Making the Most of Technology

How to integrate technology implementations with the 'big picture'

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moffatt & nichol

Introduction

Introduction

- Todays port and terminal operators incorporate many different levels of technology, equipment, and innovation
  - Highly efficient operations translate into superior service levels
- This appetite for innovation provides opportunities for optimization, but presents many challenges along the way
- This presentation will discuss:
  - Opportunities and challenges related to technology implementations
  - How to successfully implement technology projects which align with your organizations ‘big picture’ goals and plans

Agenda

- The Why – Opportunities
- The How – Challenges
- Infrastructure considerations
- Equipment considerations
- Technology considerations
- People considerations
- Integrated project delivery methodology

The Why – Opportunities

- Cost and operational efficiencies
  - Promote efficient movement of goods and cargo, not only within ports and terminals, but throughout the entire supply chain
- Customer service and competitive advantage
  - Continuous reliable productivity, without direct impact of human variability
- Increased safety measures
  - Separation of person and machine
- Increased capacity and expansion through densification
  - Increased volumes and velocity, same footprint
- Sustainability and regulatory demands
  - Ability to electrify terminal equipment and optimize drive behavior to reduce energy consumption

Business case is key

- The basic terminal planning question:
  - What are the objectives of successful technology implementation for a container terminal?
- The scale and complexity of technology implementation depends completely on the business case
  - What do we want to achieve and why?
- Important to define “technology”
  - Complexity can range from individual solutions, such as OCR at the ingate, to fully integrated solutions, such as a fully automated container handling

From “Bottom-Up” to “Top Down”

