

CONSTRUCTION AND FACILITIES MANAGEMENT | INDUSTRY DIGITAL PLAN

A guide for enterprises to assess their digital readiness and opportunities to go digital, and acquire solutions to enable plugging into Integrated Digital Delivery (IDD).



Sector lead:



In collaboration with:



In support of:



Supported by:



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GET STARTED TODAY

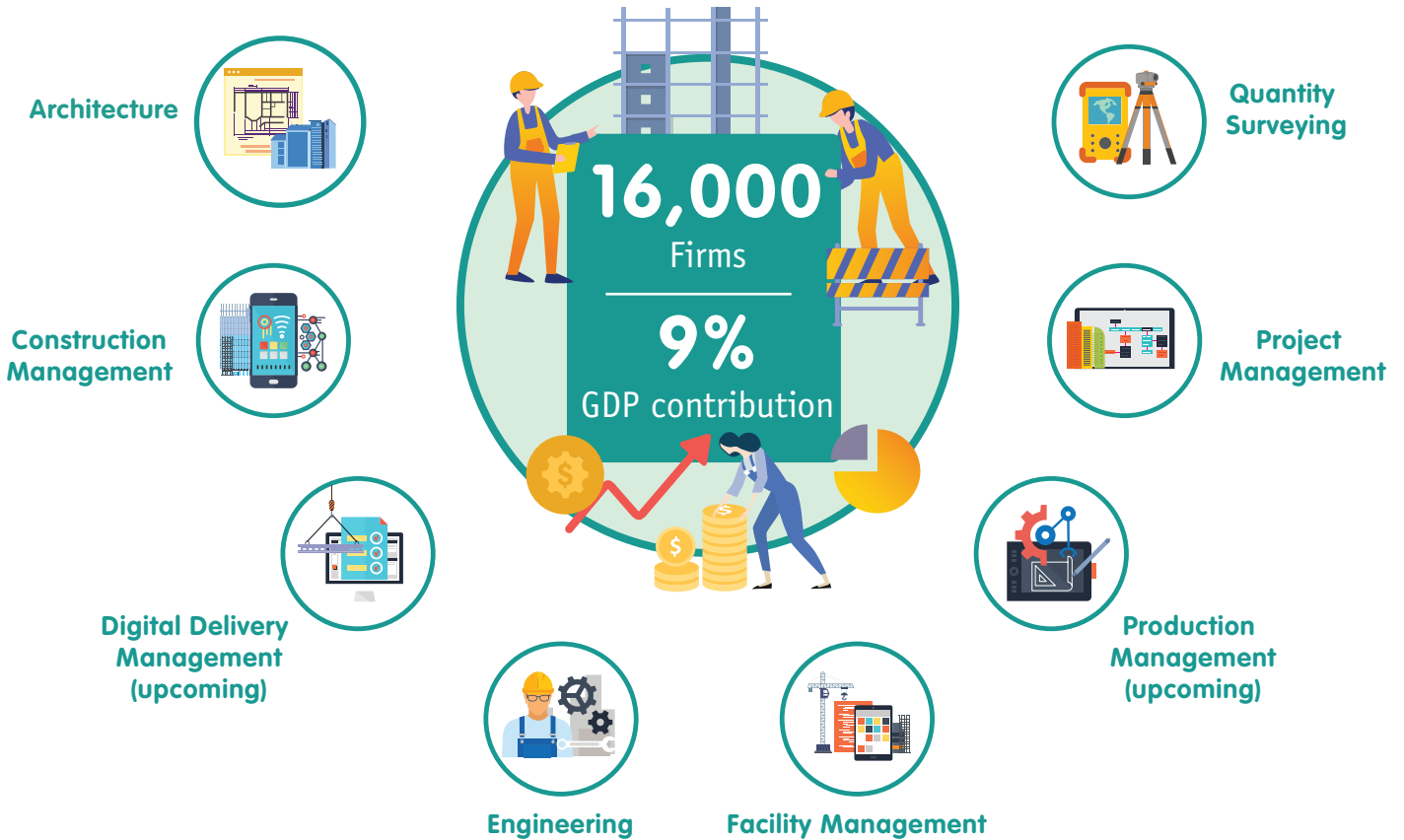
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ADDITIONAL INFORMATION

