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[Annex A: BCA-EY Joint Study on the Impact of Built Environment \(BE\) Job Roles, and Opportunity to Redesign Jobs and Rebrand the Sector](#)

1 The joint study with Ernst & Young (EY) covers the entire Built Environment (BE) life cycle from design, construction to Facilities Management (FM). The study looks into how the BE sector and its workforce (including various job roles) will be impacted due to industry transformation as well as mega and technological trends such as:

- a. Value chain aggregation and integration arising from demand for integrated service offerings;
- b. Workforce challenges such as manpower shortage;
- c. Sustainable Buildings/Construction;
- d. Multi-skilled professionals increasingly sought after to provide expertise across several functions and domains;
- e. Data Analytics & Artificial Intelligence (AI);
- f. Modular Construction; and
- g. 5G, Internet of Things (IoT) and Smart Buildings

2 The study outcomes will serve as a useful compass for employers, Trade Associations & Chambers (TACs) and individuals to seize opportunities by adopting emerging skills, digitalisation, and provide guidance on progressive human resource framework to attract and retain talents in the BE sector.

3 Some preliminary key areas of improvement highlighted in the study which underpin people-oriented initiatives are:

- a. Jobs to undergo change and redesign to ensure readiness of tasks and/or work processes for the future BE sector, coupled with upskilling/multiskilling;
- b. Industry leaders to lead the way for entire value chain adoption and implementation of ITM skills holistically.

4 The study is slated for completion and publication by 4Q2022.

Annex B: Chief Technology Officer-as-a-Service (CTO-as-a-Service)

1 Chief Technology Officer-as-a-Service (CTO-as-a-Service) enables Small and Medium sized Enterprises (SMEs) to self-assess their digital readiness and needs at any time and from anywhere, access market-proven and cost-effective digital solutions, as well as engage digital consultants for in-depth advisory and project management services.

2 The service is suitable for any business entity that wants to:

- Know how to get started in going digital,
- Understand what type of solutions to adopt for its specific business challenge, or
- Select the solution that best meets its needs.

3 Through CTO-as-a-Service, an enterprise can:

- Perform a self-assessment of its digital readiness and identify its digitalisation needs and gaps;
- Learn from other SMEs that have successfully implemented digitalisation projects;
- Receive recommendations of digital solutions based on its business needs and profile; and
- Compare digital solutions, by functions and costs.

4 There are over 450 subsidised digital solutions available for selection, ranging from those that address sector-specific or common business needs, to those that serve to streamline operations, enhance business sales revenue or safeguard business resiliency.

5 First-time usage of the digital advisory and project management services is available at no cost to eligible enterprises. Subsequent usage or enhancement of services will be based on commercial agreements, should the enterprises want to continue to engage the digital consultants.

6 For more information on CTO-as-a-Service, please visit: <https://www.imda.gov.sg/programme-listing/smes-go-digital/CTOaaS>



Annex C: Workforce Singapore (WSG) Career Conversion Programmes for the Built Environment sector

1 While Pre-Employment Training (PET) forms the main pipeline to build up the local PMETs within the Built Environment (BE) sector, the Building and Construction Authority (BCA) has been working closely with Workforce Singapore (WSG) on various BE-specific career conversion programmes (CCPs) to bring in mid-career entrants to supplement the workforce.

2 The CCPs are jointly developed with key stakeholders which include Trade Association & Chambers (TACs), the industry and training partners. Through these CCPs, mid-career individuals will undergo skills conversion and pick up new skills to transition into new job roles. Existing employees at risk of redundancy, or in vulnerable job roles due to transformation, will be reskilled to take on redesigned job roles.

List of BE-related CCPs

Programme Name	Modality	Programme Duration
CCP for BIM Professionals	Place-and-Train and Redeployment	3 – 7 months
CCP for Facilities Specialists/Technicians	Place-and-Train	4 months
CCP for Built Environment Professionals		3 months
CCP for Multi-Skilled Essential Employees (Real Estate/Facilities Management)	Job Redesign Reskilling	2- 3 months

3 BCA will continue to work with WSG, TACs and firms to attract mid-career professionals to enter the BE sector through the CCPs.

