FROM FACTORY TO FINISH: YIELDING 36% TIME SAVINGS WITH DIGITAL TRACKING OF CONSTRUCTION PROCESSES

EXECUTIVE SUMMARY

The construction industry has long grappled with challenges in manpower and operations - issues which the COVID-19 pandemic had exacerbated. These longstanding challenges have underscored the need for fundamental shifts in the sector.

Lian Beng Construction (1988) Pte Ltd has chosen to view this period of adversity as a catalyst for positive transformation. The company is resolutely committed to overhauling its approach to work and business processes. This strategic shift is not merely a response to immediate pressures, but a forward-looking initiative aimed at ensuring long-term business sustainability and viability.

One of the key areas of transformation that they undertook for Lentor Modern was to establish a more structured way of data management and tracking of logistical workflows pertinent to Prefabricated Prefinished Volumetric Construction (PPVC). To this end, they worked with solution provider, Millipede, to customise a platform that could allow an organic flow of real-time information and digital tracking of production, delivery and installation of prefabricated components.

Lian Beng also strove to connect their suppliers, sub-contractors, internal systems via a single streamlined platform to facilitate payment processes. To enable this, they adopted a digital payment solution, Doxa Connex, to streamline the otherwise complex and multi-faceted payment processes.

DIGITAL LOGISTICS TRACKING FOR PRODUCTION, DELIVERY AND INSTALLATION OF PPVC MODULES	EXPEDITING PROCESSING OF PAYMENT CLAIMS WITH DIGITAL PAYMENT SOLUTION
Reduce time spent on tracking inspection forms and photos by **36%**	Time savings of **58%** across various payment processes

Lian Beng's confidence in the advantages of Integrated Digital Delivery (IDD) was bolstered by the positive outcomes observed in Lentor Modern. They recognised that embracing IDD would allow more efficient resource allocation and streamlined operations, which not only safeguards the company's long-term viability, but also sharpens its competitive advantage in the sector.

Project
Lentor Modern

Location
Lentor Central

Typology
Residential / Commercial

Developers
GuocoLand Limited

Architect
ADDP Architects

Main Contractor
Lian Beng Construction (1988) Pte Ltd

Civil & Structural Consultant
KCL Consultants Pte Ltd

Mechanical, Electrical and Plumbing Consultant
Belmacs Pte Ltd

Expected Year of Completion
2026

KEY MOTIVATIONS FOR IDD ADOPTION

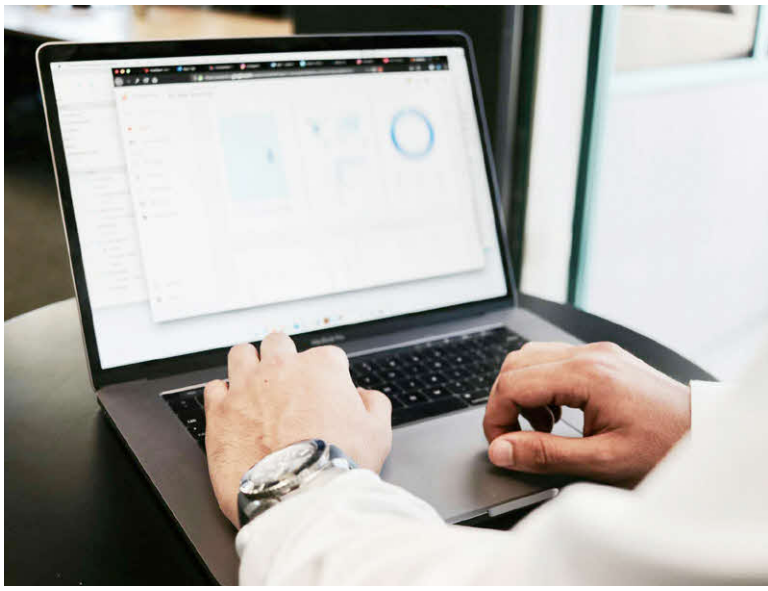
MAINTAINING AGILITY

As an industry forerunner, Lian Beng recognised the growing criticality of IDD in projects and took proactive steps to incorporate digital tools and solutions into its work processes. Notwithstanding their extensive experience with IDD implementation, they were acutely aware of the need to stay agile and embrace emerging technologies, particularly in light of rapid advancements in artificial intelligence and robotics. They believed that this agility was key not only for enhancing the organisation's resilience, but also ensuring its continued relevance in this fast-changing landscape.

