

ASEAN PORTS AND SHIPPING

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Tuesday 25 to Thursday 27 October 2022

Sheraton Saigon Hotel & Towers, Ho Chi Minh City, Vietnam

Fundamental Strategy for Container Terminal Automation

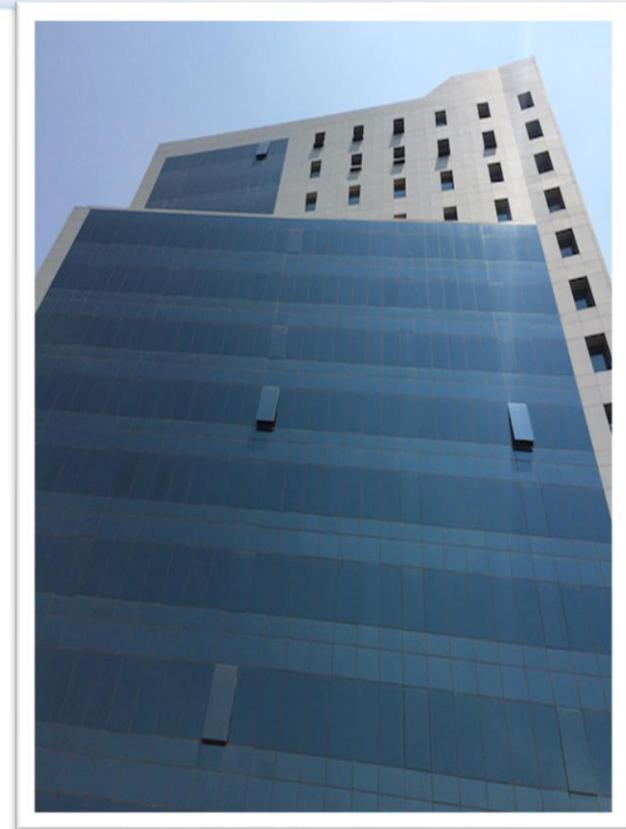
Prepared for Transport Events

By IGO Solutions

Wednesday 26th October 2022

About IGO Solutions

- IGO SOLUTIONS started 15 years ago with interest in the global ports and logistics market segment. The company have physical presence with offices in Australia, United Arab Emirates, United Kingdom, New Zealand, and India.
- Market disruptor by leading with innovation by providing new generation of products and consultancy Services for Ports, Shipping and Logistics customers based on AI technologies.
- Executed projects worldwide including The Netherlands, Scandinavia, Kuwait, Turkey, Namibia, Philippines, UAE, Australia, NZ and India.
- Developed a product suite that addresses business process pain-points and optimizes the operations for its customers.
- 800+ Man-years of experience in Global Port Operations, Shipping and Logistics.
- 55+ Team of Dedicated Technical, Domain Experts and Data Scientists, on the IGO payroll.



About Myself



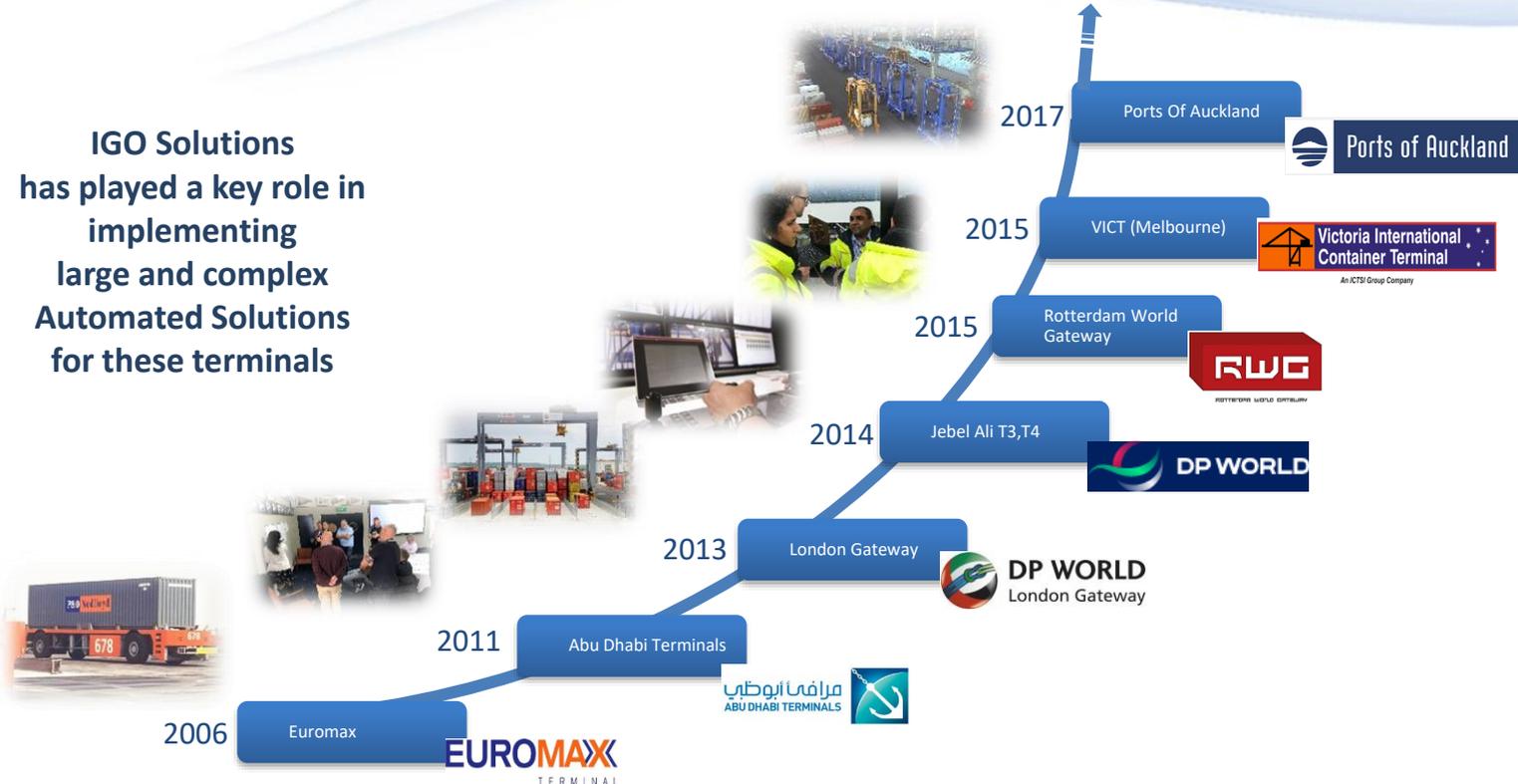
Sugith Kumar

Business Process Mapping, Test Automation Design, QA/Test Management, SOP & Training Content Development, Billing Implementation

