

Annex A: Factsheet on Taskforce for Architectural and Engineering Consultants

1. In the coming years, Singapore will continue to embark on many new infrastructure developments as we build a future Singapore that is more sustainable, liveable and inclusive.
2. To ensure that Singapore has a capable and talent pipeline of Built Environment (BE) professionals and firms to deliver on these infrastructure plans, the taskforce will look into the following areas:
 - i. Uplifting branding of the BE sector and strengthening talent inflow;
 - ii. Transforming the workforce and workplaces for the future;
 - iii. Evolving existing BE consultancy business models; and
 - iv. Propagating sustainable industry practices.
3. The taskforce is co-chaired by Ms Indranee Rajah, Second Minister for National Development, and Mr Chaly Mah, Chairman of Surbana Jurong Group, and comprises representatives from consultancy firms, major service buyers, Institutes of Higher Learning (IHLs), public agencies and young professionals. Please find the detailed list of members below:

Co-Chairs:	Ms. Indranee Rajah Minister in Prime Minister's Office Second Minister for Finance Second Minister for National Development
	Mr. Chaly Mah Chairman, Surbana Jurong Group
Members:	Ar. Angelene Chan Chairman, DP Architects
	Mr. Bernard Ho President, Society of Project Managers Singapore
	Mr. Bernard Nee Deputy President (Industry & Community), Singapore Institute of Technology
	Mr. Cheng Hsing Yao Chief Executive Officer, GuocoLand Group
	Ar. Chan Kok Way President, Board of Architects

Er. Chuck Kho President, Association of Consulting Engineers Singapore
Ar. Fun Siew Leng Chief Urban Designer, Urban Redevelopment Authority
Mr. Kwee Ker Wei Vice President, Real Estate Developers' Association of Singapore
Er. Kristian Tung Senior Principal Engineer, CPG Corporation
Mr. Kelvin Wong Chief Executive Officer, Building and Construction Authority
Mr. Lee Ang Seng Managing Director (Singapore & Myanmar), Beca
Er. Lim Peng Hong President, Professional Engineers Board
Ar. Melvin Tan President, Singapore Institute of Architects
Ar. Pan Yi Cheng Principal Architect, Type 0 Architecture
Mr. Tay Ter Long Chief of Government Procurement, Ministry of Finance
Prof. Teo Kie Leong Dean, College of Design and Engineering, National University of Singapore
Mr. Wong Kin Hoong President (Quantity Surveying), Singapore Institute of Surveyors and Valuers
Mr. Yee Boon Cheow Deputy Chief Executive Officer, Land Transport Authority

Annex B: Factsheet on the BuildSG Industry Branding Campaign

Campaign Background

1. The Build SG Industry Branding Campaign seeks to showcase the nation-building role of the Built Environment (BE) sector, and how it has been critical in shaping how Singaporeans live, work and play.
2. The campaign also seeks to share stories of how BE professionals and firms have transformed the way we design, build and maintain Singapore's built environment, as well as highlight the opportunities and purpose offered by BE careers.

“We are Never Done Building Singapore”

3. The campaign's overarching tagline “*We are Never Done Building Singapore*”, underscores the continuous effort by the BE sector in shaping the past, present and future of Singapore.
4. It also embodies the BE sector's spirit of continuous improvement in transforming the way we build in Singapore.

Main Film

5. The main film will feature the transformation of Singapore's urban landscape through the years and how the BE sector has enabled these transformations. It will also weave in how the sector has leveraged innovation and technology, such as drones for façade inspection, the use of Building Information Models (BIM), to build inclusive, liveable and sustainable spaces for Singaporeans to live, work and play.

Watch the [main film](#).

Key Visuals

6. These feature actual industry professionals from the 9 different BE career tracks against landmarks of Singapore, to showcase the diverse career opportunities in the sector, and how they have all been contributing to shape the past, present and future of Singapore.
7. The career tracks featured are, architecture, structural engineering, project management, construction management, off-site production management, digital transformation, sustainability consultancy, cost consultancy and smart facilities management.

BuildSG

WE ARE BUILT TO BUILD

A better Singapore then, now and into the future.

Discover what we do in the Built Environment sector
www.buildsg.gov.sg

Brought to you by
 Building and Construction Authority

BuildSG

WE BUILT THIS CITY

A safer, more inspiring and sustainable built environment for Singapore.

Discover what we do in the Built Environment sector
www.buildsg.gov.sg

Brought to you by
 Building and Construction Authority

BuildSG

WE ARE NEVER DONE BUILDING SINGAPORE

An exciting landscape of possibilities to live, work and play.

Discover what we do in the Built Environment sector
www.buildsg.gov.sg

Brought to you by
 Building and Construction Authority

Content Partnerships

8. To familiarise the general public with the BE sector, BCA is also working with media partners and influencers to showcase the 'behind-the scenes' stories of how the BE sector has shaped the urban environment and transformed the way we design, build and maintain our built environment (e.g. through innovative practices and new adopting technologies).
9. Best practices from progressive BE firms will also be profiled to share their lessons learnt, and encourage the rest of the industry to deepen the sector's transformation efforts.

Buildsg.gov.sg Microsite

10. The campaign materials also feature a call-to-action for audience members to click through to the career microsite, buildsg.gov.sg, to find out more about the sector, available roles, courses, and career opportunities.

Timeline

11. "*We are never done building Singapore*" will launch at IBEW, where the main film will premiere. The launch will also be supported by a progressive roll-out of content partnerships and publicity via various media channels.

Annex C: Factsheet on Revised Standard Consultancy Agreement (SCA)

1. Developed in 2014, the SCA serves as a common contract form to be used for public sector construction-related consultancy¹ tenders. It specifies the two standard conditions of contract between Government Procuring Entities (GPEs) and their consultants, covering the scope of service, obligations and liabilities, procedures for payment and settlement of disputes, among others. The SCA enhances GPEs' and consultants' familiarity with a set of standard contractual terms to reduce tendering effort and promote more efficient contract administration.