HARNESSING DATA

Lian Beng recognised the valuable insights they could gain from data collected across their projects and operations, and hoped to leverage this wealth of information to facilitate informed decision-making.

Analysing data from multiple sites and processes, Lian Beng sought to optimise resource allocation by identifying areas where efficiency could be improved upon and resources could be better utilised. This data-driven approach enabled the organisation to streamline operations more effectively, reducing waste and enhancing productivity.



DRIVING SUSTAINABILITY

Corporate social responsibility is an integral part of Lian Beng's business philosophy, with a strong focus on environmental stewardship for the benefit of future generations. The organisation firmly believes that IDD can significantly improve sustainability through resource optimisation, carbon footprint reduction, and paperless process implementation, among many others.

KEY FOCUS AREAS FOR IDD IMPLEMENTATION

Lian Beng implemented several IDD solutions in Lentor Modern (see Annex A), of which two are highlighted in the following paragraphs.

IDD Use Case: Digital Logistics

1 DIGITAL TRACKING FOR PRODUCTION, DELIVERY AND INSTALLATION OF PPVC MODULES

Being a PPVC project, the coordination between production, delivery and installation of the modules needed to be well-synchronised to ensure smooth on-site assembly and prevent any potential setbacks in the construction timeline. Conventional coordination approaches and solutions are often fragmented and rely heavily on manual processes, which could potentially lead to miscommunication, duplication of efforts and delayed decision-making.

For instance, the coordination of PPVC modules delivery from Malaysia. Typically, on-site staff in Singapore would inform yard personnel in Malaysia about the target arrival time for PPVC modules at the project site. These yard personnel would then relay this information to delivery drivers, usually via phone calls. However, as traffic conditions at customs tend to be unpredictable, delays in the delivery of PPVC modules were not uncommon. Consequently, on-site staff frequently found themselves waiting idly for module arrivals, unable to allocate their time to more productive tasks.

To ensure that the above circumstances did not arise with Lentor Modern, Lian Beng worked with Millipede to customise a multi-platform digital solution that would allow processes to be automated and integrated. This allowed data to be captured and reflected in real-time, minimising delays and enhancing overall efficiency. The platform also facilitated an organic flow of real-time information that provided better project insights and enabled more accurate progress tracking and predictions.

Key Features of Millipede's Multi-Platform Digital Solution

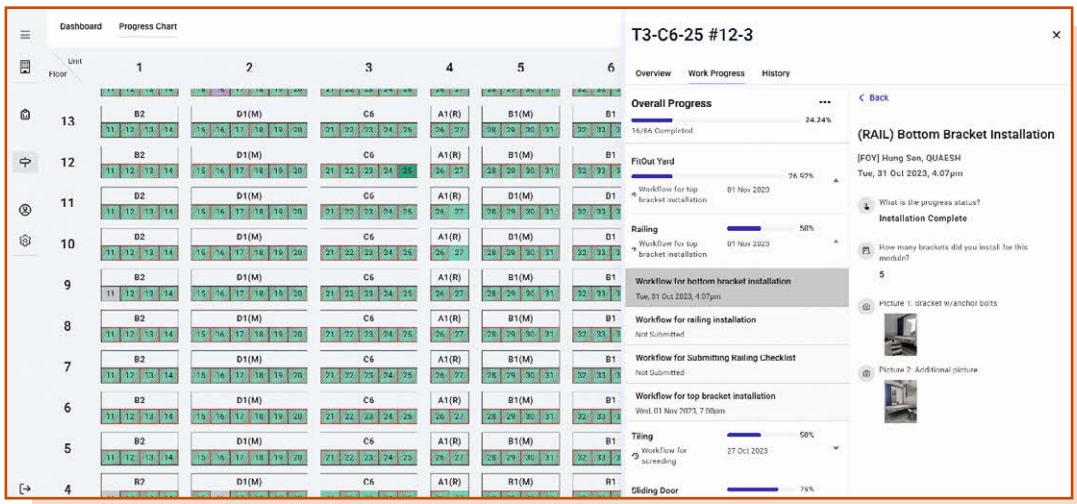
ACCURATE AND REAL-TIME ON-THE-GROUND DATA	ORGANIC AND DETAILED WORKFLOWS	USER-FIRST DESIGN
• To ensure data authenticity, all collected information underwent multi-modal verification, utilising data from multiple unique sources for cross-validation	• Changes to existing workflows were minimised (i.e. lesser disruptions) • Solution integrated with existing workflows, optimising processes to facilitate direct data capture and reducing reliance on self-reported information	• Solution was built around the needs and behaviours of the construction workforce