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- *Euromax Rotterdam*
 - *Khalifa Port Abu Dhabi*
 - *Jebel Ali Dubai*
 - *London Gateway United Kingdom.*
 - *VICT Australia*
 - *MICT Philippines*
 - *POAL New Zealand*
 - *Pusan New Port South Korea*
 - *JEDDAH, Saudi Arabia*
 - *APMT GOT, Sweden*

Automated Terminals Journey IGO Solutions

IGO Solutions has played a key role in implementing large and complex Automated Solutions for these terminals



Details

Projects

Agenda

1. Container Terminal Automation

– Why Terminal Automation

- Main Drivers *(operational driven)*
- Complexity/Challenges *(not an easy thing to do)*
- Complexity of Terminal Automation *(unmanned equipment control system)*

– The current Market

- Solutions for Automation *(various concepts, full or partly automation)*
- Equipment and System Vendors *(overview, market developments)*

– From Business Case to Go-Live

- Project Automation strategy *(a step-by-step approach to automation)*
- The Business Case *(example)*
- Why is BPM important *(holds all detailed operational processes)*
- QA and Testing Strategy *(your most crucial activity to be successful)*
- Project Organisation *(Project Governance, Resources, capabilities)*
- Communication *(crucial to inform the organisation and win hearts and minds)*
- Organisational Transformation *(from manual to factory like operated processes)*
- De-risking The Automation Project

2. Terminal Automation Planning and Cost estimation

3. IGO Customers



1. Introduction to Container Terminal Automation

– Why Terminal Automation

- Main Drivers *(operational/performance driven)*
- Complexity/Challenges *(not an easy thing to do)*
- Complexity of Terminal Automation *(unmanned equipment control system)*

Why Terminal Automation

1 - “What are the Main Drivers for Automation”

2 - “What are the Complexities/Challenges for Automation”



Why Autonomous Terminal Automation – Main Drivers

- Increase Capacity/ Yard Densification
 - Operational Improvements
 - Safer Working Environment
 - Reduce Operational Cost
 - Reduce Carbon Footprint
 - Modernizing Terminal Operation
-
- Efficient Turn Around time Vessels and Trucks
 - Reduce Non-Productive moves
 - Predictable Operational flows
 - Improve working procedures (SOPs)
 - Provide Data for Business Intelligence





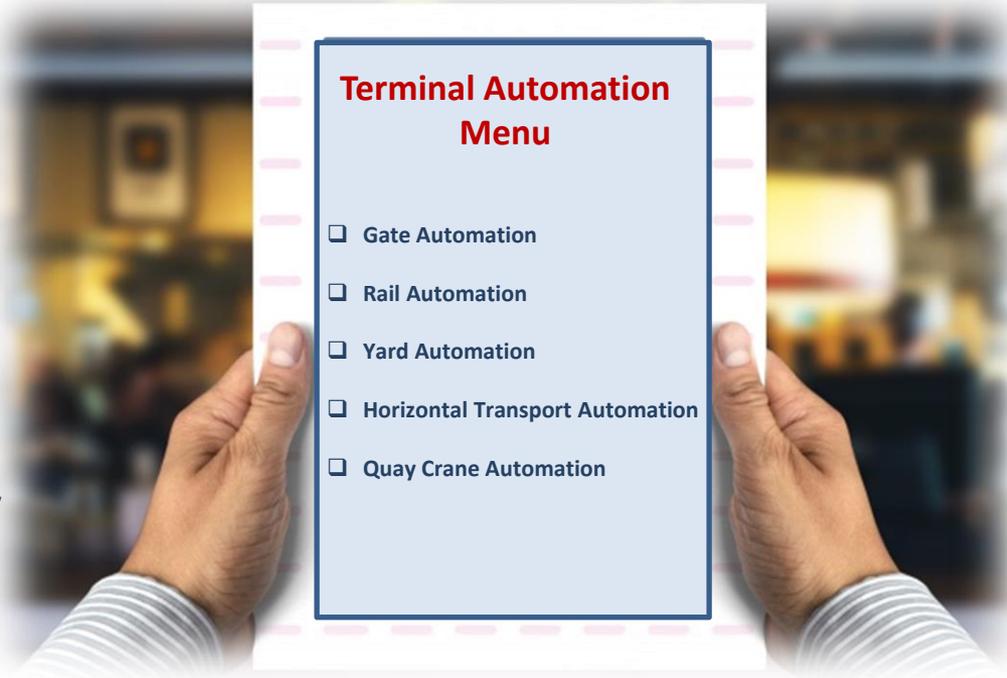
1 - Introduction to Container Terminal Automation / Autonomous Solutions

- Current Market.

- Solutions for Automation *(various concepts, full or partly automation)*
- Equipment and System Vendors *(overview, market developments)*
- **Choices for Automation** *(Options for automation implementation)*

Current Market Solutions for Terminal Automation

- **Gate**
 - Increasing throughput, quality and safety
- **Rail**
 - Increasing throughput, quality and safety
- **Container Yard**
 - Yard capacity and equipment availability
- **Horizontal Transport**
 - Reliable, cost-effective and environmentally friendly
- **Quay Crane Operation**
 - More control on quayside operations



Current Market

Gate and Rail

- Self Service Kiosks
- Gate OCR
- Rail OCR
- Reduce Intervention times
- Identification and Registration
- Automated Truck handling

“Increasing throughput,
quality and safety”



Current Market

Container Yard

The RMG has been around for a while and have been used in **automated** ports, in both perpendicular (as ASC's) and parallel modes, with and without cantilevers.