4 For more info about the CCPs, visit: <https://conversion.mycareersfuture.gov.sg/Portal/ProgramListing.aspx?source=PCP> or contact our programme partners as follows:

Programme Name	Contact details
CCP for BIM Professionals	SCAL weixuan@scal-academy.com.sg / 6793 9020
CCP for Facilities Specialists/Technicians	SIFMA pcp_fm@sifma.org.sg
CCP for Built Environment Professionals	SNEF ccp@snef.org.sg / everlyn_tan@snef.org.sg / 6827 6900
CCP for Multi-Skilled Essential Employees (Real Estate/Facilities Management)	WSG WSG_Biz_services@wsg.gov.sg / go.gov.sg/ccpmirfecoy

Funding Support for CCPs

Table 1: Funding Rates for CCPs

Funding to Employers by WSG	Standard Rate	Enhanced Rate
Salary Support	Up to 70% of the trainee's monthly salary, capped at \$4,000 per trainee per month, for the training duration.	Up to 90%* of the trainee's monthly salary, capped at \$6,000 per trainee per month, for the training duration. *For long-term unemployed (LTU) Singapore Citizen (SC) trainees or mature SC Trainees aged 40 or above. LTU is defined as being unemployed and seeking employment for more than 6 months.
Course Fee Grant	Up to 70% course fees	Up to 90% course Fees* *This includes a 20% course fee subsidy top-up from SSG's SkillsFuture Mid-Career Enhanced Subsidy for mature SCs, or a 20% course fee subsidy top-up from SSG's Enhanced Training Support for SMEs for SME-sponsored SC/PR employees, if applicable

Eligibility Criteria for CCPs

All individuals and companies must fulfil the following criteria:

- Singapore Citizen or Permanent Resident
- Minimum 21 years old
- Graduated, or completed National Service, for at least 2 years. This will be counted from the date of graduation from latest qualification, or date of completion of national service, whichever is later.
- New job role trained for under the CCP should be substantially different from previous job role(s), hence requiring reskilling for career conversion¹

¹ CCPs are geared towards helping mid-career individuals acquire skills to change careers. Hence, there is a requirement for career conversion when mid-career individuals undergo a CCP. However, individuals who have a continuous employment gap of at least 2 years prior to CCP commencement will be allowed to apply for CCP job roles similar to their previous jobs.

Annex D: Skills Framework for Built Environment

1 The Skills Framework for Built Environment² was launched in September 2020 to help BE companies and existing professionals as well as prospective new employees to the sector identify career progression pathways and the skills needed to stay relevant, especially for new jobs arising from industry transformation that require new skills. The Skills Framework for BE covers 49 job roles in the sector across eight career tracks such as Architectural Consultancy, Engineering Consultancy, Construction Management (Production) and Digital Delivery Management. The Skills Framework for BE aims to serve various stakeholders such as individuals, employers, education and training providers, government, union and professional bodies.

Accreditation Schemes as part of the Accreditation Framework for Built Environment (BE) Professionals

2 To support the Skills Framework for Built Environment, accreditation schemes for BE professionals adopt a standardised approach to validate and recognise the skillsets and competencies. The various accreditation schemes will progressively be launched by Accrediting Bodies. So far, the following accreditation schemes have been launched:

Career Pathway	Accrediting Bodies	Status
Project Management	Society of Project Management (SPM)	Launched in Nov 2020
Digital Delivery Management	buildingSMART (bSS)	Launched in May 2021
Construction Management	Singapore Contractors Association Ltd (SCAL)	Launched in Aug 2021
Facilities Management	Singapore International Facility Management Association	Launched in Dec 2021
Quantity Surveying	Singapore Institute of Surveyors and Valuers (SISV)	Launched in Jan 2022

² More information on Skills Framework for Built Environment is here: <https://www1.bca.gov.sg/buildsg/manpower/skills-framework-for-built-environment-be>