01

OUR CONSTRUCTION AND FACILITIES MANAGEMENT SECTOR

The Construction and Facilities Management Sector is an important pillar of Singapore's economy, building safe, sustainable and progressive environments to live, work and play in, contributing to a better quality of life for Singaporeans.

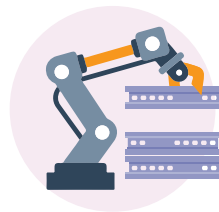


THE BUILDING AND CONSTRUCTION LIFE-CYCLE

Streamlining work processes and connecting stakeholders through digital data, innovation and technology across the whole project life-cycle from design, fabrication, construction to facilities management to deliver a better outcome for end users.

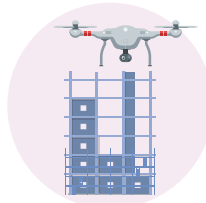
Digital Design

Engaging stakeholders to achieve optimised and coordinated design that meets client's, regulatory and downstream requirements.



Digital Fabrication

Translating design to standardised components for automating off-site production.

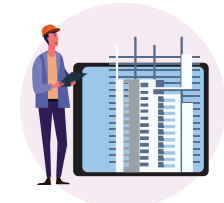


Digital Construction

Just-in-time delivery, installation and monitoring of on-site activities to maximise productivity and minimise rework.

Digital Asset Delivery & Management

Real-time monitoring for operations and maintenance to enhance asset values.



02 TRENDS IMPACTING CONSTRUCTION AND FACILITIES MANAGEMENT SECTOR



Increasing gap in digital skills and capabilities

prevailing among the various stakeholders in the labour intensive construction ecosystem, causing delays and abortive works.



Low degree of collaboration and alignment of construction information

among the various stakeholders through the different stages of project implementation.



Lack of shared platforms and standards

to fully integrate various parties involved in building projects, resulting in most work done on-site.

INDUSTRY TRANSFORMATION MAP

The Construction Industry Transformation Map (ITM) launched in 2017 envisions creating an advanced and integrated sector with widespread adoption of leading technologies, led by progressive and collaborative firms well-poised to capture business opportunities, and supported by a skilled and competent workforce offering good jobs for Singaporeans.

To achieve this vision, the key strategies are to:

- (i) increase adoption of Design for Manufacturing and Assembly (DfMA) and Integrated Digital Delivery (IDD);
- (ii) build progressive and collaborative firms; and
- (iii) support workforce needs and aspirations.



Click [here](#) or scan this QR code for more details on the Construction ITM

03 SMES GO DIGITAL

Aligned to the Industry Transformation Map (ITM), the Industry Digital Plan (IDP) is part of the SMEs Go Digital Programme that helps to make going digital simple for SMEs.



3 STEPS TO GO DIGITAL

1 | Is your business digital-ready?
Find out using the Industry Digital Plan (IDP) for your sector.

2 | How do you get started?
Take up pre-approved solutions with grant support.

3 | Where can you get help?
Access the CTO-as-a-Service for support.

For more information
Scan the QR code or visit www.imda.gov.sg/SMESGoDigital

Support available

- Chief Technology Officer-as-a-Service (CTO-as-a-Service)
- Industry Digital Plans
- Pre-Approved Solutions
- Start Digital
- Grow Digital
- Advanced Digital Solutions
- Government Grants e.g. Productivity Solutions Grant (PSG)

SMEs Go Digital comprises the following:

CTO-as-a-Service

Assess your digital readiness, explore digital solutions and request for digital advisory and project management services.

