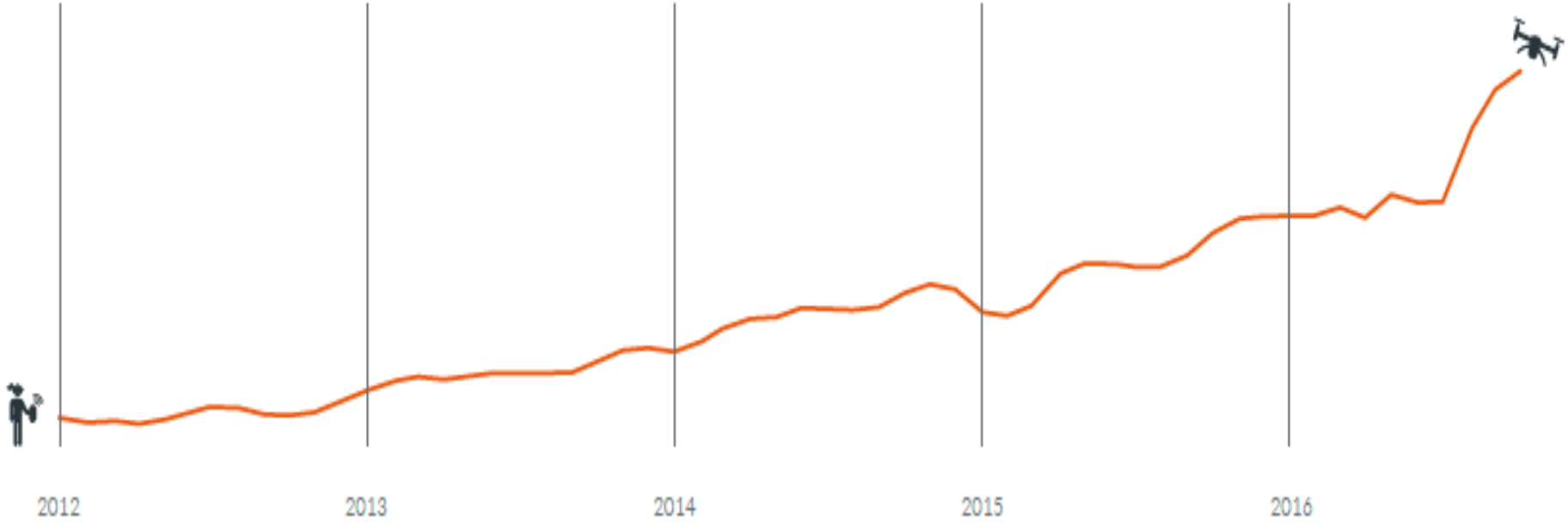
This investor interest in Australian ConstructionTech companies mirrors a rapid increase in the global interest in the sector. CB Insights estimates that the number of unique investors in ConstructionTech companies globally has increased 250% since 2012, with media interest in topics related to ConstructionTech increasing exponentially over the same period.

YEARLY UNIQUE INVESTORS INTO CONSTRUCTIONTECH[9]