2. To promote more progressive procurement practices, BCA has worked with relevant Trade Association and Chambers², major consultancy firms, the Ministry of Finance and GPEs to identify common pain points and propose enhancements to the SCA.

3. The three intended outcomes for this round of SCA enhancements are as follows.

- a. Provide clearer definition of scope of services so that agencies and consultants are aligned upfront in their understanding of the consultants' roles and responsibilities;
- b. Maintain fair and timely remuneration, commensurate with the scope of work provided; and
- c. Provide a more balanced allocation of risk, especially to address unanticipated events.

S/N	Intended Outcomes	Enhancements
1	Clearer definition of scope of services	<i>The enhanced SCA will provide for:</i> a. GPEs to state their requirements (e.g. the expected number of stakeholder engagements) upfront and more clearly. b. GPEs to highlight non-standard services beyond the base set of services, so that consultants may better gauge the work required and price them in accordingly.
2	Maintain fair and timely remuneration	<i>The enhanced SCA will provide for:</i>

¹ These include architectural, civil & structural engineering, mechanical & electrical engineering, quantity surveying and project management consultancies.

² These include the Singapore Institute of Architects (SIA), Association of Consulting Engineers Singapore (ACES), Institution of Engineers Singapore (IES), Singapore Institute of Surveyors and Valuers (SISV) and Society of Project Managers Singapore (SPMS).

		a. Consultants the option to request fee adjustments for additional services required during the course of a project. Updated man-hour fees are also provided to more fairly compute fee adjustments for additional works. b. Consultants' fees³ to be unchanged if GPEs make omission variations that reduce the final construction cost. c. GPEs to make regular monthly payments during the pre-construction stages to better alleviate consultants' cashflow pressures. d. GPEs to pay regulatory submission fees directly, instead of having consultants pay and be reimbursed later.
3	More balanced allocation of risk	<i>The enhanced SCA will provide for:</i> a. GPEs to share the costs for significant construction delays, where the delays are due to issues beyond the consultants' control. b. GPEs the option of requiring consultants to purchase a minimum amount of professional indemnity insurance, while simultaneously limiting a consultant's contractual liabilities for the project.

4. BCA will publish further implementation details through an industry circular after the announcement. The enhanced SCAs will be ready for implementation for projects with tenders called from 1 November 2024 onwards.

³ This only applies when consultants' fees are determined as a percentage of the project's construction cost.

Annex D: Factsheet on Refreshed Built Environment Industry Digital Plan

1. The Building and Construction Authority (BCA) and the Infocomm Media Development Authority (IMDA) launched the refreshed Built Environment Industry Digital Plan (BE IDP) at the International Built Environment Week (IBEW) on 4 Sep 2024. The BE IDP (previously known as Construction and Facilities Management IDP) was first introduced in 2020 and is designed for all Built Environment (BE) Small and Medium Enterprises (SMEs) to enhance their digital capabilities and improve their overall efficiency. Since then, there has been strong interest amongst SMEs in deepening their digital capabilities.

2. Building on the momentum, BCA and IMDA, in close consultation with about 400 industry stakeholders from the BE sector, jointly developed the refreshed BE IDP. The refreshed IDP, which has streamlined existing categories of solutions, focuses on further advancing Integrated Digital Delivery for the industry across three Key Transformation Areas as identified in the BE ITM, (namely Integrated Planning and Design, Advanced Manufacturing and Assembly, and Sustainable Urban Systems). It includes roadmaps on digital solutions, cybersecurity and data protection and digital skills training, to support SMEs throughout their digitalisation journey. The IDP will enable stakeholders to plan and design collaboratively using integrated digital tools, manufacture and fabricate more cost-effectively and safely, and monitor and automate asset management in an efficient and optimised manner.

Refreshed Digital Solutions Roadmap to Ensure Relevance and Alignment with Industry Trends

3. To keep pace with industry trends and technological advancements, the BE IDP includes a refreshed solution suite under the Digital Solutions Roadmap. These solutions are mapped to the three Key Transformation Areas outlined in the BE ITM, to support business needs. They will enable project teams to plan and design collaboratively and cost-effectively, manufacture and construct more productively and safely, and monitor and automate asset management in an efficient and optimised manner. See Figure A for more details on the Digital Solutions Roadmap, and its solutions categories.

Uplifting Digital Capability of Built Environment SMEs

4. Employers can refer to the refreshed Digital Skills Training Roadmap, which is a set of strategies to equip employees with the necessary skills (including change management) to adopt digital solutions at each stage of growth and tailor their training programmes. These training programmes are aligned to the refreshed Digital Solutions Roadmap and the Skills Framework⁴ and emerging areas under the SkillsFuture Series.

5. Alongside the refreshed BE IDP, a Cybersecurity and Data Protection Roadmap is also available. The roadmap provides BE SMEs with measures to identify appropriate tools and practices for protection against cyberattacks and to safeguard customers' personal data. See Figure B for more details on the Digital Skills Training Roadmap, and Figure C for the Cybersecurity and Data Protection Roadmap.

Artificial Intelligence (AI) can enhance solutions to deliver more value

6. AI and Generative AI are at the forefront of innovation and have the potential to transform the sector. The refreshed BE IDP includes examples of how AI-enabled solutions can enhance operational efficiency, help SMEs make informed decisions and elevate safety & quality standards. These include:

- AI-powered image recognition for automated defect detection during inspections;
- AI-driven analytics for real-time monitoring of safety and health risks on construction sites; and
- Generative AI to automate workflows such as speedy generation of design and floor layouts to achieve optimised design and streamline time-consuming design processes.