INDUSTRY DIGITAL PLANS (IDP)

Step by step guide on digital solutions and training required at each stage of your business growth.

PRE-APPROVED SOLUTIONS

Proven off-the-shelf digital solutions pre-approved by IMDA to meet your business needs. Government grants, e.g. Productivity Solutions Grant (PSG), are available for the adoption of these solutions.

START DIGITAL

Foundational digital solutions for new SMEs to get a head start in going digital.

GROW DIGITAL












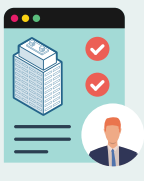




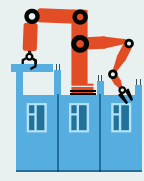
Leverage Business-to-Business (B2B) and Business-to-Consumer (B2C) e-commerce platforms to go international, without a physical presence overseas.

ADVANCED DIGITAL SOLUTIONS

Advanced and integrated digital solutions to help you strengthen business continuity and build longer term resilience.

04 DIGITAL ROADMAP

This digital roadmap serves as a guide for you to follow on your digital journey.

STAGE 01	STAGE 02	STAGE 03
<p>GETTING READY FOR THE DIGITAL ECONOMY Uplifted Digital Capabilities, Optimised Operations</p>	<p>GROWING IN THE DIGITAL ECONOMY Integrated Ecosystem, Streamlined Processes</p>	<p>LEAPING AHEAD Intelligent Business, Autonomous Operations</p>
<ul style="list-style-type: none">  3D Modelling, Immersive Visualisation and Analysis  Building Information Modelling (BIM)-to-Field (Hardware/Software)  Coordination Tools and Collaboration Platform  Digital Wearables for Workers' Health and Safety  e-Permit-to-work (e-PTW)  Facilities Management Workflow Automation (e.g. Smart Access, Energy Management and Smart Metering, Mobile Inspection, Digital Signage)  Quantity Surveying and Valuation  Site/Yard Management 	<ul style="list-style-type: none">  BIM for Asset Delivery/Facilities Management  Built Environment Digital Platform  Computational Design  Coordinated Regulatory Approvals and Rule-based Model Checker  Integrated and Smart Worksite Monitoring and Inspection 	<ul style="list-style-type: none">  Blockchain for Progress Verification  Data and Artificial Intelligence (AI)-driven Decision Support System  Intelligent National Productivity and Quality Specification (iNPQS)  Robotics for Autonomous Construction and Facilities Management

BUSINESS CAPABILITIES

Accounting Management, Human Resource Management, Customer Relationship Management, Sales Management, Inventory Management, Fleet Management and Cybersecurity

Note: This roadmap will be updated over time as digitalisation of the industry progresses and new technologies are introduced to the industry.

STAGE 01

GETTING READY FOR THE DIGITAL ECONOMY

Uplifted Digital Capabilities, Optimised Operations

Build core digital competencies and acquire digital solutions.

SOLUTION CATEGORY	DESCRIPTION	BENEFITS
 <p>3D Modelling, Immersive Visualisation and Analysis</p>	<p>Create 2D/3D models from initial concept to final documentation for construction.</p> <p>Render cinematic-quality models for architectural visualisation.</p> <p>Design sustainable and efficient buildings with advanced simulation engines and insights on building performance.</p>	<ul style="list-style-type: none">• Enable effective presentation of projects to clients by communicating project benefits through 3D photo-realistic visualisation.• Save documentation time and efforts involved in design stage.• Speed up design process and contribute to minimising waste from early stage.• Provide actionable insights through early diagnosis at design stage.
 <p>BIM-to-Field (Hardware/Software)</p>	<p>Perform reality captures to accurately record site information for better area visualisation, and to auto-assemble point cloud for integration with BIM model.</p>	<ul style="list-style-type: none">• Provide better area visualisation and facilitate informed decision-making before work starts on-site.
 <p>Coordination Tools and Collaboration Platform</p>	<p>Enable different construction disciplines (Architects, Engineers, Contractors etc.) to collaborate on the same BIM project, across the design, construction and operation phases.</p>	<ul style="list-style-type: none">• Reduce reworks and improve productivity.• Reduce conflicts and changes during construction.• Reduce risks of using outdated information.• Track issues and allow project members to communicate accountability for corrective actions.• Address challenges in real-time throughout project life-cycle.