2012 - 2016

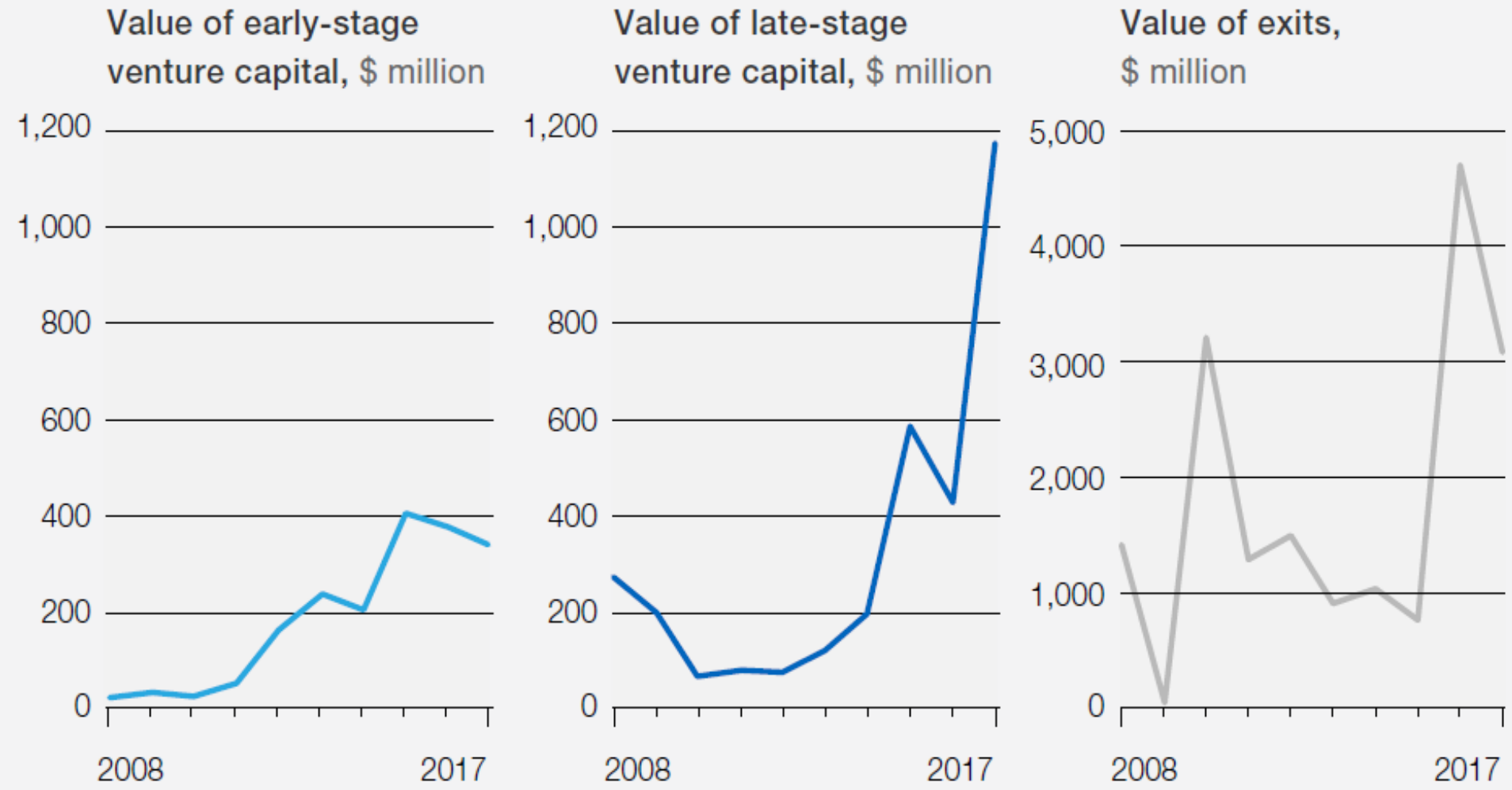


MEDIA INTEREST CONSTRUCTIONTECH[10]