- Container Inventory Control
- Dynamic planning strategies
- ASC Dual cycling strategies
- Reefer Monitoring
- Automated Truck handling

“Yard capacity and equipment availability”



Current Market

Horizontal Transport

- ❑ Decoupled transfer with cranes, reduced fleet
- ❑ Electric Vehicles, auto recharging
- ❑ Smart Pooling logic optimizing fleet
- ❑ Congestion Management for parking and transfer
- ❑ AHT multi-lift and dual cycling strategies

“Reliable, cost-effective and environmentally friendly”



Current Market

Autonomous Trucks (TT)

Retrofitting existing port terminal trucks that meet the industry needs today.

- ❑ Development last 2 years
- ❑ Not really matured proven Technology
- ❑ Cost-Effective, Accessible, Scalable
- ❑ Low purchase and operating cost.
- ❑ Decoupled from the year/more flexible
- ❑ Transition from manual in phases.

“More control on quayside operations”

OEM(s)	AI Solutions Provider	Terminal	Equipment	Autonomy Ops Level (1-10)	Maturity Level (1-10)	Notes
Terberg (retrofit)	DG World UAE	DPW Jebel Ali	Terminal Tractors	9	7	Originally partnered with AI drivers in 2016. Have tested 4 autonomous TTs.
Terberg (retrofit)	AI Drivers	PSA Singapore	Terminal Tractors	9	8	Testing Terminal Tractors for over two years. Also testing 1 x autonomous STS Crane (see next slide).
Westwell China	Westwell China	HPH Thailand	Terminal Tractors	9	6	Testing 8 fully autonomous TTs for 1-year.
Westwell China	Westwell China	COSCO Abu Dhabi	Terminal Tractors	9	6	Terminal ordered new fully autonomous TTs.
-	ISEE	-	Terminal Tractors	9	4	Developing fully autonomous TTs. Had successful test with cars in Boston
-	EMBotech	-	Over-The-Road (OTR) Trucks	9	5	Decision-making software makes highly automated driving feasible today
-	-	Port of Virginia	OTR Trucks	-	In Progress	Federal Highway Administration grant to develop a proof of concept for autonomous trucks to serve container terminals
Various	Various	-	OTR Trucks	9	7	See next slides – Volvo, Google, Tesla, Uber, Ford all have initiatives underway

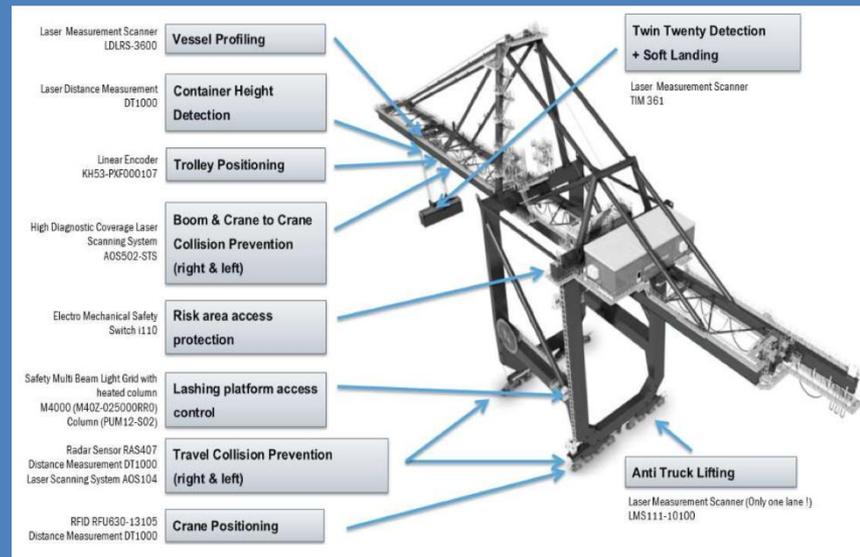


Current Market

Vessel and Quay Operations

- ❑ STS Remote Operations
- ❑ Better control and automated functions on STS
- ❑ Real time and mobile information to crane team
- ❑ STS multi-lift and dual cycling strategies

“More control on quayside operations”



Current Market

System and Equipment Vendors (focus TOS-ECS)

SUPPLIER	Systems		
	TOS	ECS	GOS
CYBERLOGITEC	X		
NAVIS/OCTOPI/JADE	X	X	
TBA	X	X	
TOTAL SOFT BANK	X		
TIDEWORKS	X		
RBS	X		
SOLVO	X		
GULLSEYE	X		
IT PARTNER	X		
TGI MS	X		
SOFTPAK	X		
MODALITY	X		
ZODIAC(DPW)	X		
NGEN(HPH)	X		
SIPG	X		
TCS iPOS	X		
ABB		X	
SIEMENS		X	
TMEIC		X	
CAMCO			X
ORBITA			X
ENVISION	X		X
CERTUS			X
VISY			X
TALK PORTS			X
ICT GROUP		X	

SUPPLIER	Equipment							Systems		
	STS	ASC	RTG	SC	AGV	RMG	TT	TOS	ECS	GOS
ZPMC	X	X	X	X	X	X			X	
KALMAR	X	X	X	X	X	X	X		X	
KONECRANES	X	X	X	X	X	X			X	
KUENZ		X	X						X	
SANY	X	X	X							
LIEBHERR	X	X	X	X						
KOCKS	X									
TGPC			X							
HPMC	X									
OMG	X									
VDL					X					
GAUSSIN					X		X			
TERBERG							X			
VOLVO							X			
HYSTER										



Most common combinations however, market is changing rapidly

Current Market

Equipment and System Vendors

- Choices are depending highly on your operational processes.
- **High-Level Business Process Maps** and **Simulations** are crucial to find the best-fit-for-your-operations.