STAGE 01

GETTING READY FOR THE DIGITAL ECONOMY

Uplifted Digital Capabilities, Optimised Operations

Build core digital competencies and acquire digital solutions.



SOLUTION CATEGORY	DESCRIPTION	BENEFITS
 <p>Digital Wearables for Workers' Health and Safety</p>	<p>Track critical health and safety information such as human fatigue and stress, heat stress and ergonomic risks so as to alert affected parties accordingly to avoid safety incidents.</p>	<ul style="list-style-type: none"> • Address safety issues in the workplace and health condition of the workers that may impact safety. • Track data and remind workers and supervisors through audio and visual alerts.
 <p>e-Permit-to-work (e-PTW)</p>	<p>Submit, track and monitor PTW applications for high risk activities digitally via a centralised system.</p>	<ul style="list-style-type: none"> • Enhance productivity through reduced paperwork and waiting time. • Increase accountability by tracking approval of PTW applications in real-time. • Increase ease of access and visibility of permits through auto-generation of dashboards and reports. • Enhance detection of potential incompatible works.
 <p>Facilities Management Workflow Automation (e.g. Smart Access, Energy Management and Smart Metering, Mobile Inspection, Digital Signage)</p>	<p>Automate the creation, tracking, logging and/or closing of incidents upon triggers by sensors/humans; to provide for reporting, document management, tracking of energy consumption, and resource management; and to provide display of real-time content.</p>	<ul style="list-style-type: none"> • Reduce turnaround time with streamlined workflow process. • Automate incident reporting and track with single point operator.

STAGE 01

GETTING READY FOR THE DIGITAL ECONOMY

Uplifted Digital Capabilities, Optimised Operations

Build core digital competencies and acquire digital solutions.

SOLUTION CATEGORY	DESCRIPTION	BENEFITS
 <p>Quantity Surveying and Valuation</p>	<p>Automate take-off based on BIM for accurate quantity and cost estimation.</p>	<ul style="list-style-type: none">• Provide fast, effective and efficient quantity take-off and cost estimation.• Produce reliable quantities and competitive cost estimates.• Improve cost database management to reduce information loss.
 <p>Site/Yard Management</p>	<p>Plan and manage site activities using BIM model and digital layouts.</p> <p>Manage material and equipment on construction sites and monitor the production quality and progress.</p>	<ul style="list-style-type: none">• Reduce paperwork on-site and during project operations.• Boost productivity and streamline site processes.



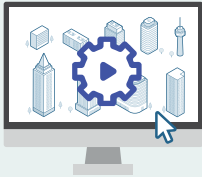


STAGE 02

GROWING IN THE DIGITAL ECONOMY

Integrated Ecosystem, Streamlined Processes

Integrate and streamline key processes along the value chain.

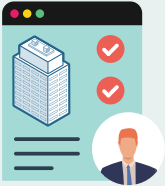

SOLUTION CATEGORY	DESCRIPTION	BENEFITS
 <p>BIM for Asset Delivery/ Facilities Management</p>	<p>Manage defect resolution during handover and maintenance, and support building and maintenance operations.</p>	<ul style="list-style-type: none"> • Systematise manual inspection of assets and facilities through automation, resulting in more reliable inspection reports. • Provide capabilities for preventive maintenance.
 <p>Built Environment Digital Platform</p>	<p>Facilitate data sharing in different formats among project partners over the project life-cycle to coordinate their work activities, monitor issue resolutions and smoothen project delivery. It also allows project partners access to an ecosystem of suppliers to source for the right materials.</p>	<ul style="list-style-type: none"> • Gain access to timely information. • Resolve errors in a timely manner. • Reduce reworks and delays • Source from a wider range of materials. • Improve overall project performance.
 <p>Computational Design</p>	<p>Explore creative and alternative design scenarios, and automate the adaptation of building configuration changes through parametric design, relationship modelling, and computing logic.</p>	<ul style="list-style-type: none"> • Explore more design choices leading to desired solutions for productivity gains. • Automate repetitive tasks to speed up design process.