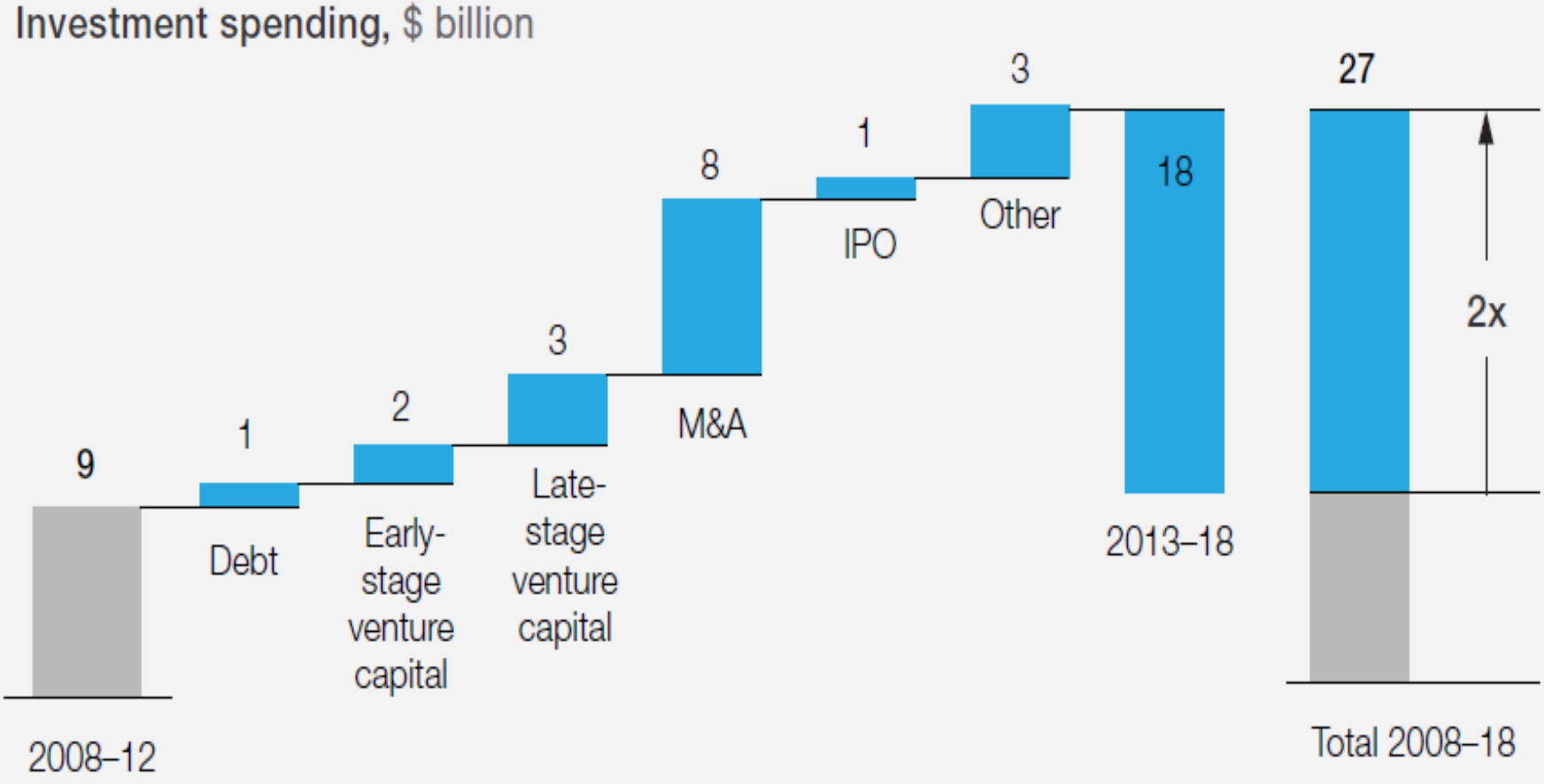
Early- and late-stage investments in venture capital have trended upward since 2008, whereas exits have peaked erratically.

Value of total transactions, (n = 676 unique companies)



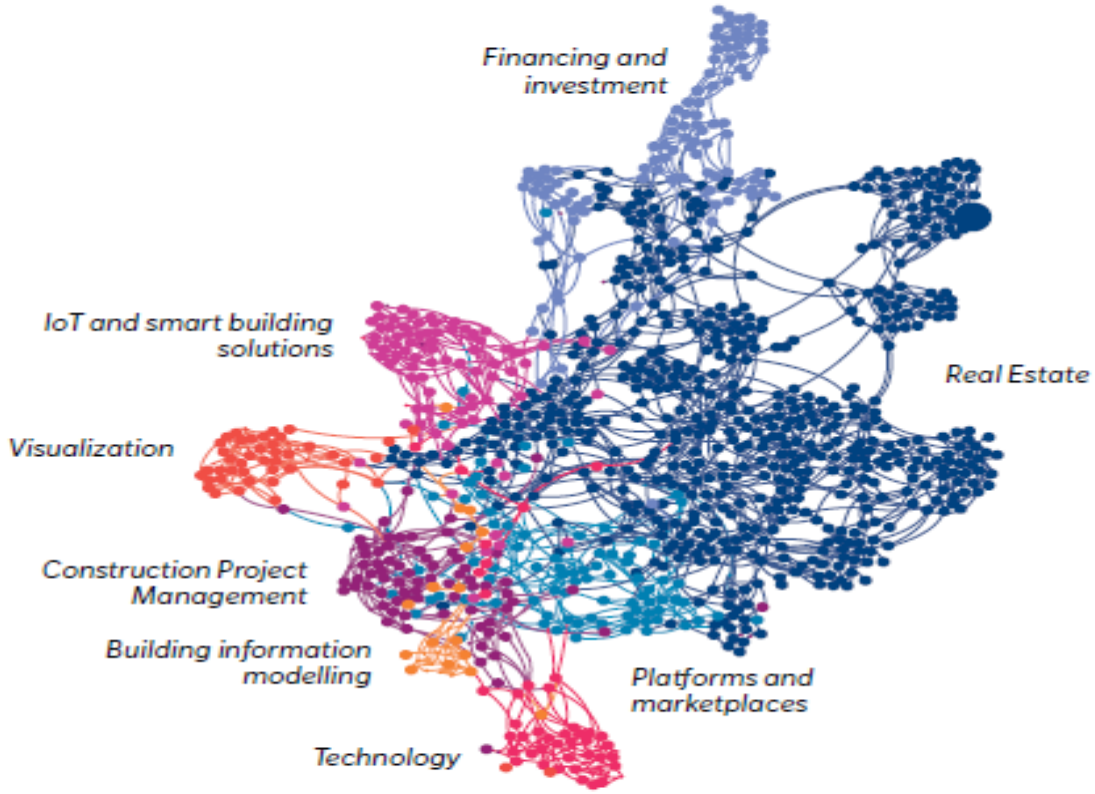
McKinsey&Company | **Source:** Pitchbook data; McKinsey analysis