Introduction to Container Terminal Automation Implementation Strategy

– From Business Case to Go-Live

- Project Automation strategy *(a step-by-step approach to automation)*
- The Business Case *(example)*
- Why is BPM important *(holds all detailed operational processes)*
- Requirements Definitions *(holds all detailed agreed and signed-off Requirements)*
- Vendor Management *(holds all detailed agreed Project Delivery Plans)*
- QA and Testing Strategy *(your most crucial activity to be successful)*
- Project Organisation *(Project Governance, Resources, capabilities)*
- Communication *(crucial to inform the organisation and win hearts and minds)*
- Organisational Transformation *(from manual to factory like operated processes)*
- De-risking The Automation Project

High-Level Project Strategy - Logical steps

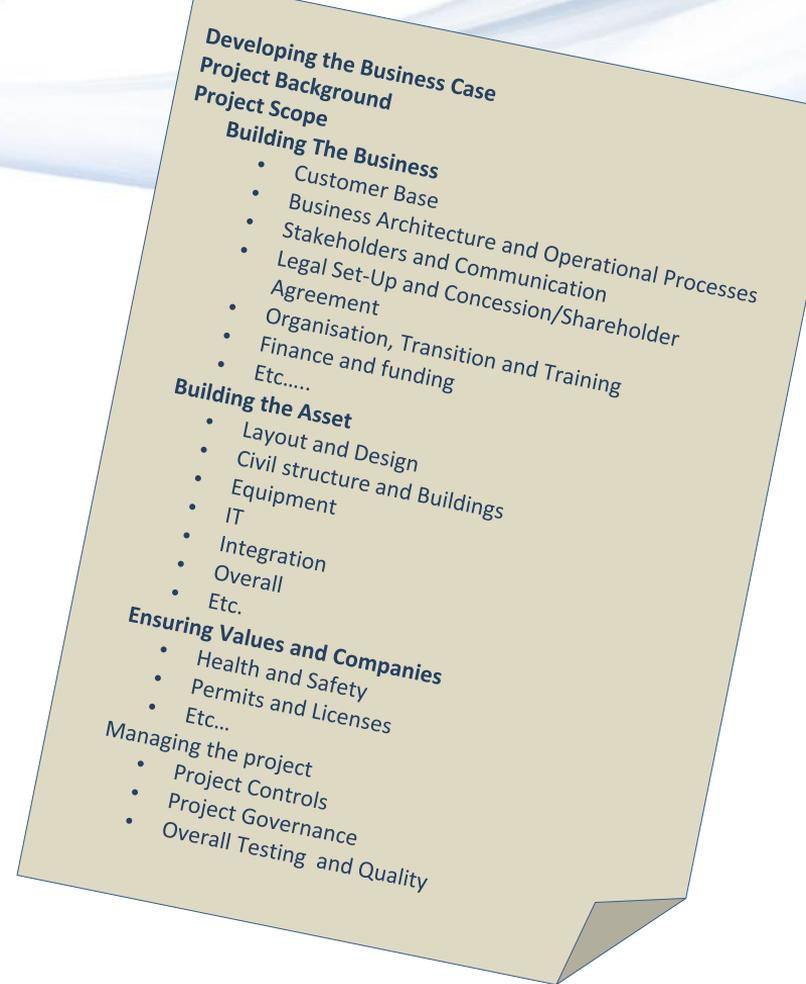


High-Level Project Strategy

Example Business Case

Business Case (Main topics)

- Developing the Business Case
- Project Background
- Project Scope
- Building the Business
- Building the Asset
- Ensuring Values and Companies
- Managing the Project



High-Level Project Strategy

Why Business Process Modelling is crucial (1)



The most Important task!

Understanding the gap
between
Manual operations
and
Automated operations

BPM As-Is

Manual Operations

BPM To-Be

Automated Operations

High-Level Project Strategy

Why Business Process Modelling is crucial (2)

Reduced process costs	10 - 15 %
Increased quality / reduced number of errors	20 - 30 %
Reduced process throughput times	10 - 30 %
Reduced training time / expenses	10 - 30 %
Reduced number of (internal) support requests	15- 30 %
Reduced number of customer complaints	20 - 30 %
Increased forecast accuracy	15 - 30 %