Moving towards competency-based procurement

3 With the accreditation schemes progressively launched, public sector construction and Facilities Management (FM) procurement will also move towards competency-based procurement in phases.

a. Phase 1

Government agencies would recognise accreditation as an alternative to academic qualification and years of experience in the following areas:

- i. Tender specification requirements which specify the minimum required experience of key project team members
- ii. Tender evaluation criteria which evaluate the strength and competencies of the project team proposed by the tenderer

Similarly, BCA is also reviewing the personnel requirements to recognise accreditation as an alternative qualification in the Contractors Registration System (CRS) and Public Sector Panels of Consultants (PSPC) listing.

b. Phase 2

Depending on the BE sector's readiness (e.g. when there is a critical mass of accredited personnel built up), BCA will review with Government agencies to fully implement the recognition of accredited personnel as a default requirement in tender specification, tender evaluation and firms registration requirements under the PSPC and CRS.

More information on Accreditation Framework for Built Environment Professionals is at <https://www1.bca.gov.sg/buildsg/manpower/skills-framework-for-built-environment-be/accreditation-framework-for-built-environment-professionals>

Annex E: Work-Study Diploma (WSDip) Programmes

1 The Work-Study Diploma (WSDip) is a unique 2.5-year apprenticeship-based programme designed to create additional pathways of success for ITE graduates. Through learning by doing, the programme prepares applicants for higher level jobs requiring deeper skills. It involves a mixture of on-the-job training at ITE's partnering companies and off-the-job training at ITE.

a. WSDip in Mechanical & Electrical Services Supervision

- The WSDip in Mechanical & Electrical Services Supervision was launched in April 2018. The course equips students for the role of 'Site Supervisor/Trade Supervisor/Project Coordinator' in the Construction Management track. Students will learn skills, knowledge and professional attributes to supervise, coordinate, inspect, test and commission M&E services works in buildings to ensure that M&E works are carried out in compliance with contracts specifications, drawings and statutory requirements.

b. WSDip in Vertical Transportation

- The WSDip in Vertical Transportation was launched in 2019. Students are equipped with the skills and knowledge to manage and supervise new lift installation or upgrading projects, as well as perform high-level lift inspections, maintenance, servicing and fault diagnostics, in compliance with all relevant standards, regulations and codes of practice.

c. WSDip in Facilities Management

- The WSDip in Facilities Management will commence in April 2023. It aims to prepare the next generation of Technical Executives/Facilities Executives/Property Executives for the Facility Maintenance (FM) industry where they will learn foundation FM topics and new areas such as BIM, visual analytics and integrated facility management.

Annex F: Profiles for Jobs and Skills (J&S)

Profile: Chief Technology Officer-as-a-Service (CTO-as-a-Service) for a Built Environment SME

Utracon Corporation Pte Ltd

Utracon Corporation Pte Ltd is an engineering and construction firm which faced challenges in getting employees' buy-in in embarking on digitalisation projects. In particular, they find it challenging to automate their manual processing of staff expenses for more than 100 staff in its Singapore office.

Through CTO-as-a-Service, a digital consultant worked with Utracon to understand their business needs and provided guidance to introduce a company-wide digital transformation charted by a change management plan. Guided by the change management plan, the digital consultant advised Utracon to involve their senior management as champions to drive digital transformation and lead a digitalisation taskforce, comprising employees from various departments. This allowed staff in the taskforce to work collectively in developing milestones for their digitalisation project and provide other colleagues in Utracon with timely updates.

To automate the manual processing of staff expenses, the digital consultant went through with Utracon available digital solutions and Utracon was able to select the appropriate Optical Character Recognition (OCR) solution that best suits their needs. With the OCR solution, images of text can be converted into machine-readable text. Utracon is in the process of implementing the OCR solution and expects it to improve the efficiency of claims processing by 50 percent, as well as minimise erroneous or incomplete reports.

With the setup of the digitalisation taskforce, Utracon shared that decisions to initiate and plan digitalisation projects can now be expedited. It now takes as short as three months, as compared to their past similar efforts which usually took a year. Utracon also observed that employees are now more confident and motivated towards digitalisation.