Investment in construction technology has doubled over the past decade.



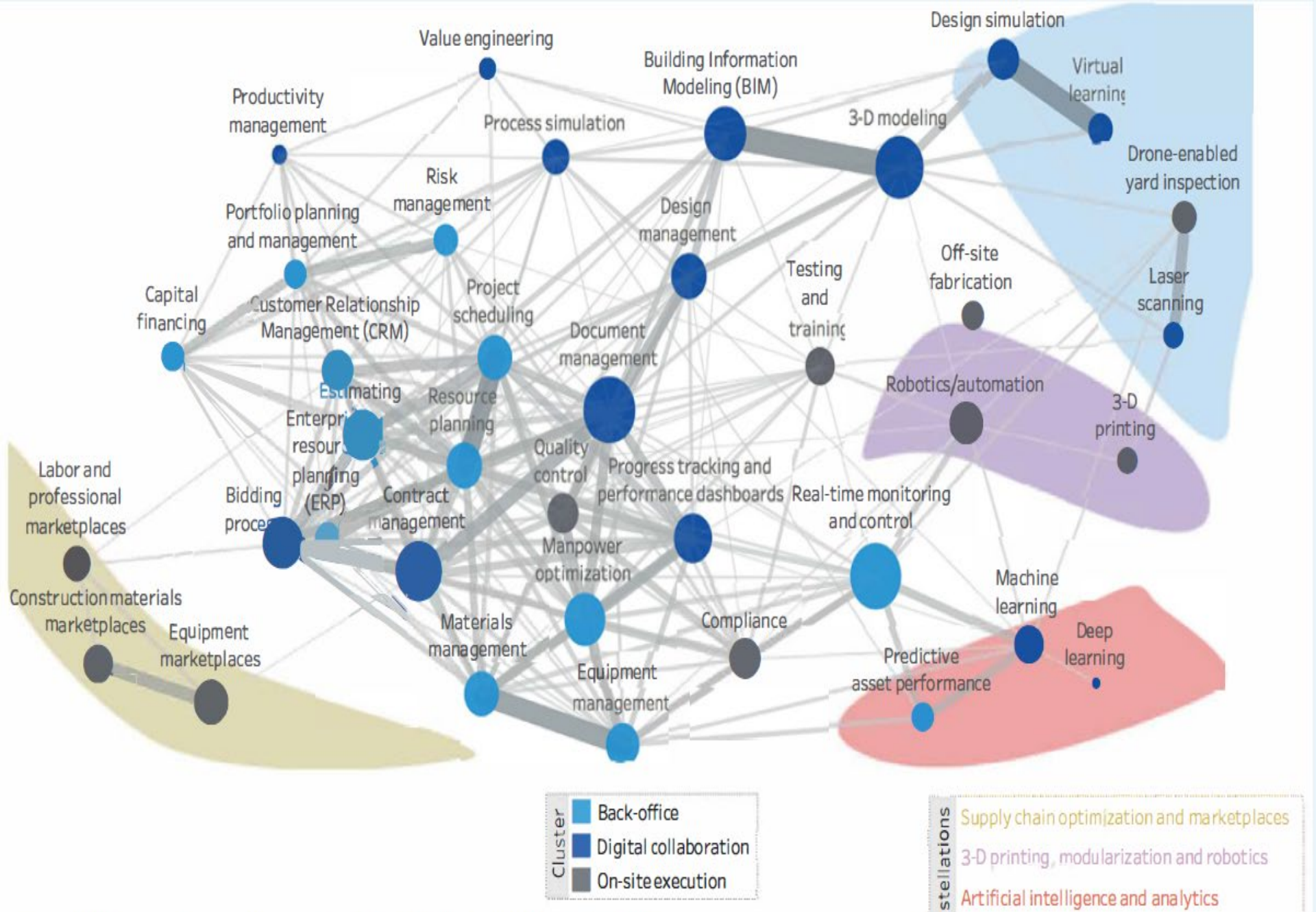
McKinsey&Company | **Source:** Pitchbook data

STARTUPS CLUSTERED ACCORDING TO SEMANTIC ANALYSIS OF THEIR ACTIVITY
SIZED BY FUNDING RECEIVED. ONE NODE = ONE COMPANY.