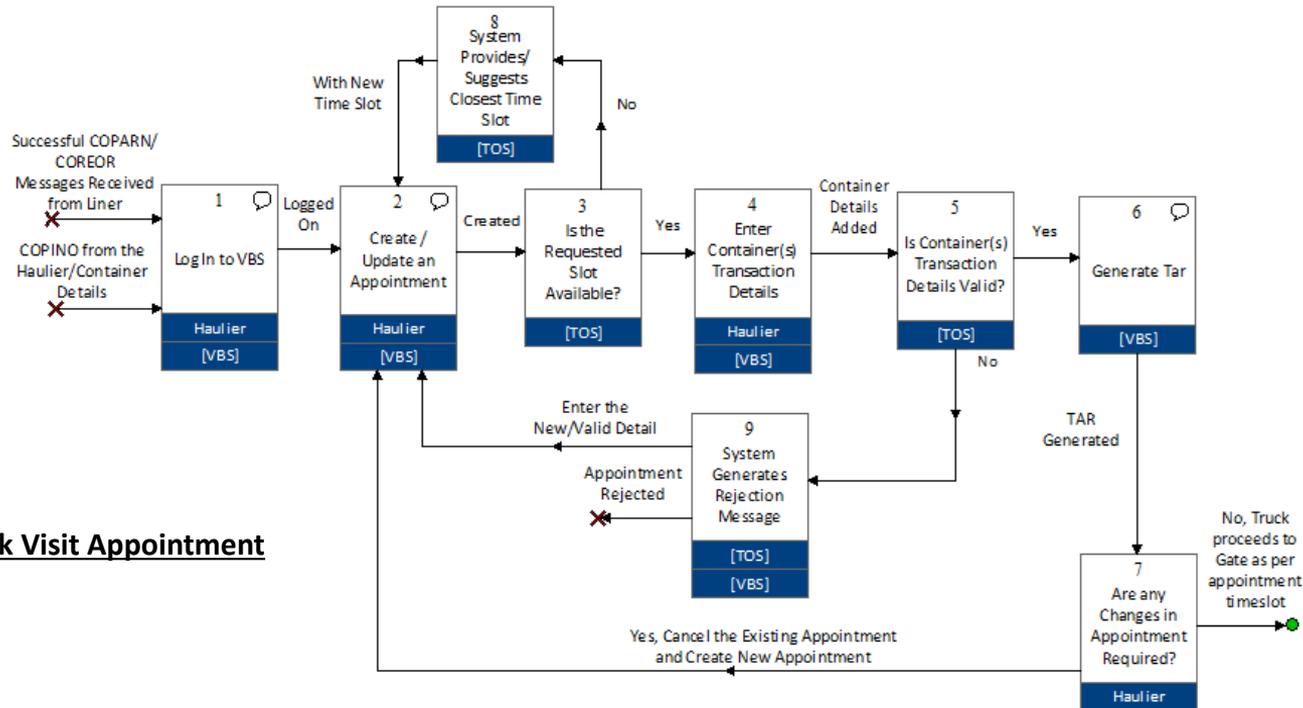
High-Level Project Strategy

Why Business Process Modelling is crucial (2)

Visio or PPT are not BMP Tools, a Professional Tool is a Must

Truck Visit Appointment

1.2.1.1



Example Truck Visit Appointment

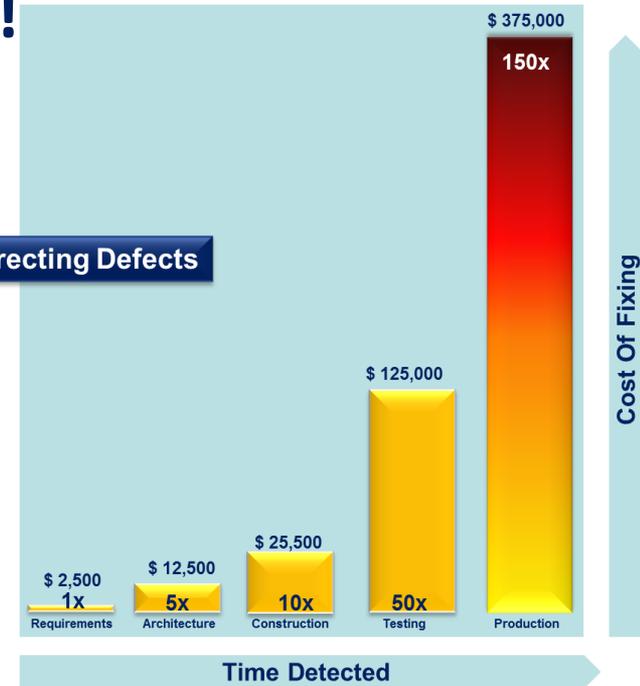
From Business Case to Go-live

Why QA and Testing is so Important!

Defect Prevention

- Reducing Costs after opening our terminal
- Enhancing Quality to achieve required performance
- Ensuring that all critical defects preventing our terminal from opening are identified and where possible solved
- Approved workarounds implemented for critical defects that cannot be solved

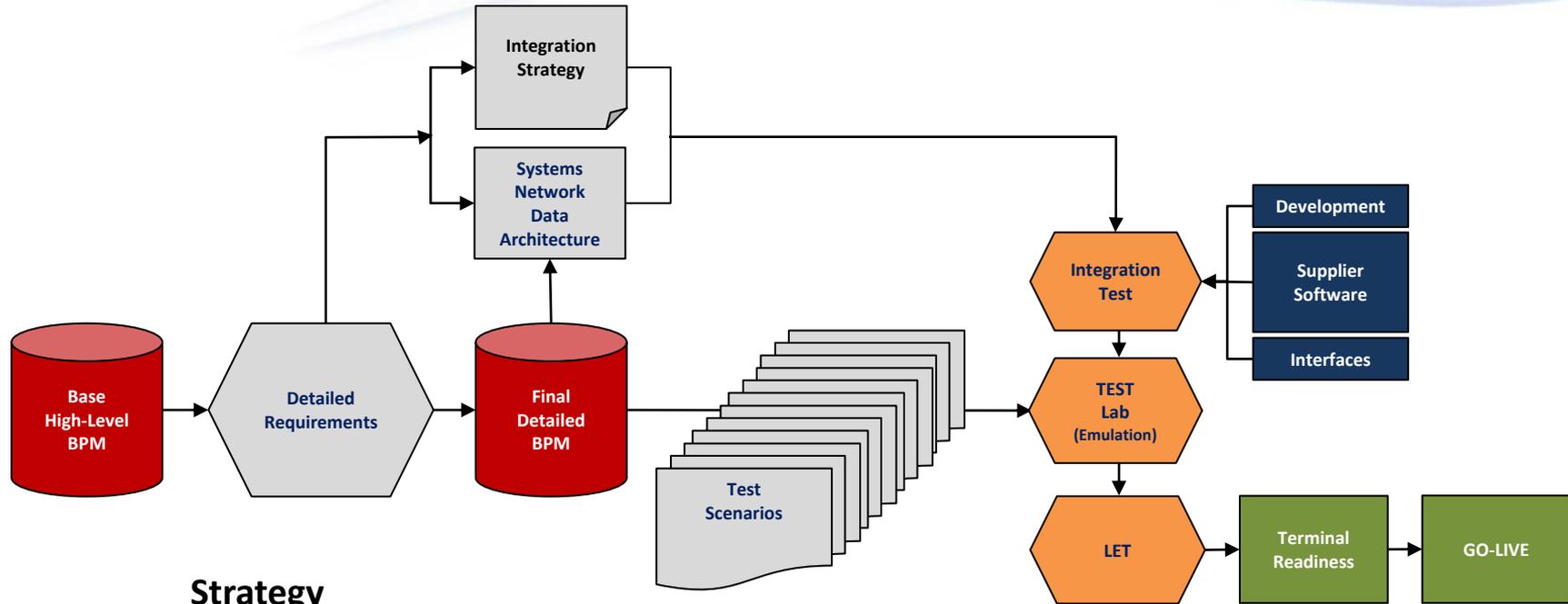
Cost Of Correcting Defects



The National Institute of Standard Technology (NIST)

QA and Testing Strategy

Most vital and critical activity...QA and Testing!