⁴ This was jointly developed by BCA, SkillsFuture Singapore and Workforce Singapore, together with relevant stakeholders to provide a common skills language for the BE sector and is aligned with the BE ITM. It identifies pivotal BE jobs, outlining career pathways as well as existing and emerging skills to support the growth and transformation of the sector. Specifically for digitalisation, the Digital Delivery Management (DDM) accreditation scheme was introduced to build digital competencies.

Support available for Built Environment SMEs to go digital

7. BCA is working with IMDA to identify and pre-approve more relevant solutions, for the industry so that SMEs can enjoy funding support for adoption of these digital solutions, under the Productivity Solutions Grant (PSG).

8. There has been strong take-up rate from over 900 SMEs of pre-approved digital solutions from the Construction and Facilities Management IDP launched in March 2020, supported under the PSG. Examples of some success stories can be found in Figure D. More information on the BE IDP (and other initiatives such as IMDA's CTO-as-a-Service), visit <https://go.gov.sg/beidp>.

Figure A - Digital Solutions Roadmap



Solution Categories under Key Transformation Areas in the BE ITM

i) Integrated Planning and Design

Enable developers, consultants and construction firms to collaborate and design accurately and cost-effectively.

a. 3D Modelling, Immersive, Visualisation and Analysis

Enable consultants to prepare 3D models for design and regulatory submissions; use visualisation/immersive technology to visualise and validate designs with clients; and perform digital analysis of designs and simulate performance to optimise design.

b. Coordinated Regulatory Approvals and Rule-based Model Checker

Enable consultants to perform intelligent checks of their design models against regulatory requirements for compliance purposes, and help developers and consultants/architects obtain speedy approvals through collaborative design using IFCSG-compliant Building Information Modelling (BIM) authoring solutions.

c. Quantity Surveying and Valuation Solutions

Ensure automation of quantity take-off and conduct cost estimations using BIM more accurately and efficiently.

d. Digital Contract Management Solutions

Ensure effective work verifications against contractual deliverables and milestones, leading to prompt payments and healthy cashflow project.

e. Data and AI-driven Decision Support System

Enable developers and lead construction companies to monitor their projects' performance in terms of cost, time, safety, quality and productivity through dashboard solutions, based on data contributed from project stakeholders.

f. Built Environment Digital Platform

Act as a centralised repository for all project-related information leading to a single source of truth that facilitates project collaboration and decision making throughout the project lifecycle.

ii) Advanced Manufacturing and Assembly Methods

Enable construction firms of all sizes and specialisations to keep their workers safe and well-utilised, and help lower cost of fabrication.

a. Smart Inspection and Management Solutions

Enable immediate alerts for timely intervention of potential project delay and safety breaches using sensor and video-based analytics to improve on-site manpower deployment and safety monitoring.

b. Design for Manufacturing and Assembly (DfMA) Solutions

Increase the use of standardised components that can be sourced from manufacturers' catalogues through AI-assisted design optimisation solution to improve constructability and reduce fabrication costs.

c. Robotics and Automation Solutions

Augment workers with robots to undertake dangerous and physically demanding tasks on construction sites, hence reducing human errors and improving safety.

iii) Sustainable Urban Systems

Lower buildings' emissions and energy needs and consolidate operational and analysis needs across facilities and buildings, which developers and facilities management firms aspire towards.

a. Asset Condition-based and Predictive Maintenance Solutions

Predict building assets' health and performance to optimise maintenance frequency and prevent costly and unexpected breakdown.

b. Integrated Building Management Platform

Consolidate the controls of assets and services, such as HVAC, lighting, and security, enabling holistic situational awareness and simplifying coordination of building services across multiple stakeholders.

c. Facilities Management Workflow Automation Platforms

Automate facilities management work processes and enhance efficiency of service delivery by documenting, tracking and closing of incidents/issues.

Figure B – Digital Skills Training Roadmap

7. Digital Skills Training Roadmap		
This digital skills training roadmap serves as a guide to equip your company and workers with the necessary skills (including change management) to adopt digital solutions at each stage of growth. Training programmes are aligned to Skills Framework and emerging areas under SkillsFuture Series.		
Stage 1 Getting Digital Economy Ready	Stage 2 Growing in the Digital Economy	Stage 3 Leaping Ahead
 3D Modelling, Immersive, Visualisation and Analysis ✓ BIM Modelling for OpenBIM (IFC-SG) submission > ✓ CORENET X Regulatory Approval for Building Works (RABW) > ✓ Computational BIM >	 Built Environment Digital Platform ✓ Common Data Environment (CDE) > ✓ Integrated Digital Delivery (IDD) Management > ✓ Data Analytics for Built Environment >	 Data and AI-driven Decision Support System ✓ Data Analytics for Built Environment > ✓ Artificial Intelligence Application > ✓ Programming and Prompt Engineering >
 Quantity Surveying and Valuation ✓ BIM Data and Modelling (Architecture/MEP/Structure) > ✓ Digital contract management > ✓ Cost Planning and Estimation >	 Coordinated Regulatory Approvals and Rule-Based Model Checker ✓ BIM Modelling for OpenBIM (IFC-SG) submission > ✓ CORENET X Regulatory Approval for Building Works (RABW) > ✓ BIM Model Checker >	 Robotics and Automation (R&A) ✓ Robotic and Automation Technology Application > ✓ Digital Construction Site Management > ✓ Artificial Intelligence Application >
 Digital Contract Management ✓ Digital Project Planning and Execution > ✓ Supply Chain Management > ✓ Digital contract management >	 DfMA Solutions ✓ Digital Logistics > ✓ Supply Chain Management > ✓ Digital Project Planning and Execution >	 Integrated Building Platform ✓ Smart Energy Management > ✓ Digital Twin > ✓ Integrated Facilities Management (FM) >
 Smart Inspection and Management ✓ Remote Monitoring > ✓ Digital Reality Capture > ✓ Digital/Smart Inspections >	 Asset Condition-based and Predictive Maintenance ✓ Internet of Things Management > ✓ Smart Energy Management > ✓ Digital Twin >	
 Facilities Management (FM) Workflow Automation ✓ Smart Facilities Management (FM) > ✓ Internet of Things Management > ✓ Smart Energy Management >		
Training programmes aligned to Skills Framework and emerging areas under SkillsFuture Series Training programmes aligned to Digital Delivery Management (DDM) Competency Framework and Training Roadmap For assistance in company-led upskilling of existing employees in tech capabilities, including job redesign and redeployment, contact IMDA's Jobs Transformation Map (JTM) Training Partners. Note: Course directory can be found at MySkillsFuture Course Directory		