Cluster	#	Funding
Real Estate	611 (52%)	$13,900MM
Platforms and marketplaces	114 (10%)	$1,500MM
Financing and investment	107 (9%)	$1,600MM
Construction Project Management	93 (8%)	$500MM
IoT and smart building solutions	89 (8%)	$710MM
Technology	64 (6%)	$400MM
Visualization	59 (5%)	$550MM
Building information modelling	29 (2%)	$240MM
Sum	**1166** (100%)	**$19,4BN**

Source: Crunchbase, Capital IQ, QUID, Oliver Wyman analysts



Sources: McKinsey Startup and Investment Landscape Analytics, PitchBook, Capital IQ.

For more on this research, see our article : "Seizing opportunity in today's construction technology ecosystem"

What do we mean by a digital built Britain?

Digital built Britain incorporates digital data, models and technologies into our built assets – from homes, offices and schools to transport networks, bridges and tunnels. This digital revolution will give us insights that transform how our buildings, infrastructure and services work, and how we use them.

Existing examples of digitalisation include building information modelling (BIM), which, through improved information management, has already brought about huge advances in the way the UK's architecture, engineering, construction and operations (AECO) sectors design, build and manage the country's buildings and infrastructure.

In 2016 the government launched the Digital Built Britain Programme to deliver further digitalisation of the sector. Over the next decade, new digital technologies such as the Internet of Things, digital twins, AI and advanced data analytics are expected to bring about further dramatic changes, transforming the UK's approach to planning, building, integrating and maintaining its built assets.

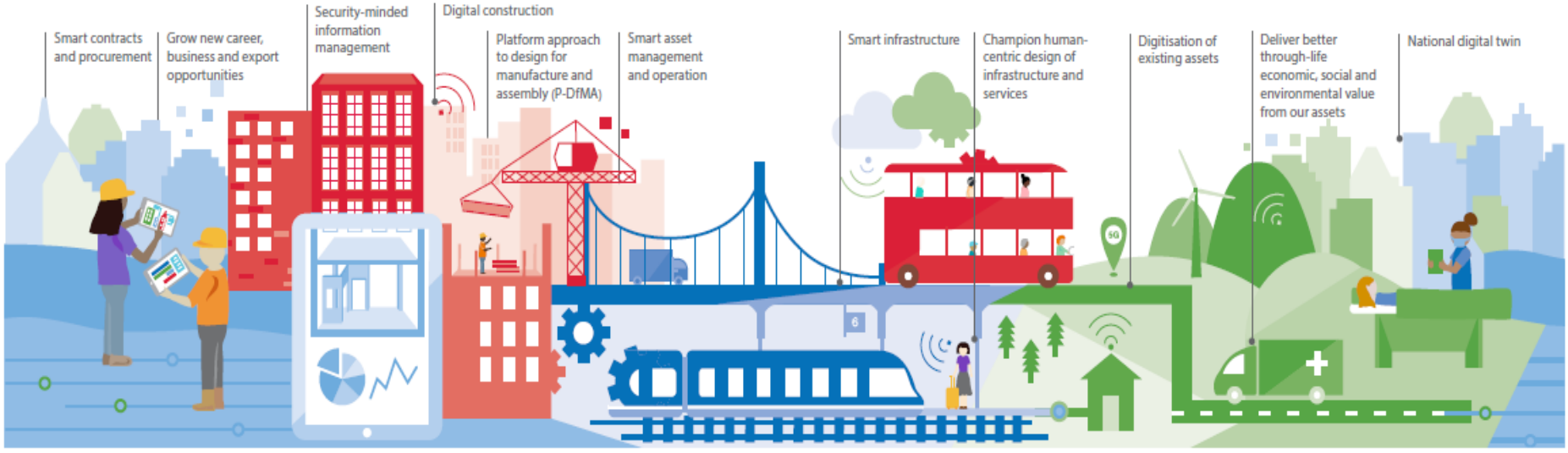
The benefits of digital transformation

If managed well, digitalisation could dramatically improve the performance of the UK's built assets, delivering improved performance, reduced impact on the natural environment and better public and social services. Above all, it will enable Britain to make better use of the buildings and infrastructure it already has.