Strategy

- Foundation are Detailed Requirements and the Final detailed BPM
- Dictates the Integration Strategy, Architecture Solutions
- Structured Testing, Test Scenarios (incl. most exception handling)

QA and Testing Strategy

Roles and Responsibilities

- **Terminal Deployment Team**
 - Deployment Lead (Supervision and escalations)
 - QA Engineer (Vendor contact mgt)
 - Operational Business Lead (Operational Analyst)
 - Operational Functional Testers (Super-User)
 - Equipment Engineer
- **Automation Support**
 - Automation Solutions Expertise
 - TOS Expertise
 - Interface Expertise
- **Optional Support Resources:**
 - IT-Infrastructure
 - External SME's (e.g. Yard, Waterside, Landside)



From Business Case to Go-live - Project Organisation

Project Steering Committee

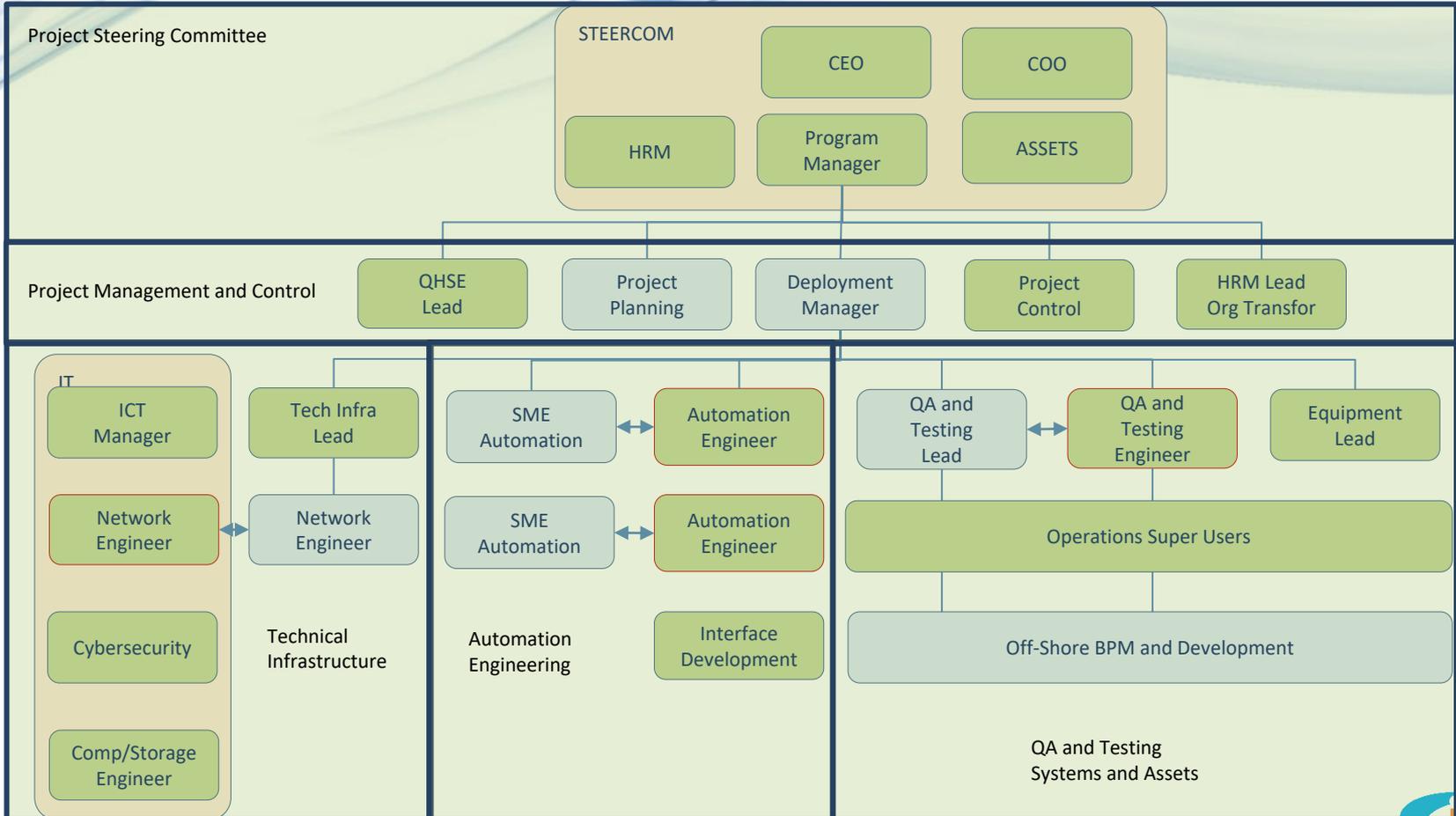
Project Management and Control

**Technical
Infrastructure**

**Automation
Engineering**

**QA and Testing
Systems and Assets**

From Business Case to Go-live - Project Organisation



External

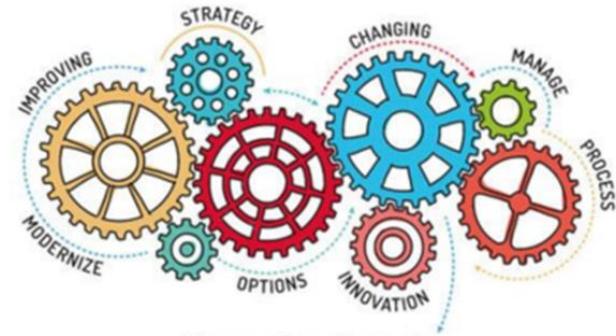
Local

Buddy

From Business Case to Go-live

Organisational Transformation

1. **Dedicated project Team** (HR lead, Operations, Engineering, Workers council etc.)
2. **BPM As-Is and BPM To-Be (Gap Analysis)** starting point for new organisation
3. **Develop Organisation Transformation Strategy**
 - New Organisational Structure (Operations, Engineer
 - Develop new function profiles (Required Skills, Expe
 - Assessment of the Gap Analysis Review
 - Develop Resource - and HR Planning
 - Determine the Financial Impact
 - Include Transformation Planning in Master Planning



Organizational
Transformation

From Business Case to Go-live

Communication is Crucial for Success

- All Terminal Staff are an Integral Part of Terminal Automation.
- Over communicate, reiterate key points, direction and vision.
- Internal and external Stakeholder Communication
- Encourage participation, workshops, testing etc.