STAGE 02

GROWING IN THE DIGITAL ECONOMY

Integrated Ecosystem, Streamlined Processes

Integrate and streamline key processes along the value chain.




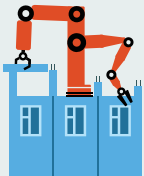
SOLUTION CATEGORY	DESCRIPTION	BENEFITS
 <p>Coordinated Regulatory Approvals and Rule-based Model Checker</p>	<p>Verify model quality and code compliance via an automated model checker prior to coordinated submission for regulatory approval.</p>	<ul style="list-style-type: none">• Improve design and BIM quality through automated checking.• Streamline regulatory submission and approval process.
 <p>Integrated and Smart Worksite Monitoring and Inspection</p>	<p>Provide real-time digital monitoring and insights to project health in a connected digital environment for various site solutions and technologies.</p> <p>Monitor on-site activities such as through sensors and video analytics to provide alerts to potential safety and health risks including those posed by vehicles/machines, fatigue, noise, dust, heat and working at height.</p>	<ul style="list-style-type: none">• Centralise site data, progress, and inspections.• Analyse data and create dashboards to drive decision making.• Provide real-time identification of worksite hazards.• Improve safety and health of workers.

STAGE 03

LEAPING AHEAD



Intelligent Business, Autonomous Operations

Enable forward-thinking Large Local Enterprises (LLEs) and their key SMEs partners to venture overseas.

SOLUTION CATEGORY	DESCRIPTION	BENEFITS
 <p>Blockchain for Progress Verification</p>	Record construction progress efficiently and in a verifiable and permanent way.	<ul style="list-style-type: none"> • Increase security as approved transactions are encrypted and stored across a network of computers. • Reduce cost as there is no need for middlemen.
 <p>Data and AI-driven Decision Support System</p>	Increase project predictability and performance through cumulative data collection, machine learning, and artificial intelligence.	<ul style="list-style-type: none"> • Mitigate risks in construction predictably. • Improve cost, schedule, and resource planning and forecasts.
 <p>Intelligent National Productivity and Quality Specification (iNPQS)</p>	Allow user to compose specifications that can be linked to the BIM model.	<ul style="list-style-type: none"> • Improve productivity through integration of BIM with common specifications for architectural and engineering works. • Ensure traceability of requirements. • Able to link with latest products, and local and international standards.
 <p>Robotics for Autonomous Construction and Facilities Management</p>	<p>Undertake strenuous and repetitive works such as brick stacking, painting and cleaning.</p> <p>Greet visitors and help them with navigation information.</p>	<ul style="list-style-type: none"> • Reduce repetitive and laborious tasks done by human and free them up to spend time on higher value tasks. • Reduce number of workplace accidents.

05 DIGITAL SKILLS NEEDED

Digital skills are required for all construction and facilities management job roles to varying levels of proficiency. All job roles may require upskilling to support your digitalisation journey.