PPVC Modules Production, Delivery and Installation – A Comparison of Workflows

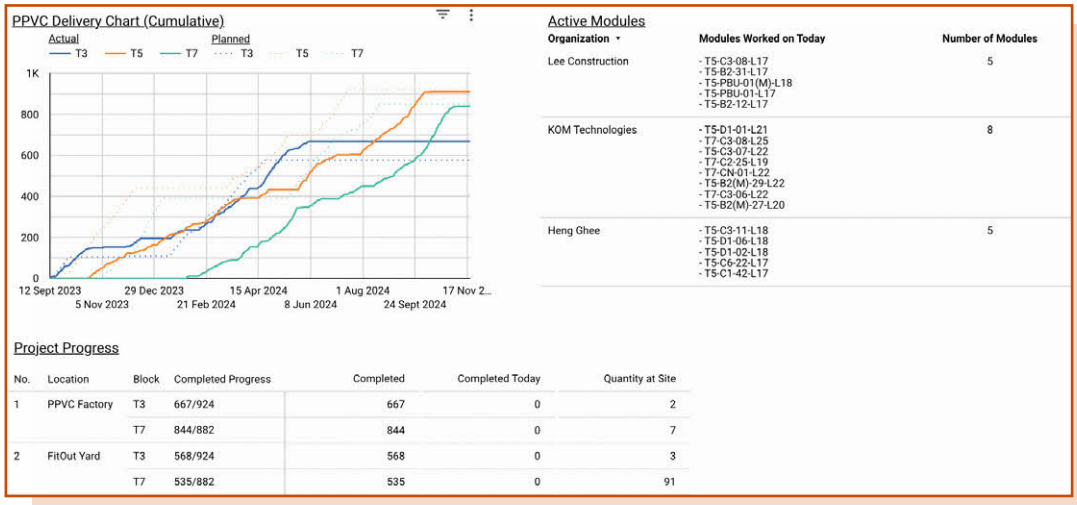
Production

Conventional Method		With Millipede's Solution	
• Concreting and inspection checklists were usually filed in physical folders • Site staff had to manually sift through the entire stack of paperwork to locate the relevant checklist when needed	**15 mins**	**8 mins**	Checklists were digitised and stored in a cloud-based system, allowing site staff to retrieve the relevant checklist with a single click
Precast yard personnel had to manually tally the number of modules that has been cast and delivered	**10 mins**	**6 mins**	The dashboard was able to generate instantaneous, real-time summary reports

Time Savings: ~40%



Progress of specific trades and items can be individually monitored, enabling the team to track and/ or adjust on-site operations readily.



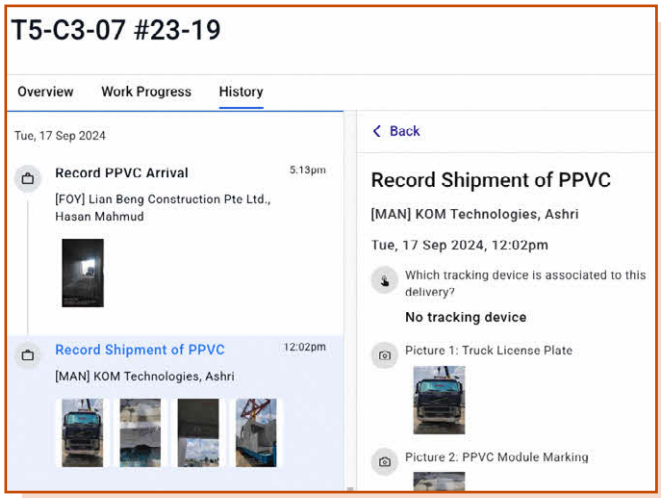
Users can monitor project progress at different levels of granularity.