People will derive greater value and benefit from services that are embedded in, and delivered through, the built environment. For example, smart sensors embedded in roads could be used to control autonomous vehicles and to smooth traffic flows. Using data and information in ways that are smarter – without being intrusive – will enable us to find ways to achieve greater capacity from our hospitals and schools, offices, roads and bridges. For example, monitoring and management of traffic flows and vehicle loads could further enable the extension of infrastructure repair and replacement cycles.

Digitalising the entire lifecycle of our built assets will give us a better understanding of how to create, to manage and to recycle our buildings and infrastructure. For example, data about the provenance and history of the materials within a building could enhance the recycling value of such materials and reduce waste.

Finally, by managing our assets and services as integrated systems rather than separate entities we will be able to deliver significant benefits for the citizens and organisations in the UK. For instance, thoughtful scheduling of services through well-designed transport nodes could increase capacity by reducing transfer and waiting times.



Design

Use best practice, secure by default, information management and digital techniques to get data right from the start and design better-performing homes, buildings and infrastructure.

Build

Exploit new and emerging digital construction, information management, and manufacturing technologies and techniques to improve safety, quality and productivity during construction.

Operate

Use effective information management to transform the performance of the built environment and the services it delivers.

Integrate

Understand how the built environment can improve citizens' quality of life and use that information to drive the design and build of our economic and social infrastructure and the operation and integration of the services they deliver.

Digital design: Assist with document control and integration as design progresses from sketches to construction documents

Preconstruction

Estimating: Automate and improve the accuracy of bid estimates

Construction relationship management: Provide dashboard for business-development pipeline

Market intelligence: Gather and analyze information gathering from past projects and competitor performance

Marketplace: Create a platform for stakeholders to prequalify, evaluate, and select partners

Construction

Design management

- Visualize drawings and 3-D models on site, on mobile platforms
- Update blueprints in the field with mark-ups, annotations, and hyperlinks

Scheduling

- Create, assign, and prioritize tasks in real time
- Track progress online
- Immediately deliver work plan and schedule to all workers

Materials management

- Identify, track, and locate materials across the supply chain

Field productivity

- Track crew deployment in real time
- Manage project staffing across skilled trades
- Track on-site productivity at a trade and worker level

Equipment management

- Track and manage construction-equipment fleet

Quality control

- Inspect remote sites through pictures and tags shared through app
- Update and track live punch lists across projects to expedite project closure

Contract management

- Update and track contract-compliance checklist
- Update records for all client and contractor communication regarding contract terms
- Track vendor prequalification and liens and manage payments

Performance dashboard

- Monitor project progress and performance
- Provide automated dashboards created from field data
- Generate manpower updates and view past reports on handheld devices

Document management

- Upload and distribute documents
- Search all projects across phases
- Share information across sites

Safety

- Track and report safety incidents across the job site
- Alert workers on safety procedures and provide tips live