Figure C – Cybersecurity and Data Protection Roadmap

This roadmap serves as a guide to introduce SMEs to cybersecurity and data protection measures at each of the three stages of growth. For more information, please refer to [CSA SG Cyber Safe programme](#), [Data Protection Essentials \(DPE\)](#) and [Data Protection Trustmark \(DPTM\)](#).

Cybersecurity As the company increases its level of digitalisation	Data Protection As the company increases its collection and use of personal data
Cyber hygiene measures for protection against common attacks	Basic data protection and security practices to protect clients' personal data & recover quickly from a data breach
 Cybersecurity Toolkits >	 Data Protection Essentials (DPE) >
 Cyber Essentials >	
 Cybersecurity Solutions >	
 CISO-as-a-Service cybersecurity consultants >	
Risk assessment to assess if cybersecurity measures commensurate with enterprise risk profile	Accountable data protection practices to demonstrate compliance with the PDPA
 Cyber Trust >	 Data Protection Trustmark (DPTM) >
 Cybersecurity Solutions >	

Figure D – Success stories from 3 SMEs that have adopted pre-approved solutions under the Productivity Solutions Grant (PSG)

Active Fire Protection Systems Pte Ltd Information and data management used to be fragmented as Active Fire depended on manual/ conventional processes. The lack of coordination among different value chain stakeholders also meant that much time was spent on unnecessary rework. With the use of digital solutions such as modelling tools, Active Fire observed that all stakeholders can now access the projects' 3D models at the same time, which improves communication between all parties. They also noted that clients are now better able to understand the design intent and make better-informed decisions. These help to streamline processes and reduce rework for the team.
Bosh Engineering Pte Ltd Prior to implementing digital solutions such as Common Data Environment (CDE) platform, Bosh Engineering noted time inefficiencies stemming from having to wait for comments from project stakeholders and commuting for in-person meetings. With the adoption of the digital solution, the firm is now able to have discussions, coordination and project tracking in real-time. This has reduced miscommunication with project stakeholders and boosted productivity. Bosh Engineering also observed that staff can now complete tasks more quickly, leading to a noticeable decrease in overtime work.
Scan-Bilt Pte Ltd Scan-Bilt's staff used to have to manually format and build up costing for each tender exercise. The process was time-consuming and prone to errors. With digital solutions for quantity take-off, they are now able to churn out Bills of Quantities (BQs) at a faster rate with higher accuracy. They are also able to retrieve historical rates from past tenders easily now. This speeds up the costing process for similar items, unlike the past where they used to manually search through tenders and specific line items, which was time-consuming. The enhanced accessibility to historical data also allows them to better analyse and understand price trends.

Annex E: Factsheet on ConTech Summit and Innovation & Technology (I&T)

Background on ConTech

1. “ConTech” refers to a collection of cutting-edge and innovative construction technologies which can be adopted by the wider Built Environment (BE) sector. Such solutions, be it those developed and commercialised by nascent start-ups or established MNCs, can assist BE firms to transform their businesses and operations, and address existing challenges and pain points relating to productivity and sustainability.

2. Globally, ConTech solutions continue to receive attention and gain investment traction. ConTech solutions had seen an approximately **77% increase**⁵ in market share of the global Venture Capital (VC) market between 2020 and 2023.⁶ The total investment value of ConTech deals closed in 2023 was US\$3.03 billion.⁷ Given that the construction sector accounts for 14% of global GDP,⁸ the share of ConTech solutions as a proportion of VC spending remains marginal compared to the industry’s size. This presents significant room for growth for ConTech solutions in the global BE sector.

3. As sector lead, BCA plays a facilitative role in connecting both local and international stakeholders to drive I&T. This includes raising awareness of Singapore as an ideal market to testbed and develop ConTech solutions for the wider South East Asia (SEA) and Asia Pacific (APAC) regions, spotlighting local and regional start-ups and research to international investors, and driving thought leadership on the latest ConTech developments. The idea is to establish Singapore as a regional centre for ConTech solutions, and interest promising start-ups and investors to bring in innovative technologies which can disrupt and transform the BE sector.

4. As detailed in Table 1, emerging ConTech solutions can be broadly categorised into (i) sustainable green construction technologies; (ii) enhanced productivity and efficiency technologies; (iii) agile supply chain technologies; and (iv) disruptive future of construction technologies.⁹ Such ConTech solutions address existing challenges relating to productivity and sustainability in the local BE sector, and are broadly aligned with the key transformation areas under the Built Environment Industry Transformation Map (BE ITM). For example:

⁵ According to Cemex Ventures’ Top 50 ConTech Startups Report 2024

⁶ Growth from 0.6% in 2020 to 1.06% in 2023

⁷ According to Cemex Ventures’ Top 50 ConTech Startups Report 2024

⁸ According to Global Market Model 2023

⁹ According to Cemex Ventures’ Top 50 ConTech Startups Report 2024

- a. 3D printing and precast automated processes are aligned with ongoing efforts to enhance productivity by moving construction off-site to enable **Advanced Manufacturing and Assembly (AMA)**;
- b. Digital twin and digital project management technologies are aligned with ongoing efforts to connect various stakeholders across the building lifecycle working on the same project via a “digital spine”, in what is termed as **Integrated Planning and Design (IPD)**.
- c. Energy efficiency solutions and sustainable materials are aligned with ongoing efforts to meet Singapore’s ambitions to achieve net zero emissions by 2050 and realise **Sustainable Urban Systems (SUS)**.