Delivery

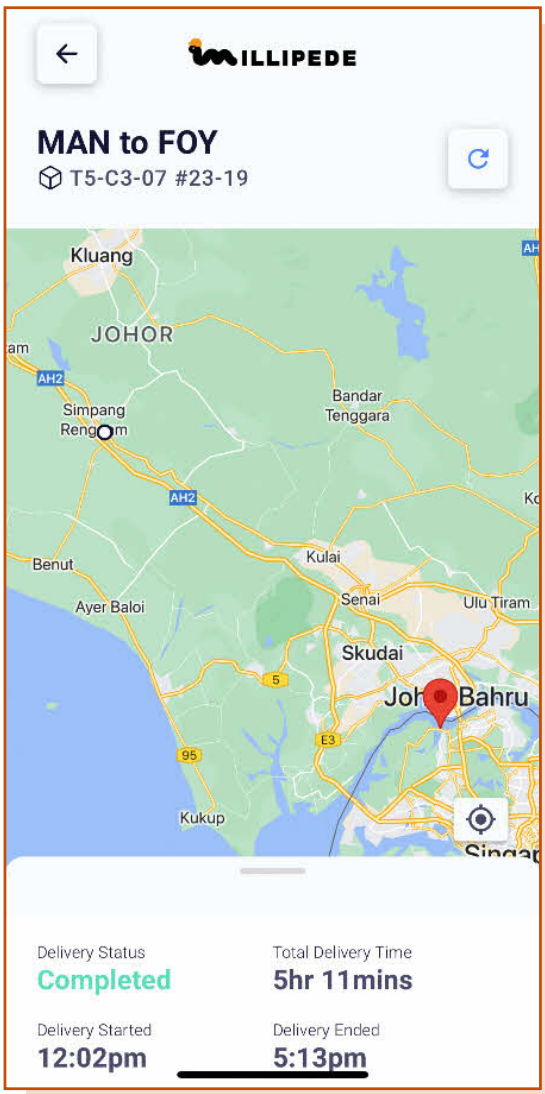
Conventional Method		With Millipede's Solution	
Communication between site staff and yard personnel or delivery drivers to enquire about location and estimated time of arrival were limited to phone calls or Whatsapp	**15 mins**	**10 mins**	• The implementation of a trailer tracking system enabled site personnel to monitor the vehicle's location at any time. • This technology also enhanced their ability to accurately estimate the trailer's arrival time at the project site.

Time Savings: ~33%

Real-time capture of data.



Delivery record on dashboard.