ALL PROJECT TEAM MEMBERS	TEAM MEMBERS WHO ARE ADVANCED USERS
<p data-bbox="252 589 625 624">TECH BASIC COURSES</p> <p data-bbox="161 645 722 790">Broad-Based Integrated Digital Delivery (IDD) Understanding and Awareness Vendor-Specific Solutions Training</p> 	<p data-bbox="916 589 1374 624">TECH ADVANCED COURSES</p> <p data-bbox="847 645 1449 768">Higher Proficiency Digital Skills to perform tasks in Integrated Digital Delivery (IDD) projects at various stages</p> 
<p data-bbox="596 1451 986 1487">JOB ROLES (EXAMPLES)</p>	
<p data-bbox="177 1563 1412 1653">ARCHITECT, ENGINEER, QUANTITY SURVEYOR, CONSTRUCTION MANAGER, PROJECT MANAGER, FACILITIES MANAGER</p> <p data-bbox="244 1697 1342 1733">UPCOMING: PRODUCTION MANAGEMENT, SPECIALIST (DIGITAL DELIVERY)</p>	

DIGITAL ROADMAP ON TRAINING

	STAGE 01 GETTING READY FOR THE DIGITAL ECONOMY	STAGE 02 GROWING IN THE DIGITAL ECONOMY	STAGE 03 LEAPING AHEAD
TECH BASIC COURSES	<ul style="list-style-type: none"> • SkillsFuture for Digital Workplace • Introduction to Construction Industry Transformation Map (ITM) and Integrated Digital Delivery (IDD) • Understanding Building Information Modelling (BIM) Data and Modelling 	<ul style="list-style-type: none"> • Overview – Integrated Digital Delivery (IDD) Concepts and Project Framework • Understanding Project Collaboration • Understanding Construction Site Management 	<ul style="list-style-type: none"> • Understanding Digital Design for Manufacturing and Assembly (DfMA) • Understanding Virtual Construction • Basics to Smart Facilities Management (FM)
VENDOR-SPECIFIC SOLUTIONS TRAINING			
TECH ADVANCED COURSES	<ul style="list-style-type: none"> • Basic Building Information Modelling • Intermediate Building Information Modelling (Coordination & Documentation) • Advanced Building Information Modelling (Computational) 	<ul style="list-style-type: none"> • Integrated Digital Delivery (IDD) Project Planning and Execution 	<ul style="list-style-type: none"> • Integrated Digital Delivery (IDD) Application and Development • Data Analytics and Machine Learning • Internet of Things

Please visit BCA Academy, <https://bcaa.edu.sg> and Singapore Polytechnic, <https://www.sp.edu.sg/pace/construction-and-facilities-mgt-idd-idp> for details.

06 GET STARTED TODAY

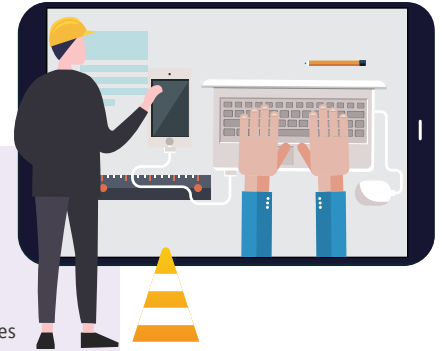
You will be supported at every stage of your digital journey, through three simple steps:

1 Is your business digital-ready?

Find out if you are digital ready by using the IDP resources [here](#) or scan the QR code.



Construction and Facilities Management IDP



2 How do you get started?

- Tap on [CTO-as-a-Service](#) to complete your Digital Readiness Self-Check in the web app and select from the recommended digital solutions that best meet your business needs.
- Visit [GoBusiness Gov Assist](#) to search for digital solutions and solution providers. If funding support is required, apply for the [Productivity Solutions Grant \(PSG\)](#) on the Business Grants Portal, before purchasing and implementing the digital solutions.
- Apply for training subsidies under the [SkillsFuture Enterprise Credit \(SFEC\)](#).



CTO-as-a-Service



GoBusiness Gov Assist



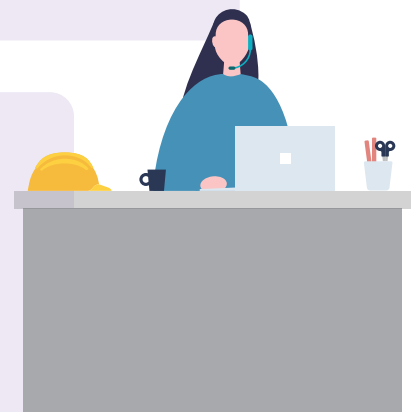
SFEC

3 Where can you get help?

- Tap on the [CTO-as-a-Service](#) for digital consultancy and project management services.
- Visit [SME Centre](#) if you require business advisory.