- Prevents Tunnel vision and Resistance to Change
- Prevents noise making around the project team
- Reduces terminal staff frustrations and create partnerships



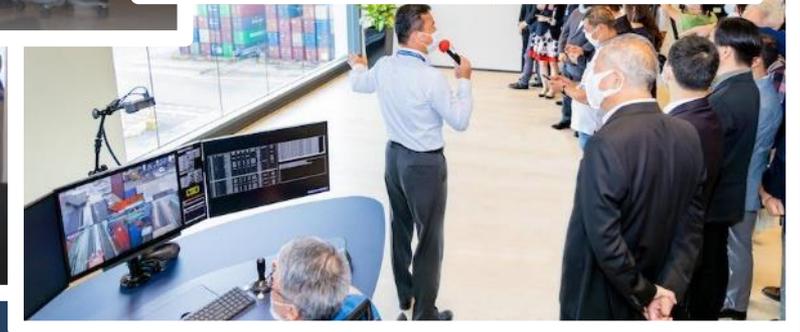
De-risking The Complex Automation Project

Key Risk Areas

- Business Requirements
- Equipment Control System
- Project Mobilization
- Workforce Transformation
- Go-Live Strategy



Control Room (something to think about)

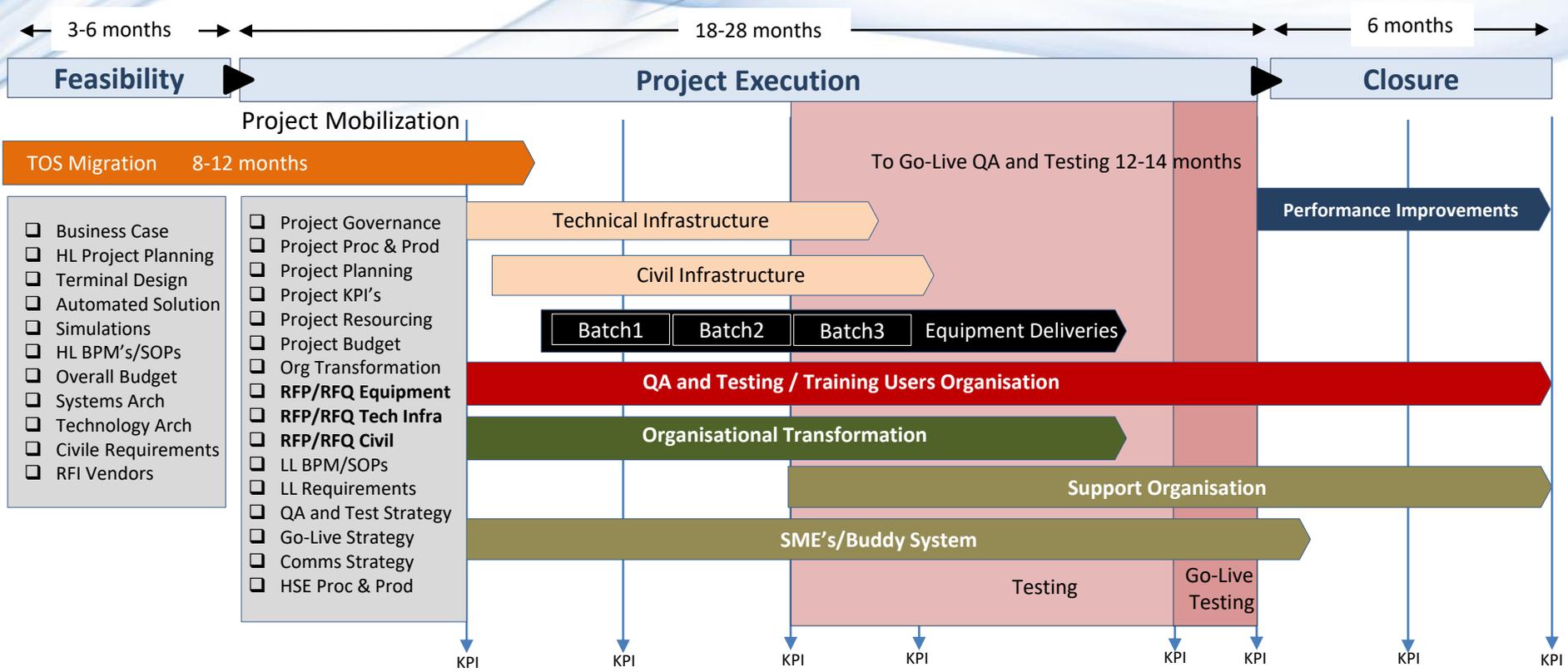


- **Combine functions Planning, Equipment and Remote Operations**
- **Your “eye” on operating your terminal**

2 - Project Planning and Reporting Project Cost estimation



Average Automation Project Life Cycle



- Business Case
- HL Project Planning
- Terminal Design
- Automated Solution
- Simulations
- HL BPM's/SOPs
- Overall Budget
- Systems Arch
- Technology Arch
- Civile Requirements
- RFI Vendors

- Project Governance
- Project Proc & Prod
- Project Planning
- Project KPI's
- Project Resourcing
- Project Budget
- Org Transformation
- RFP/RFQ Equipment
- RFP/RFQ Tech Infra
- RFP/RFQ Civil
- LL BPM/SOPs
- LL Requirements
- QA and Test Strategy
- Go-Live Strategy
- Comms Strategy
- HSE Proc & Prod