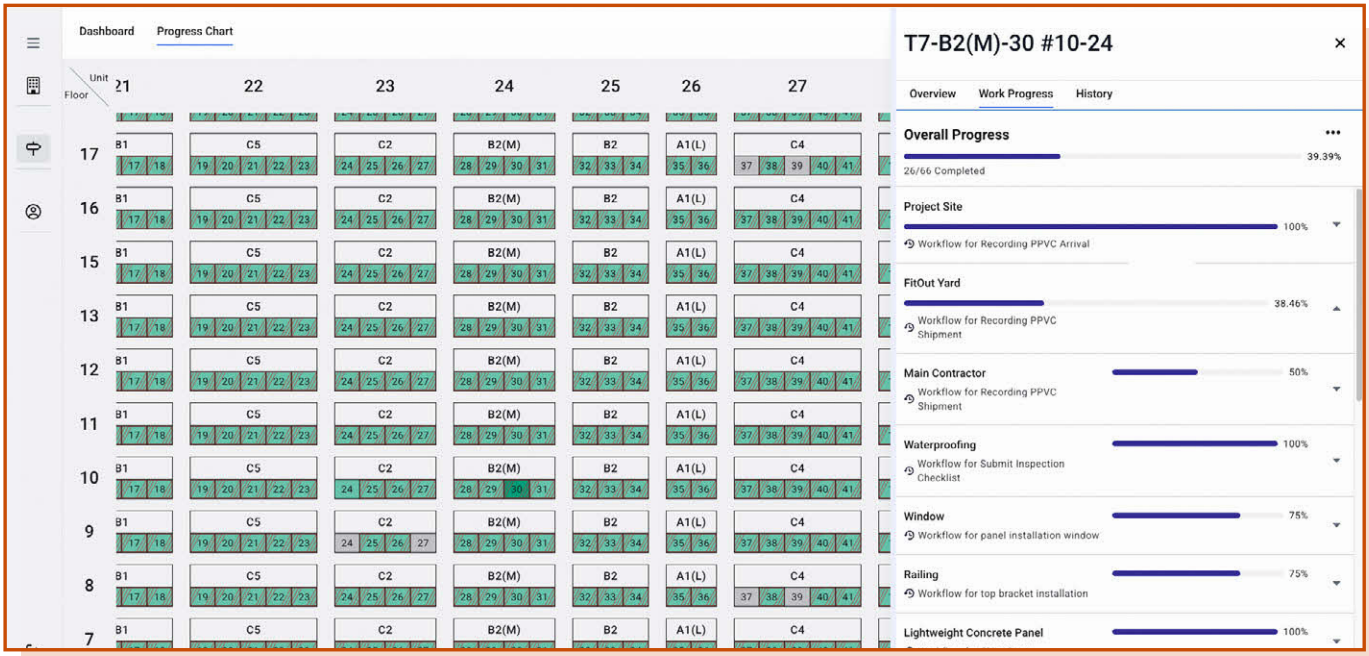


GPS tracking of trailer.

Installation (Also referred to as Fit-Out Yard Installation)

Conventional Method		With Millipede's Solution	
Site staff would have to manually file the inspection checklists	**10 mins**	**6 mins**	Each module's trades and activities were documented chronologically and stored in a cloud-based system
In cases of damage, there was often a lack of accountability, as parties would deny involvement in the affected module.	**30 mins to check and verify**	**20 mins to locate and validate records**	The dashboard was able to generate instantaneous, real-time summary reports

Time Savings: ~35%



Dashboard provides key indicators to decision makers, allowing them to make critical and effective decisions.

Recording of work process via QR code.

Estimated overall time savings for production, delivery and installation of PPVC modules:

36%

2 EXPEDITING PROCESSING OF PAYMENT CLAIMS WITH DIGITAL PAYMENT PLATFORM

Lian Beng's management of sub-contractors' monthly claims has traditionally been a highly manual and paper-based process, from initial submission of claims to final payment. This approach, which relied heavily on physical documentation necessitated multiple iterations between various stakeholders, resulting in a time-consuming process prone to errors and difficult to audit.

As Lian Beng expands its operations, the increasing operational complexity will exacerbate these inefficiencies, contributing to greater administrative burden and potential payment delays. The traditional approach not only hampers productivity, but also increases the risk of financial discrepancies, potentially straining relationships with sub-contractors and impacting project timelines.

In their drive to improve payment efficacy and quality, Lian Beng began working with Doxa to implement Doxa Connex, a procurement and payment digital solution, in the project. With Doxa Connex, Lian Beng was able to digitalise the process of payment claims and verifications through a common workspace that all relevant parties could collaborate on, thereby reducing the number of manual iterations required. Underpinned by blockchain technology, the solution also provided an immutable audit trail, enhancing transparency and accountability throughout the project.