Enterprise-resource-planning systems

Operations and management

Work-order management

Remote monitoring of building systems

Predictive analytics for system management

Mid to small project management

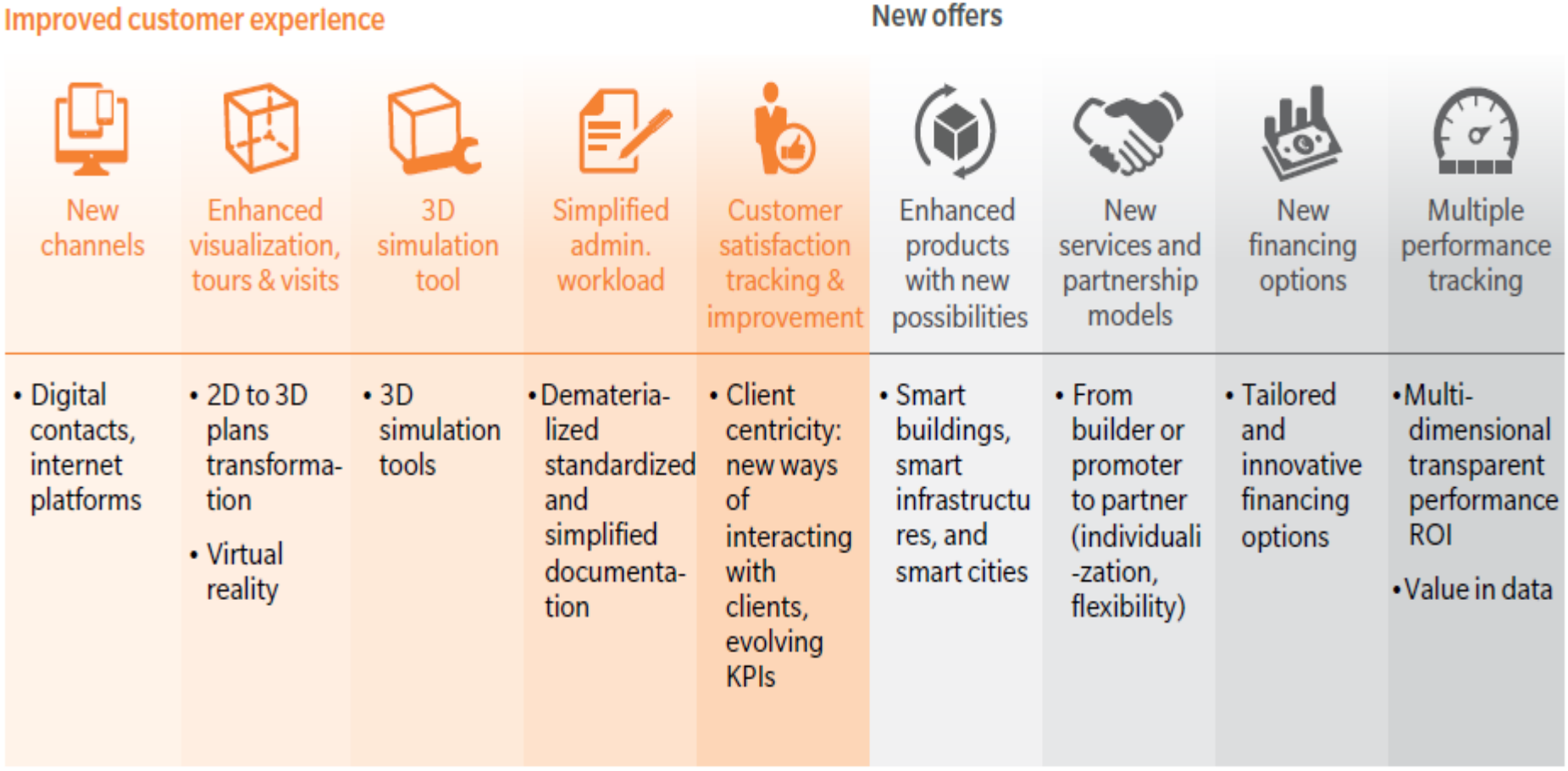
Asset management with an ongoing record of facility performance and maintenance backlog

DIGITALIZATION OFFERS NUMEROUS OPPORTUNITIES TO INCREASE OPERATIONAL EFFICIENCY (DIRECT COSTS, DELAYS, SECURITY, AND ENVIRONMENTAL IMPACT)

Interactive Work processes		Connected machines, equipment, and workers					Industrialized models
							
Use of visualization and simulation	Dematerialized and reactive workflows	Accelerated data collection and analysis	Connected workforce and tools	Smart energy management	Machine performance optimization	Automation	Industrialization of processes and parts
• Virtual, augmented, and mixed reality	• Dematerialized and in-situ documentation management/ updates • Instant connected schedule coordination of work, inventory and transport • Network of sub-contractors and support to bidding, selecting and contracting	• Surveying, scanning, and mapping • Progress and incident monitoring • Performance, inventory, and incident monitoring	• Connected workers, exoskeletons for support • Tools inventory management and tracking/ localization	• Energy consumption optimization • Rapid failure correction	• Localization, fuel, idle time, safety tracking	• Semi-automated to automated vehicles and processes	• Production on adjacent sites/prefabrication/ modules • Additive printing of specific parts