With a good head start, Utracon plans to integrate the staff expense claims solution with their accounting software so that approval processes can be shortened, and management can have greater visibility to better manage project costs. After the successful implementation in their Singapore and Malaysia offices, Utracon intends to roll out the solution across all their offices in Asia.

Profile: Collaboration between Keong Hong Construction Pte Ltd and Institute of Technical Education (ITE)

Mr Er Ang Hooa

Executive Director, Keong Hong Construction Pte Ltd

Mr Er Ang Hooa has been in the Built Environment (BE) sector since 1978. Beginning his career as Civil Engineer, Mr Er has assumed various management roles in the Built Environment (BE) sector, as Project Manager, General Manager and, from 2011, as Director of Keong Hong Construction Pte Ltd, overseeing projects such as SIM University Extension, New Raffles Hospital, J Gateway Condominium, Seaside Residences, National Skin Centre Extension.

Mr Er has also been passionate in contributing his knowledge to the industry. He recognises Work Study Diplomas (WSDip) programme as a win-win initiative benefiting both the employer and the trainee student, as well as the BE sector.

Since 2017, Mr Er has contributed his industry knowledge to help shape one of the first ITE Work Study Diplomas (WSDip) - WSDip in Mechanical & Electrical Services Supervision. In developing the criteria, Mr Er not only provided his technical advice, he also facilitated site visits to live projects, for instance, Seaside Residences and National Skin Centre Extension, for ITE's curriculum development team.

Trainee from Keong Hong Construction Pte Ltd's Traineeship

Keong Hong also offers traineeships for students in the WSDip Programme. This gives students exposure to the BE sector early on and to understand the workflow and processes, beyond classroom learning.

Mr Muhammad Syabil B Baharudin

Senior M&E Coordinator, Keong Hong Construction Pte Ltd

Since 2018, Keong Hong has supported ITE students' skills development and provide employment and career opportunities for them. Mr Syabil is one of these trainees who now working as a full-time staff at Keong Hong. The WSDip in Mechanical & Electrical Services Supervision programme honed his digital skills in BIM Modelling. The programme also covers practical aspects in handling M&E combined service drawings (CSD) (a combined services coordination drawings which helps to identify clashes), authorities' compliances and codes of practice.

Mr Syabil's on-the-job training on M&E construction includes site coordination. This involves liaising with other consultants and sub-contractors to resolve technical/site issues. He has since taken on more supervisory responsibilities in project management.

Syabil hopes to gain more experience in this field and take up more leadership roles. He looks forward to share his knowledge and encourage more talents into this industry.

Profile: Career Conversion Programme (CCP) for BIM Professionals

Employee profile

Wang Wei Lin, 27

BIM Modeler, KTC Group Holdings Pte Ltd

Working on construction projects is no stranger to Wang Wei Lin, 27, who was formerly a project engineer in the construction sector. However, in her previous job role, she mainly utilised tools that rendered 2D artworks, and with the digital transformation in the built environment sector, she was keen to take on a new role that utilises 3D BIM and beyond.

Wei Lin joined KTC Group Holdings in July 2021 and was sent for the Career Conversion Programme for BIM Professionals, which lasted six months. During the On-the-Job training, she was shown how to create and utilise the BIM models. Her past experience as a project engineer enabled her to understand the construction process from start to finish. She was able to harness her technical skills while working in a 3D environment and effectively identify potential issues to be resolved before construction began. At work, she collaborates with modellers/ engineers from other disciplines to update the building model accurately as the project develops over time.

Currently, Wei Lin works on 3D structure modelling and the development of fabrication drawings using the updated 3D models. Wei Lin believes that using the BIM process has enabled her to visualise projects better, compared to the traditional construction workflow whereby many drawings are required to provide to achieve the same visualisation required. She is able to collaborate more effectively with her peers in detecting and resolving issues before construction.

While embarking on BIM has been a fulfilling experience for Wei Lin thus far, she hopes to equip herself with the necessary skillsets to keep up with the digital transformation in the built environment sector and build up a career in BIM.