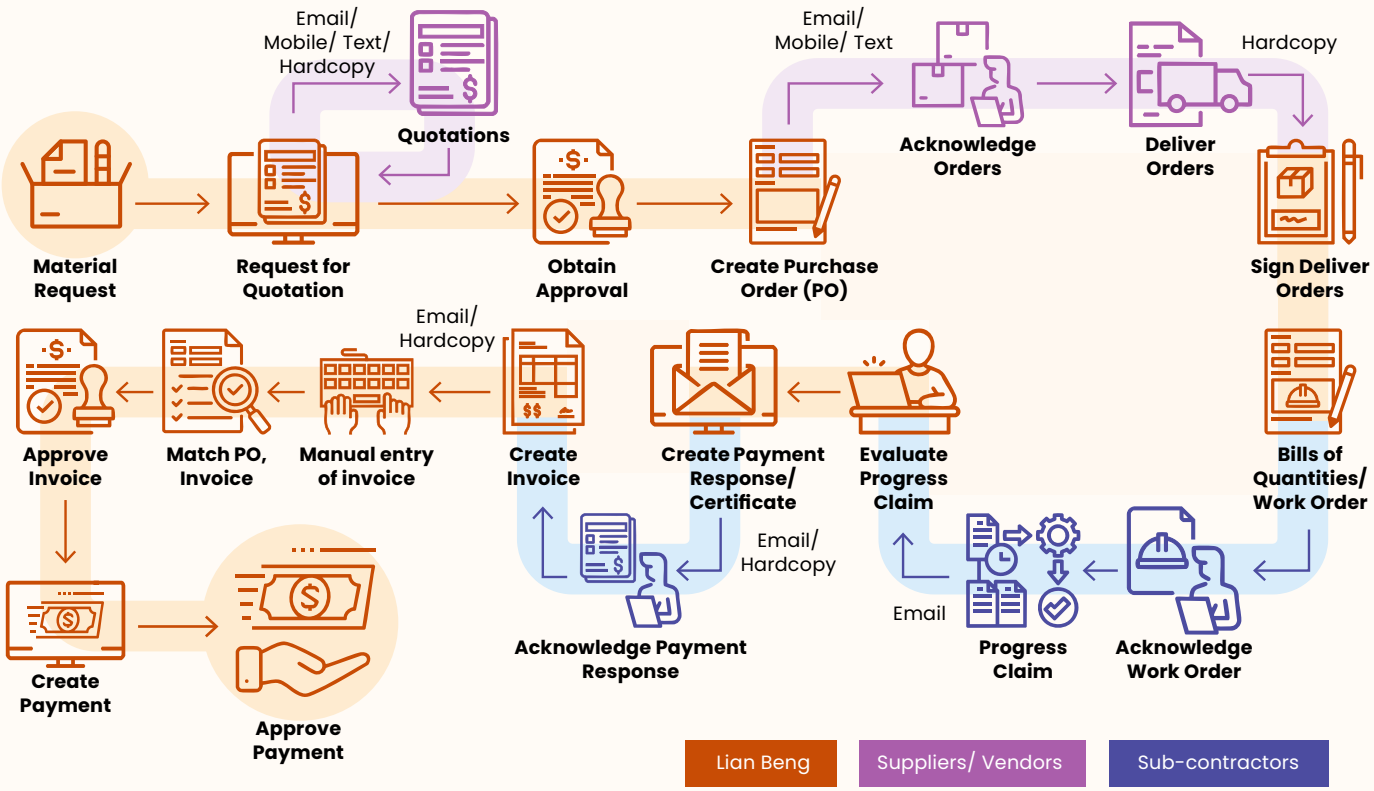
Benefits of Adoption of Digital Payment In Lentor Modern