SME Centre



07

FOR MORE INFORMATION

FOR SMEs

DIGITAL CONSULTANCY & SOLUTIONS

CTO-as-a-Service
go.gov.sg/CTOaaS

SMEs Go Digital
<https://www.imda.gov.sg/SMEsGoDigital>

GoBusiness Gov Assist
<https://www.gobusiness.gov.sg/productivity-solutions-grant/>

BE SAFE ONLINE HANDBOOK

https://www.csa.gov.sg/~media/csa/documents/publications/be_safe_online/be_safe_online_handbook.pdf

BUSINESS ADVISORY

SME Centres managed by Trade Associations

- Association of Small and Medium Enterprises (ASME)
- Singapore Chinese Chamber of Commerce & Industry (SCCCI)
- Singapore Indian Chamber of Commerce & Industry (SICCI)
- Singapore Malay Chamber of Commerce & Industry (SMCCI)
- Singapore Manufacturing Federation (SMF)

<https://www.enterprisesg.gov.sg/smecentre>

Enterprise Infoline: +65 6898 1800

INDUSTRY STAKEHOLDERS

Association of Consulting Engineers Singapore
<http://aces.org.sg/>

Building Construction And Timber Industries Employees' Union
<https://www.batu.org.sg/>

Real Estate Developers' Association of Singapore
<http://www.redas.com/>

Singapore Green Building Council
<https://www.sgbc.sg/>

Singapore Institute of Architects
<https://sia.org.sg/>

Singapore Institute of Surveyors and Valuers
<http://www.sisv.org.sg/>

Singapore International Facility Management Association
<https://ifmasingapore.wildapricot.org/>

Specialists Trade Alliance of Singapore
<http://stas.org.sg/>

The Institution of Engineers, Singapore
<https://www.ies.org.sg/>

The Singapore Contractors Association Ltd
<https://www.scal.com.sg/>

FOR INDIVIDUALS

CAPABILITY UPGRADING

BCA Academy
<https://bcaa.edu.sg/idd>

Singapore Polytechnic
<https://www.sp.edu.sg/pace/construction-and-facilities-mgt-idd-idp>

SCAL Academy
<https://scal.academy.com.sg>

Course Directory
<https://www.myskillsfuture.gov.sg/content/portal/en/training-exchange/course-landing.html>

Fundamentals for Future Economy
<https://www.skillsfuture.gov.sg/digitalworkplace>

SkillsFuture Series
<https://www.skillsfuture.gov.sg/series>

CAREER FACILITATION

WSG's Careers Connect
<http://www.wsg.gov.sg/career-services.html>

e2i Centres
<https://e2i.com.sg/app/>

FOR ICM VENDORS

SMEs Go Digital
<https://www.imda.gov.sg/icmvendors>

#SGDIGITAL

Singapore Digital (SG:D) is a nation-wide movement to unify Singapore's digitalisation efforts. Whether it is help for different industries to start their digitalisation journeys, or creating new ecosystems, opportunities and capabilities for the future, SG:D is set to take us ahead as a leading digital global node. The :D smiley face icon in the logo signifies the optimism of Singaporeans advancing together with digital innovation. As we progress into the digital economy, it is all about the people – the heart of all we do.



imda.gov.sg
bca.gov.sg



twitter.com/IMDAsg



facebook.com/IMDAsg
facebook.com/BCASingapore



youtube.com/IMDAsg
youtube.com/BCASingapore



linkedin.com/company/IMDAsg
linkedin.com/company/BCASingapore



instagram.com/IMDAsg
instagram.com/BCASingapore