Table 1: Categories and Examples of ConTech Solutions

Sustainable Green Construction	Enhanced Productivity and Efficiency	Agile Supply Chain	Disruptive Future Tech
Built environment decarbonisation	Project design & budgeting	Procurement	3D printing & additive manufacturing
Circular business models	Geotechnical analysis	Materials & resources marketplaces (labour, equipment or materials)	Off-site, modular, & precast automated processes
Waste management & recycling	Project bidding	Logistic tools & materials tracking	Robotics & machine-assisted applications
Alternative fuels & new energy sources	Project specification for materials and processes	Fleet management & dispatching	Optimisation of materials manufacturing (mixes, coatings, binders, etc.)
Sustainable materials	Planning & scheduling	Delivery & last-mile platforms	Smart cities & buildings
Sustainable products libraries & life-cycle assessments (LCA)	Project monitoring & control	Inventory management & onsite handling	
Water conservation & efficiency	Document management		

Environmental damage mitigation	Health & safety compliance and mitigation		
Energy efficiency	BIM & digital twins		
	Risk management		
	Project quality		
	Finance & credit solutions		
	Asset management & maintenance		

Inaugural ConTech Summit 2024

5. The inaugural ConTech Summit 2024 presents a platform for both international and local participants of the International Built Environment Week (IBEW) to explore emerging ConTech solutions and gain insights from leading global experts. In particular, the [event](#) will showcase local and foreign start-ups with unique ConTech solutions, presentations from industry leaders on global and regional ConTech trends and developments, and a panel discussion on the future of ConTech.

6. The expected audience at the ConTech Summit includes progressive BE firms, investors (which includes VC firms and Corporate Venture Capital arms), start-ups, and Institutes of Higher Learning (IHLs), and innovation centres¹⁰ – which BCA recognises as key stakeholders in driving the adoption of I&T in the BE sector.

7. The ConTech Summit will focus on the latest ConTech developments and contribute to the growth of a vibrant local I&T ecosystem for Singapore's BE sector:

a. ConTech as a Transformative Force for the Future

ConTech investments and solutions do not only constitute a temporary trend, but should be considered as a transformative force that brings value to firms and is capable of permanently reshaping the BE sector. Moving forward, demand is expected to grow¹¹ for innovation and investments in ConTech solutions given the global construction industry's projected compound annual growth rate (CAGR) of 4.4% between 2023 and 2028,¹² while challenges of productivity and sustainability become increasingly intractable globally.

¹⁰ This includes outfits set up by international firms in Singapore to engage in research and commercialise their innovations for local and regional deployment, e.g. Kajima's The GEAR and Obayashi Construction-Tech Lab Singapore.

¹¹ Assessment is derived from Cemex Ventures' Top 50 ConTech Startups Report 2024

¹² According to Research and Markets' Construction Industry 2023 Report

b. Singapore as an Ideal Market

Singapore has developed into a supportive I&T ecosystem to develop, testbed and deploy the latest ConTech solutions, and is a location worth considering for ConTech investments. Aspects of Singapore's facilitative ecosystem include its supportive regulatory standing for innovations; (ii) events and spaces to testbed innovations, e.g. BCA's Built Environment Innovation Hub (BEIH) and (iii) open innovation and funding programmes, e.g. [Built Environment Accelerate-to-Market Programme \(BEAMP\)](#).

In particular, **Kajima Asia Pacific will launch its new commercial entity "The Gear Pte Ltd"** based in Singapore at the ConTech Summit. The new entity will function as (i) Kajima's dedicated technology services business, which will commercialise Kajima's research and innovations for industry use both in Singapore and the wider region; and (ii) an open innovation platform, including a residency programme for start-ups and various ecosystem-building initiatives centred at The GEAR Building. More information on The Gear Pte Ltd will be provided through Kajima's separate press release for IBEW.

Another example is **Obayashi's establishment of its R&D base for the Asia-Pacific Region (i.e. Obayashi Construction-Tech Lab Singapore, or OCLS) in Singapore**, where the OCLS was launched at the Built Environment Innovation Hub centred on the BCA Braddell Campus on 18 Jul 2024. Moving forward, Obayashi intends to leverage OCLS as a hub for the Asian region, complementing its existing innovation bases in Silicon Valley in the U.S. and in Tokyo in Japan to advance next-generation construction-related technologies. The OCLS will be embarking on research collaborations with (i) NTU's Singapore Centre for 3D Printing (SC3DP), with an initial focus on 3D metal printing of mechanical joints for construction applications; and (ii) SUTD, on researching robot-friendly construction worksites. BCA's Productivity Innovation Project (PIP) scheme¹³ has also supported OCLS to bringing in concrete levelling and trowelling robots from Fang Shi Technology, for deployment in Obayashi Singapore's ongoing projects.

Local BE firms in Singapore have actively facilitated investments and the adoption of the latest ConTech solutions. For example, **CDL has invested in VC funds which are synergistic to its core businesses as a developer, including Fifth Wall and Taronga Ventures**. Doing so has provided capital for both VC funds to invest in promising ConTech start-ups and solutions. At the same time, Fifth Wall and Taronga Ventures have introduced relevant technologies to assist CDL with its problem statements and achieve their

¹³ The PIP scheme co-funds up to 70% of the qualifying costs of technology adoption and innovations that improve productivity.

sustainability ambitions, while providing the latest insights on global technology trends disrupting the Built Environment. This has not only provided CDL with access to a steady stream of start-ups with innovative technology and business models, but also allows CDL to further innovate its businesses to stay ahead of global technology trends.