Payment processing time reduced by 58%

ENHANCED ACCOUNTABILITY with immutable records of all transactions

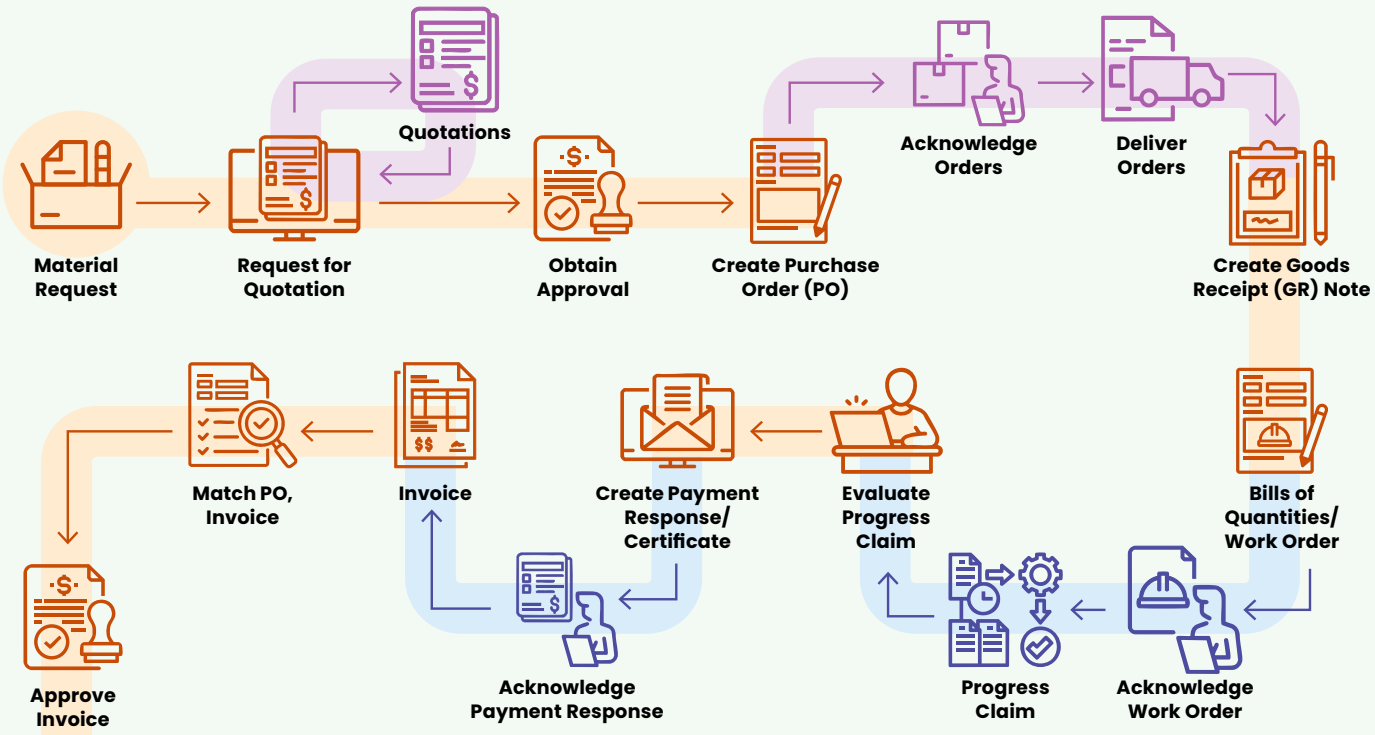
Before Doxa

Lian Beng's ERP/ Accounting System & Manual Processes



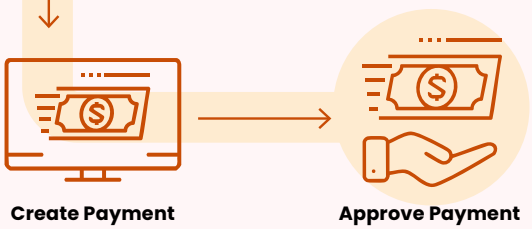
After Doxa

Automated Processes using Doxa Connex



Lian Beng's Accounting System

Seamless interfacing with Lian Beng's internal system



Lian Beng | Suppliers/ Vendors | Sub-contractors

Allan Wong
Construction Director, Lian Beng Construction (1988) Pte Ltd

Integrated Digital Delivery (IDD) has transformed the Built Environment sector by enhancing collaboration, driving innovation and boosting productivity across the value chain.

Encouraged by the positive outcomes achieved thus far, we remain committed to advancing our IDD journey to foster better collaboration among stakeholders and deliver sustainable, high-quality projects.

CHANGE MANAGEMENT STRATEGIES

Recognising that the introduction of both digital use cases would affect a broad spectrum of stakeholders, from internal staff to onsite construction teams, Lian Beng collaborated closely with both solution providers, Millipede and Doxa, to mitigate potential resistance and facilitate smoother transition to the new systems.

i Upfront User Engagement

The Millipede team, recognising potential resistance to change, invested considerable effort in comprehensive user engagement across diverse stakeholders. Their approach extended beyond identifying pain points to offering customisable solutions that addressed multiple stakeholders' concerns.

Through repeated demonstrations and targeted interactions with both main contractor and subcontractors, Millipede fostered familiarity with the mobile application's interface and showcased how it would address specific challenges. This strategy allowed stakeholders to feel invested in the implementation process.

Training and onboarding at precast yard.

Training and onboarding at fit-out yard.

ii Customised Stakeholder Training and Continuous Support

Doxa conducted training workshops for relevant users from the purchasing, contracts, finance and site teams. These sessions focused on familiarising users with the platform to smoothen the transition. The training was also extended to Lian Beng's suppliers and sub-contractors, ensuring that they were well-versed in the platform's use. This approach helped fulfil the platform's intended purpose and maximised benefits across the project.

All registered users were also given access to the Doxa Customer Support team, where they could reach out to them for support and assistance when required. Additionally, Doxa provided refresher training sessions for Lian Beng, its suppliers and sub-contractors.

Beyond training, Lian Beng and Doxa also held regular meetings to discuss adoption levels and platform usage. These meetings also covered challenges faced by Lian Beng's users in utilising the platform. Subsequently, Doxa would devise solutions to address the challenges, typically through software enhancements or workaround solutions, helping users adapt to the new system.