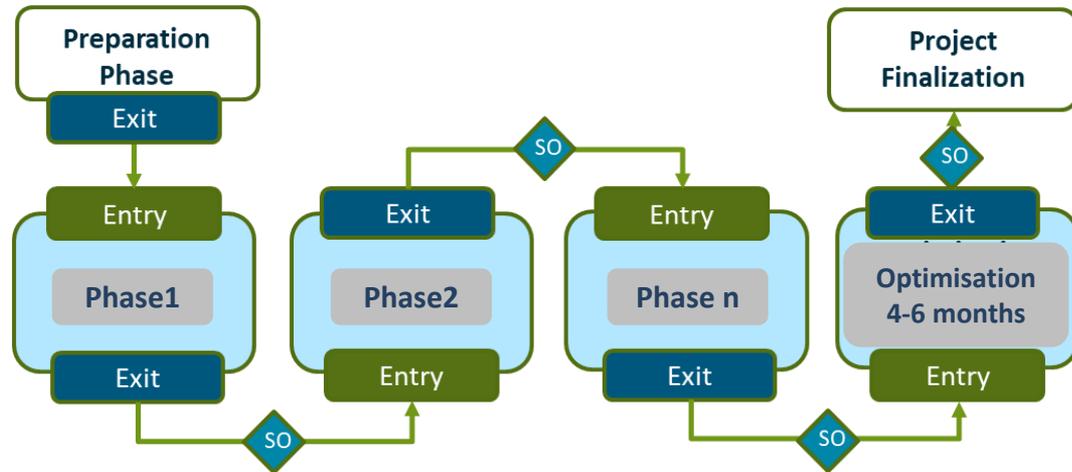
Build, Delivery, Testing up to Go-Live in logical phases (blocks)

Planning Go-Live Strategy with KPI's

- Include key milestones/stages in the project
- Per Phase Exit/Entry Criteria for Sign-Off

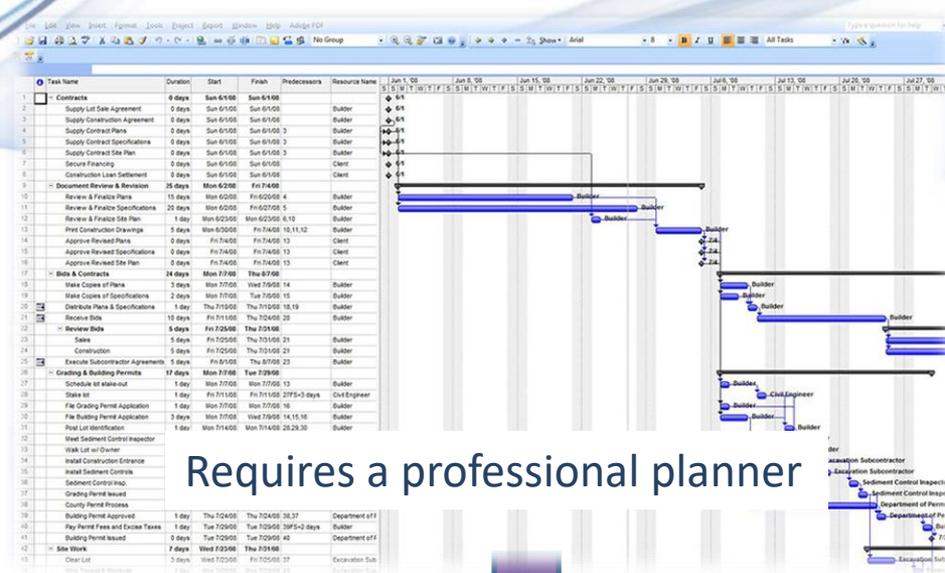
Exit /Entry Criteria

- Civil Works
- Tech Infra
- Systems
- Equipment
- Health & Safety
- Resources
- Operations
- Organisation
- Performance



Planning and Reporting

- Planning could hold 3000 activities
- Manage on a weekly basis
 - Critical Path Analysis
 - Meetings with workstream owners
 - Reporting
 - Risks
 - Assumptions
 - Issues
 - Dependencies



Requires a professional planner

RAID SUMMARY			
Risks	Assumptions	Issues	Dependencies
Total Risk #	Total Assumption #	Total Issue #	Total Dependency #
5	5	6	6
Risk Level	Criticality	Priority	Priority
2 Low	1 Low	3 Low	3 Low
1 Medium	2 Medium	0 Medium	1 Medium
1 High	1 High	1 High	1 High
1 Critical	1 Critical	2 Critical	1 Critical

Key elements for Project Cost Estimation

Terminal Characteristics

(As-Is ➔ To-Be)

Need much more info/assumption

- Terminal / Yard Layout
- Operational Performance
- Container flows and types
- Dwell types
- Stacking Strategies
- 5-year volume forecast
- Current and expected yard density
- Expected Reefer operations
- Expected Equipment Choices
 - STS, Barge, ASC/RTG etc.
- Current Technical Infrastructure
- Etc.....

Option-1

One-day Workshop

High-Level

Budget estimate

- Terminal Lay out
- ASC/RTG
- HL Phase Implementation
- HL Resource planning
- HL Tech Infra HL design
- Etc

Low-Level

Developing the Business Case

Project Background

Project Scope

Building The Business

- Customer Base
- Business Architecture and Operational Processes
- Stakeholders and Communication
- Legal Set-Up and Concession/Shareholder Agreement
- Organisation, Transition and Training
- Finance and funding
- Etc.....

Building the Asset

- Layout and Design
- Civil structure and Buildings
- Equipment
- IT
- Integration
- Overall
- Etc.

Ensuring Values and Companies

- Health and Safety
- Permits and Licenses
- Etc...

Managing the project

- Project Controls
- Project Governance
- Overall Testing and Quality

Option-2

Business Case
Development



3 – IGO Customers



Customer base



MAERSK

NEOM



MAK





Our combination of domain knowledge expertise delivers unique value to our clients



Track Visit Appointment 1.2.1.1