In addition, **Pan-United has partnered CarbonCure Technologies as its first concrete producer partner outside North America** to offer low-carbon concrete which leverages carbon sequestration and utilisation in Singapore, allowing Pan-United to potentially sequester over 19,500 tonnes of carbon dioxide every year.

c. Growth Opportunities in the Region

The event will demonstrate the vast potential and growth opportunities for ConTech solutions in Southeast Asia and the wider Asia-Pacific region, by connecting ConTech start-ups with international investors and key I&T stakeholders.

For example, our **local start-ups Wavescan¹⁴ and Ailytics¹⁵ have expanded their operations into the Hong Kong and Greater Bay Area region**. Wavescan was among the finalists pitching at the Elevator Pitch Competition (EPic) 2024 organised by the Hong Kong Science & Technology Parks Corporation (HKSTP) in Hong Kong, and Ailytics had raised US\$2.7 million in pre-Series A funding led by the Singapore-based VC firm Tin Men Capital (with the support of other investors including Aurum Investments [a subsidiary of Woh Hup Holdings] and AngelCentral) to expand its operations in the region.

¹⁴ Wavescan is a Singapore-based start-up which provides electromagnetics-based sensor solutions for safer, resilient, and sustainable cities.

¹⁵ Ailytics is a Singapore-based start-up which provides video analytics and monitoring solutions for heavy industries' operations, including construction.

Built Environment Accelerate-to-Market Programme (BEAMP)

8. Research and innovation in the BE sector has also transformed – the Built Environment Accelerate-to-Market Programme (BEAMP) organised by BCA, Enterprise Singapore and JTC supports promising innovators as they develop technology solutions for the Built Environment. BEAMP has opened new opportunities for start-ups and innovators in the built environment sector. Since the programme was launched in 2019, BEAMP had organised more than 100 challenge statements, and supported more than 40 projects.

Overview of BEAMP Programme

9. Each BEAMP cycle consists of two key phases. Depending on the technical maturity of the solution proposed, shortlisted innovators may be channelled through the Accelerate Solution Development (ASD) Phase or the Market Development (MD) Phase, where appropriate.

a. ASD Phase

Projects under the ASD phase will take around 3 to 6 months to complete. In this Phase, industry firms identify needs and challenges faced through Challenge Statements; these participating firms are known as Challenge Statement Owners (CSOs). Innovators are invited to respond to these Challenge Statements by submitting proposals about how their existing solutions or a prototype based on their expertise or proprietary technology can be adapted / applied to address the Challenge Statements and meet the industry's needs. These proposals are assessed by an evaluation committee before they are selected for the Programme. Shortlisted innovators will then work with the CSO to develop a minimum viable product (MVP)¹⁶.

b. MD Phase

Projects under the MD phase go through further solution refinement and test-bedding and are expected to take up to 18 months to complete. In this Phase, CSOs work with innovators to refine existing solutions and technology so that they can be tested at a site and for eventual manufacturing and commercialisation. This phase supports the innovators to create the market demand for their solutions, providing them with a sustainable business model.

c. Commercial Trials

During the industry adoption phase, the programme will provide additional support for innovators to conduct small-scale commercial trials to gain early market traction and build track records to bolster their chances of commercialisation in the wider industry.

¹⁶ An MVP has three main characteristics: (i) enough value that people are willing to use or buy it initially; (ii) demonstrates enough future benefit to retain early adopters; and (iii) provides a feedback loop to guide future development.

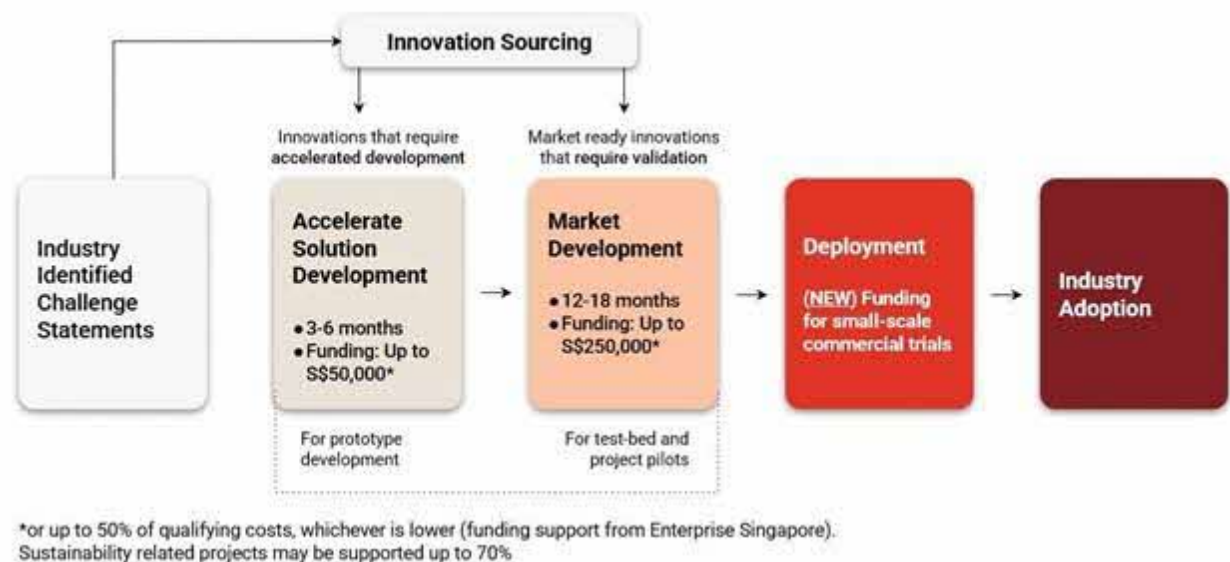
d. Funding Support

Enterprise Singapore supports local small and medium-sized enterprises (SMEs) with up to 50% of qualifying costs, capped at S\$50,000 for the ASD phase and S\$250,000 for the MD phase. Sustainability-related projects may be supported at up to 70%.