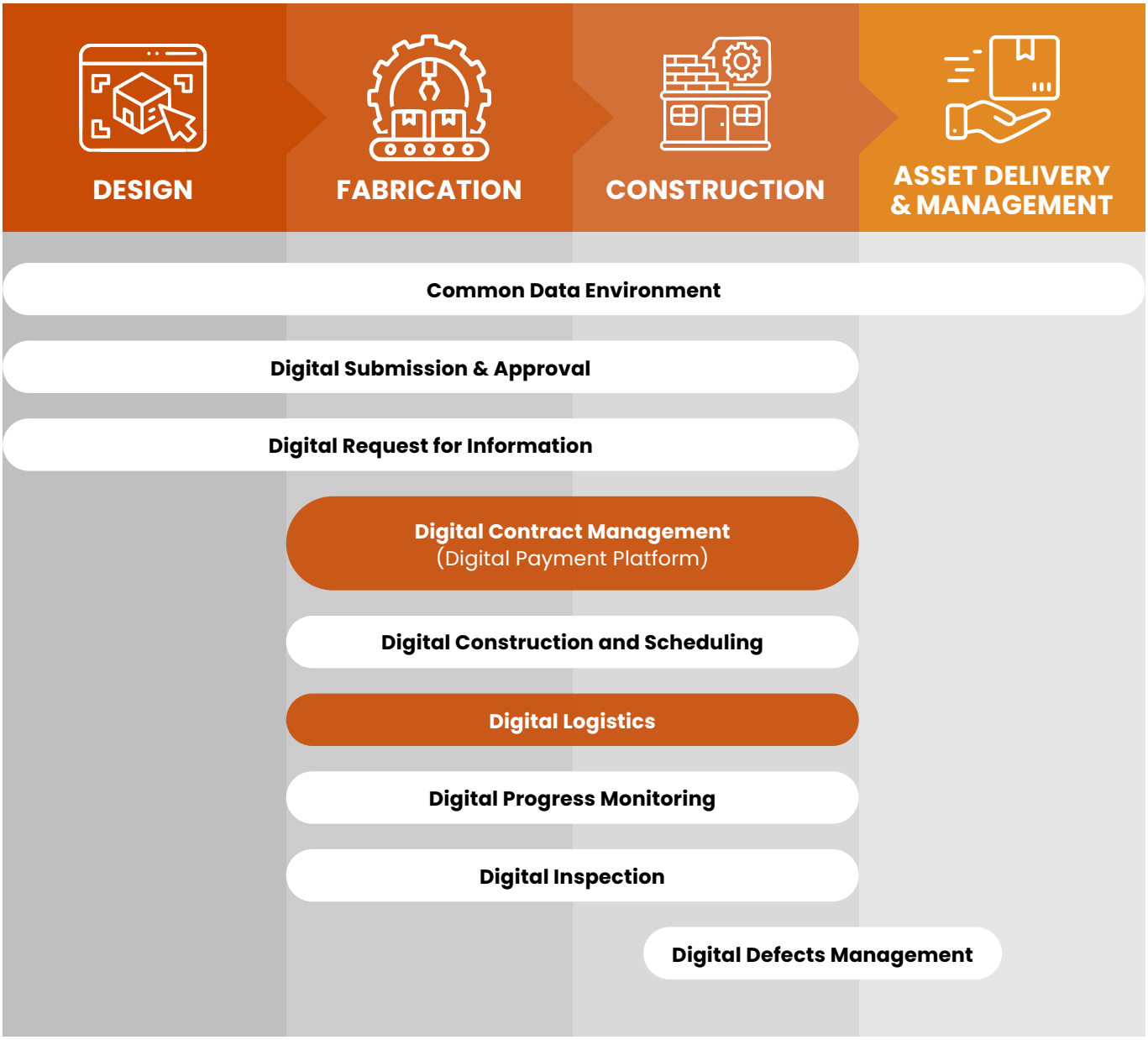
iii Empowering Advocates and Incentivising Usage

From experience, Millipede observed that peer-driven adoption was the most potent catalyst for change. To this, they worked with Lian Beng to select and empower designated "Milli-experts" within the project teams. These experts, comprising both Lian Beng headquarters staff and on-site supervisors, were thoroughly trained in the solution/ mobile application. Acting as liaisons between the Millipede team and end-users, they were instrumental in resolving issues related to the mobile application and its on-site implementation, thereby facilitating smooth implementation and integration of the new technology.

To further encourage adoption, vouchers were also awarded to users who submitted the most number of jobs using the application. This proved to be popular, with users logging in an average of 3496 entries per month.

Top contributor recognition for making the most submissions through the Millipede application.

ANNEX A – LIST OF DIGITAL USE CASES IN LENTOR MODERN



Orange bars denote use cases highlighted in write-up