Employer profile

Mr Jerry Law Ming Hui,

Digital Engineering Manager, KTC Group Holdings Pte Ltd

The transformation of the built environment sector involves developing a highly competent professional workforce. That is why KTC Group Holdings aim to nurture young Singaporeans to be capable of driving innovation and lead digital readiness in the Digital Built Environment.

In 2022, the company sent two of its workers for the Career Conversion Programme for BIM Professionals, to acquire new skills in 3D structure modelling, in hopes for them to lead the company in its digitalisation effort.

Traditionally, drafting involved the use of computer aided software and has been viewed as a low technical competency. BIM on the other hand is a highly technical job which requires more intensive knowledge and practical skills to achieve mastery and is an enabler for many other technological implementation

Through this, the company wants to be able to attract more locals who are keen to join the digital built environment and make an impact on the future of the sector.

Profile: Built Environment Mid-Careerists

Leading by Example

**Mr Richard Chien-Ming Kuppusamy,
Head of Lendlease Digital Asia & Head of Digital Engineering, Asia,
Lendlease**

Mr Richard Chien-Ming Kuppusamy is well versed in the Built Environment (BE) being an Architect by training. His interest in the digital aspects of the BE sector started early, being one of the pioneer cohort of BIM specialists. Mr Kuppusamy then pivoted full time into Integrated Digital Delivery (IDD) and Construction Technology mid-career. Mr Kuppusamy currently heads Lendlease's Digital business in Asia with his latest project being Lendlease Podium – a platform for property developers and designers to quickly visualise and optimise the highest and best use for any site by codifying urban planning data, automating design through computational algorithms, coding in hard cost, and financial analysis. These are linked to a digital catalogue of DfMA products to drive manpower and cost savings.

Additionally, Mr Kuppusamy was also instrumental in setting up the Lendlease Digital, Graduate Programme which provides opportunities for fresh graduates to obtain broad experience in both software and BE roles. Through the Programme, Mr Kuppusamy has received 10 graduates to work on Podium – 3 of whom are from core BE backgrounds while the remaining are from educational backgrounds in data science, systems engineering, and computer sciences.

Upskilling to take on broader job scopes

Mr Loh Jun Han, Computational Designer, Lendlease Asia

Mr Loh Jun Han has an educational background in Facilities Management and Mechanical Engineering. He believes that through the use of technology, the sector can improve productivity and sustainability, as well as reduce manual, abortive and unproductive work processes. Driven by his interest and vision for the BE sector, he undertook self-learning in software development and self-taught in various programming languages. This has opened several career opportunities for him, leveraging his background from the BE sector and bridging that knowledge with software development, beyond what engineers were traditionally trained to do.

Before being recruited by Mr Kuppusamy to join Lendlease as a computational designer in June 2021, Mr Loh worked as a computational specialist and interactive digital media engineer.

As a computational designer, Mr Loh now leads a collaborative cross-disciplinary team of architects, M&E and C&S engineers as well as software engineers at Lendlease Digital to apply knowledge to develop design automation and DfMA solutions. Lendlease has also supported Mr Loh's professional development in digitalisation which includes sending him to various courses.

Profile: Good HR Practices

Mr Charles Tan

Executive Director, Sunray Woodcraft Construction Pte Ltd

Sunray Woodcraft Construction believes that building a strong company culture starts with sparking conversations between senior leaders and employees over regular coffee and lunch sessions.

The leaders at Sunray also practice sincere communication, openness to listen and make a concerted effort to lead promised changes.

Sunray also believes in identifying and grooming the right type of leaders relevant to different target audiences. For example, Sunray carries out dialogues with its employees and HR to map out their development needs. There are also available training programmes including executive programmes which involves classroom and online training as well as hands-on experience via short-term project assignments, mentorships and role transfers. Sunray also looks to expand their talent pipeline by working with educational institutions to provide internships and with BCA to offer scholarships through the iBuildSG scholarship programme. Their efforts have paid off and Sunray was listed among the best employers in Singapore by Straits Times.