Companies keen to apply for BEAMP should meet these criteria:

1. Be registered and operating in Singapore
2. Have a minimum of 30% local shareholding
3. Be in a financially viable position to start and complete the project

An overview of BEAMP with the relevant funding support provided across different phases is illustrated below:



BEAMP Cycle 5

10. The BEAMP continues to grow innovation capabilities in our local firms, drive greater interest and investments in technology innovation and adoption, and create benefits for the firms involved. For example, Chuan Lim Construction and Azimuth Technologies' collaboration on developing a solution for the automatic installation of noise barrier panels under Cycle 4 of BEAMP had (i) enhanced efficiency by completing installations in under 5 minutes per column (as compared to current project requirements of 10 minutes per column); (ii) reduced on-site manpower needs to ideally just one operator (as compared to the on-site workforce of at least 4 workers for the manual process); and (iii) improved safety by minimising the need for workers at heights.

11. Cycle 5 of BEAMP was launched with 16 challenge statements at the Future City Festival 2.0 on 15 March 2024. The latest cycle of BEAMP includes enhancements such as (i) additional support for small-scale commercial trials to secure early market traction and build a track record for innovators' solutions; (ii) an increase in funding quantum for the ASD phase from S\$30k to S\$50k; and (iii) a new sustainability pillar which CSOs can submit challenge statements for, as part of the Government's commitment to decarbonising the Built Environment.

a. Accelerator

Padang & Co has been appointed to manage Cycle 5 of BEAMP as the programme accelerator. Padang & Co will:

- a. Consolidate the industry firms' challenges into challenge statements which are relevant and can interest innovators.
- b. Bring in innovators (locally, regionally and globally) with innovations that may overcome the challenges.
- c. Help innovators to shape their business models and sharpen their pitch in preparation for the market commercialisation of their innovations.
- d. Build a network of innovators, investors and venture capitalists, and manufacturers to foster a culture of innovation development and market commercialisation for the built environment.

b. Current Projects with In-Principle Approval

As part of the ongoing Cycle 5, the BEAMP has provided in-principle approval for **at least 5 projects under the ASD phase** for prototype development, and **at least 4 projects under the MD phase** for solution refinement. The current projects supported under Cycle 5 are detailed as follows:¹⁷

<u>ASD</u>
<i>Building Inspection, Maintenance and Facility Management</i>
1. Myrmidon Laboratories Pte Ltd ("MyrLabs") an A*STAR spin-off that creates cutting edge hardware and algorithms.
CSO: DP Facade
Innovation: Robot for Inspection of Building Façade Cavities To create a robot which can fit into narrow cavities behind mechanically-fixed building façade claddings which are typically 50mm to 150mm in width, and inspect the condition of the framing, brackets, and anchors. The solution aims to enhance productivity by avoiding the need to manually remove individual cladding panels, which can be both time-consuming and costly.
<i>Digital Asset Delivery & Management</i>

¹⁷ Evaluation for other projects for Cycle 5 are still ongoing, and what is reflected here may not be the final number of projects supported.

2. Ailytics Pte Ltd is a Video Analytics solution provider focused on Southeast Asia helping companies enhance their operational safety and productivity.

CSO: Penta-Ocean Construction Co Ltd

Innovation: Automated Tracking of Earthworks and Earth Retaining Stabilising Structures (ERSS)

To develop an automated tracking system for earthworks and ERSS through a platform leveraging deep learning (DL) techniques such as DL segmentation, frame analysis, and object detection. The solution is intended to facilitate productivity and progress tracking of on-site earthworks and ERSS works, and minimise inefficiencies through analysis.

3. Frontline Industrial Software Pte Ltd provides a platform product which has mathematically modelled the complex environment of a construction site, and deployed its AI-powered optimisation algorithms to help users find the best sequence of actions to achieve their optimal construction outcomes.

CSO: Penta-Ocean Construction Co Ltd

Innovation: Automated Project Scheduling Tool

To develop an automated project scheduling tool which analyses past projects to generate new project schedules for ongoing projects. The solution could assist in avoiding potential productivity losses, hidden costs and risks associated with poor project scheduling.

4. Cloudtim Software Pte Ltd provides software development and consultancy services with expertise in Machine Learning, advanced algorithmic strategies, dataset organisation, and data analytics.

CSO: M Moser Associates

Innovation: Automated Cost Estimation and Compliance Checks

To develop a solution which can automate cost estimation tasks as part of Quantity Take-Off (QTO) and compliance checks for 2D drawings, before extending this to 3D BIM models. The solution aims to improve productivity as compared to the traditional manual practice which is time-consuming and prone to errors.

Construction Site Safety

5. Ailytics Pte Ltd is a Video Analytics solution provider focused on Southeast Asia helping companies enhance their operational safety and productivity.

CSO: Exyte Singapore Pte Ltd

Innovation: Edge AI Video Analytics for Monitoring Site Safety

To develop an automated, portable and mobile solution which can tap into existing cameras to run AI at the edge (via integrating the edge AI box within the existing Video Surveillance System (VSS) unit) with low connectivity, and to send out notifications and alerts when site safety breaches occur. The solution is expected to significantly diminish the need to set up comprehensive and costly networks across entire project sites (particularly in remote or hard-to-reach areas), enhancing productivity and worker safety.

MD***Building Inspection, Maintenance and Facility Management***

1. dConstruct Robotics is a start-up which delivers customisable autonomous navigation solutions for mobile robotics applications.

CSO: EM Services Pte Ltd

Innovation: Autonomous Inspection of HDB Corridors

To introduce fully autonomous robots to navigate and operate independently across different floors using lift access to undertake inspection operations of HDB corridors. The solution will augment routine manual inspections, save time, increase productivity, and reduce costs.