Source: Oliver Wyman analysis

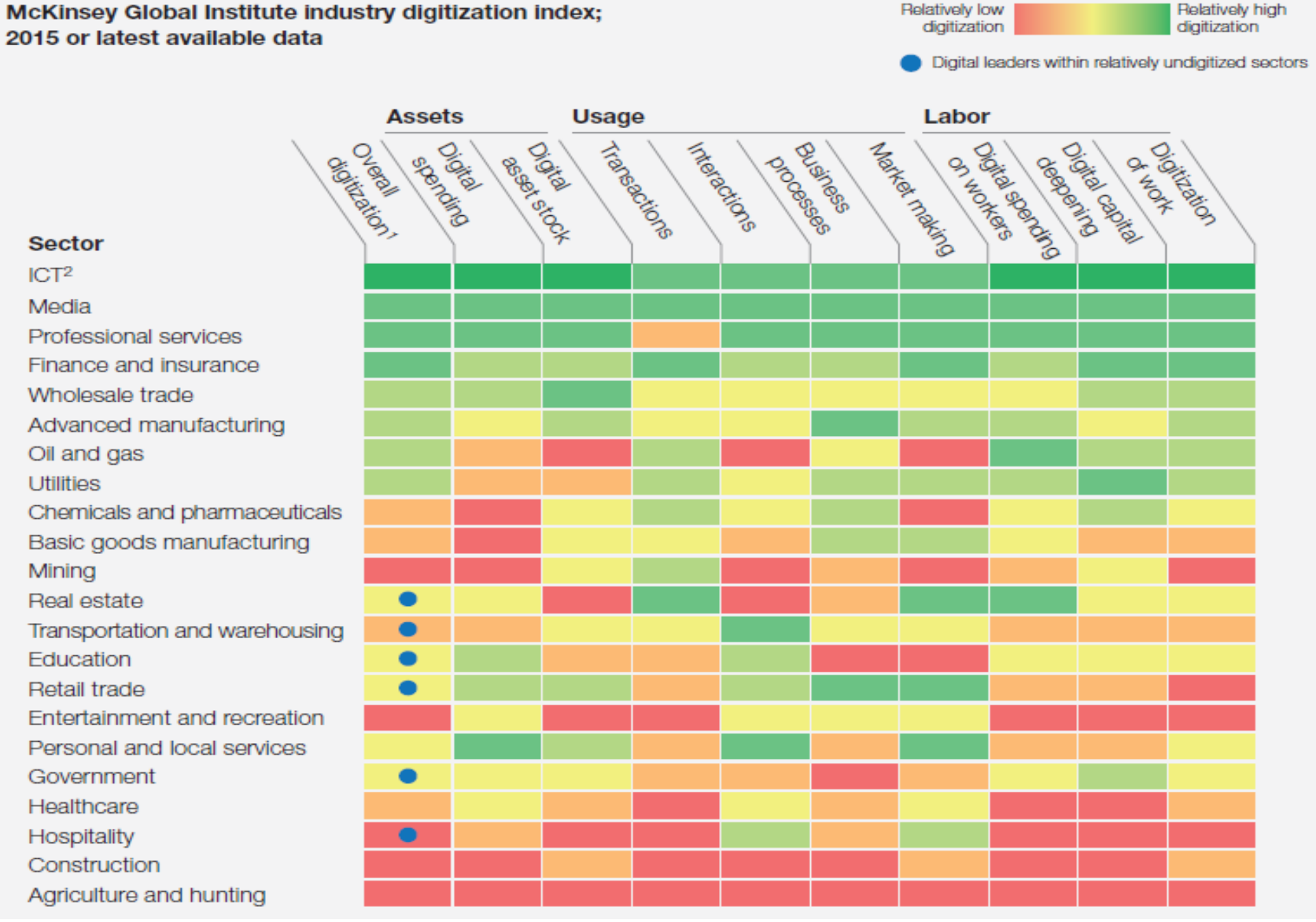
BEYOND OPERATIONS, DIGITALIZATION IN THE CONSTRUCTION INDUSTRY TRIGGERS OPPORTUNITIES TO RAISE SALES AND ENHANCE CUSTOMER SATISFACTION



Source: Oliver Wyman analysis

The construction industry is among the least digitized.

McKinsey Global Institute industry digitization index; 2015 or latest available data



Digitalization in the construction world is in its infancy. While innovation is booming it still remains scattered and not really organized. Nonetheless, **digital in construction will eventually generate usages and breakthroughs that we simply cannot conceive yet.**

Digital transformation can mean different things to different stakeholders, so starting with a shared definition can help executives and managers to agree on a transformation's goals.
Broadly, a digital transformation involves two types of change: business-model innovation, whereby companies introduce digitally enabled products and services, and operational improvement, whereby companies apply advanced technologies and ways of working to enhance the development and delivery of projects.

A new analysis of the construction technology ecosystem finds emerging trends, constellations of solutions, and an ever-increasing universe of technology use cases that are disrupting the way we plan, design, and execute projects.

Our conclusion is that undertaking new research into frameworks and business models, extending existing work taking place in established research collaborations, and leveraging insights from this and other sectors to accelerate digitalisation provides a robust portfolio of next steps to build the capabilities needed for digital built Britain.