2. OPERVA AI Pte Ltd is a start-up specializing in solutions for building inspections and construction monitoring, that actively use AI software automations, and drone technologies to improve the safety, operational, and financial outcomes for the built environment.

CSO: ARUP Singapore Pte Ltd

Innovation: 3D Digital Twin Model of Building Façade

To enhance building façade inspections through an integrated 3D digital twin application solution. This solution uses drones equipped to scan buildings, and create detailed 3D models from point cloud data. These 3D models are then used to visualize inspection data, identify façade components, recognize defects, and track repair progress. The solution can improve productivity by facilitating more accurate information transfer between analyst and close-range inspector, which can reduce the time spent on-site for rectifications (arising from clarifications and potential abortive works).

3. H3 Zoom Pte Ltd is a start-up that offers an artificial intelligence micro-services cloud platform dedicated to maintenance inspections and monitoring of commercial assets for industrial and institutional clients globally.

CSO: City Developments Limited

Innovation: Automated Quality Inspections for Building Interiors

To develop an AI-powered building inspection analytics solution utilising off-the-shelf 360 cameras, which will enable seamless detection of indoor architectural and structural defects for quality assurance and quality management purposes. The solution can improve productivity as well as reducing reliance on manual inspection checks.

Automation & Robotics

4. Azimuth Technologies is a SME which provides customised innovative engineering solutions for the Oil and Gas industries. Moving forward, Azimuth is working on developing various automation solutions for use cases in the construction industry.

CSO: Pan United Concrete Pte Ltd

Innovation: Robotic Concrete Slump Testing and Cube Making

To develop an automated cube making station and slump test station by utilising robotic arms, a portable conveyer, stackable fixtures, and smart controller programming. The solution will improve productivity and quality of cube making and slump tests, by reducing the manpower and storage space required for cube curing and maintaining consistency in the labour-intensive processes required of RMC suppliers and contractors.

Annex F: Overview of the IBEW 2024 Programme

4 September 2024 (Wednesday)			5 September 2024 (Thursday)			6 September 2024 (Friday)			
BEX Asia Tradeshow 4-5 Sep: 1000 – 1800, 6 Sep: 1000 – 1700									
Cassia Main	Begonia Junior	BEX Asia Main Stage	Cassia Main	Begonia Junior	BEX Asia Main Stage	Cassia Main	Begonia Junior	BEX Asia Main Stage	Offsite
Opening Ceremony 0930 – 1000			Session 5 Carbon in the Built Environment: Identifying Quick Wins in the Decarbonisation Journey 0930 – 1015	Session 6 Construction Automation: The Use Cases for AI, Robots and 3D Printing 0930 – 1015		CEOs in Conversation followed by BCA Awards & Lunch (by invitation only) 0930 – 1345	Session 10 Masterclass: Decarbonising ASEAN Data Centres By Eco-Business 0900 – 1000		Learning Journeys to Exemplary Projects around Singapore 0900 – 1200
NETWORKING AM BREAK 1000 – 1100		NETWORKING AM BREAK 1015 – 1045					NETWORKING AM BREAK 1100 – 1130		
Opening Keynote 1100 – 1200			Plenary 3 Designing the Future: Considerations for Developers, Architects and Contractors to Build Smarter & Faster 1045 – 1200	Partner Event* IES Seminar - M&E Increasing Content of Electrical Engineering Components for Prefabricated Construction of Buildings and Infrastructures 1100 – 1200	Partner Event SGBC Seminar 1030 – 1600		Session 11 Masterclass: Demystifying Digital Twins By Bentley Systems 1000 – 1100	Session 12 Masterclass: Preparing for NEC Implementation in Singapore 1000 – 1100	
LUNCH 1200 – 1400		LUNCH 1200 – 1400						Session 13 Masterclass: Unleashing the Full Potential of BIM Data Management By Autodesk 1130 – 1230	
Session 1 Carbon Reporting in the Built Environment 1400 – 1440	Session 2 Achieving Project Excellence Through Better Use of Digital Technologies 1400 – 1500	Session 3 Solving the Productivity, Manpower & Project Management Challenges with Technology 1400 – 1530	Plenary 4 From Vision to Reality: Shaping the Smart Facilities Management Landscape 1400 – 1500	Session 7 Masterclass: Modern Methods of Construction Readiness By Amy Marks 1400 – 1500			Partner Event* IES Seminar - C&S Environmentally Sustainable Land Transportation 1400 – 1500		Learning Journeys to Exemplary Projects around Singapore 1400 – 1700
Session 4 Aligning Stakeholders in the Adoption of Modern Methods of Construction (MMC) 1440 – 1530			Session 8 Adaptive Reuse: Is It Worth It 1500 – 1540	Session 9 Unlocking the Future of Construction: Driving Transformation through Digital Solutions and Collaborative Design & Delivery 1500 – 1540					
NETWORKING PM BREAK 1530 – 1600			NETWORKING PM BREAK 1540 – 1610				Future Talent Programme Fireside Chat Panel Discussion: “Making a Career in the Built Environment” (by invitation only) 1530 – 1645		
Plenary 1 Constructing the Future 1600 – 1700	ConTech Summit (by invitation only) Registration starts: 1445 Startup Showcase: 1500 ConTech Summit: 1600 – 1800		Keynote 2 Regenerative Architecture in a Rapidly Urbanising World 1610 – 1650	Partner Event* SPM Seminar Project Managers’ Role and Leadership in Navigating an Evolving Legal and Regulatory Landscape for Built Environment Projects in Singapore 1600 – 1800		Future Talent Networking Programme with Industry Leaders (by invitation only) 1530 – 1800			
Plenary 2 The Collaboration Playbook: How Successful Projects Adopt a Partnership Mindset to Achieve on Time, on Target, on Profit Projects 1700 – 1800			Plenary 5 Overcoming Barriers to Innovation in the Built Environment 1700 – 1800						
INDUSTRY NETWORKING NIGHT 1800 – 2000									