New

Business Case

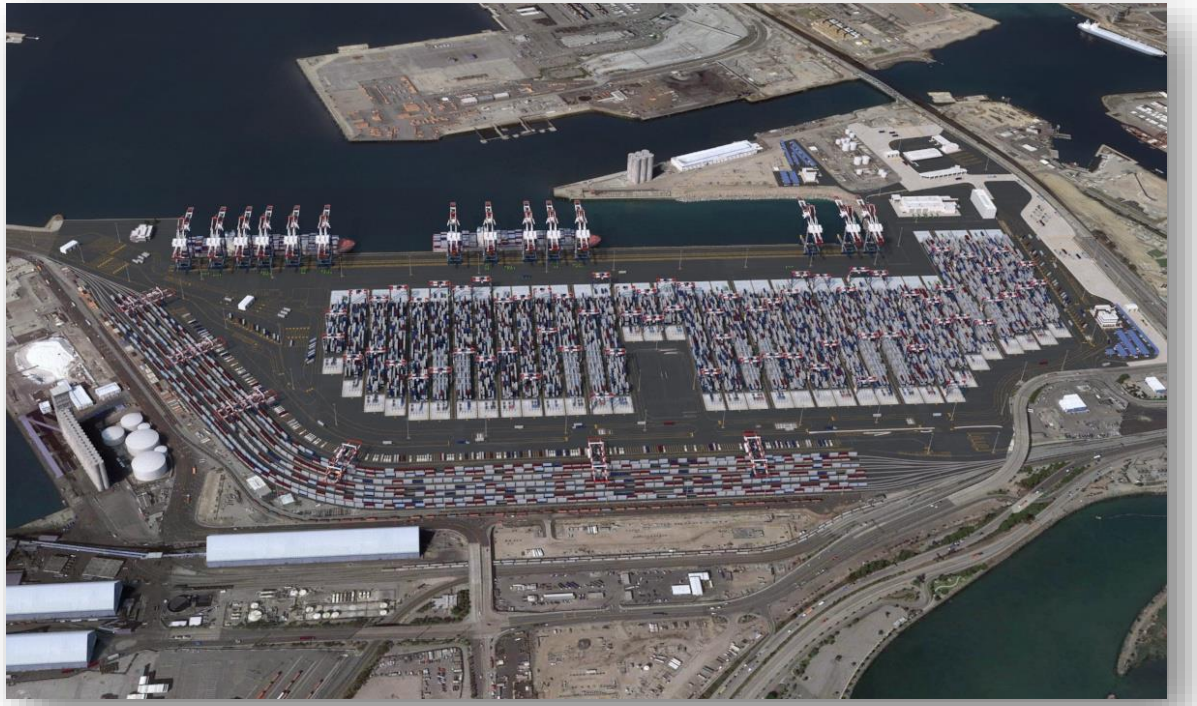
Operations

Logistics

Equipment

Infrastructure

Traditional



The How – Challenges

- Infrastructure
  - Large capital investment with long-term life requirement
- Technology
  - Advancing quickly, unlimited options, cutting edge or bleeding edge?
- Equipment
  - Large capital investment with long-term life requirement
- People
  - Internal and external stakeholders, all have different priorities
  - New mindset, paradigm shift in skillset, retraining the workforce to work smarter not harder

Infrastructure Considerations

Development Philosophy

- The infrastructure required to support highly complex technology implementations may be fixed for its economic life but can be phased to accommodate continual growth and expansion
- Early preparation of a well-integrated, long-term masterplan and development plan is a **must**
- Due to the high cost of capital investment in infrastructure, it must be designed to sustain long term useful life
- Thorough analysis to predict performance and operating costs for the life of the infrastructure benefits all stakeholders

Development Philosophy

- Looking back…
  - Historically, terminal operators implemented technology on top of existing infrastructure
  - Lease terms were shorter and there was little appetite for additional infrastructure investment
  - The relationship between terminal operator and port authority was very much a tenant/landlord dynamic
- Looking forward…
  - Port authorities and terminal operators recognize the need to implement advanced technology, which can require significant infrastructure investment
  - Lease terms are lengthening
  - The relationship between terminal operators and port authorities is becoming more similar to a partnership dynamic, where both parties are equally invested

Development Philosophy Example

- Long Beach Container Terminal, MHRP
  - Masterplan designed as a 3.3 Million TEU fully automated container terminal
  - Built in three phases to accommodate growth and expansion
  - Infrastructure designed and constructed to support the business case
- Primary stakeholders
  - Invest significant economic resources in infrastructure design and construction
  - In order to recoup this investment, long useful life was required
  - Stakeholders (OOCL, POLB) signed a historic 40 year lease agreement to guarantee long-term returns on substantial infrastructure investments

Infrastrucutre Considerations

- Start with basis of design
- Pavement areas
  - Vehicle and wheel load repetition and life cycle cost
- Well-consolidated landfill
  - Critical to minimize total and differential settlements due to dynamic loads created by crane operation, stacked container storage, impact loads from container stacks, seismic events
- Wharf and berth design
  - Quay design loads will depend on crane design, cranes are getting bigger and bigger
  - Berthing and mooring loads, future vessel size 20,000+ TEU

Infrastrucutre Considerations

- Container storage area
  - Stacking Area – designed for stacked container loads and able to remain level within tolerance
  - RMG rails and beam – settlement and deflections
  - Hazardous – segregation and spill control
  - Grading and drainage – near-zero grading in the stack
- Power systems
  - Redundancy, reliability, 100% fault tolerance
- Future changes
  - Increased vessel size, larger cranes, more automation

Technology Considerations

Technology

- Technology provides the opportunity to enhance or eliminate the human interaction in processes
- Using technology to harness data as a decision-making tool
- How to leverage technology, big picture thinking
  - More Tech = More Data = Better Decision-making
  - Sharing data across the supply chain, two-way exchange
  - Scalability

Technology

- Define your appetite for technology early on
- Determine your risk tolerance
- Decide if you are early adopters or want proven technology
- Turnkey solution or project delivery organization
- Bandwidth to support implementation and continuous improvement

Equipment Considerations

Equipment

- Regulatory requirements
  - Electrification
  - Reduced emissions
- Useful life and ability to adapt
  - More technology on equipment than ever before, no longer just container movers
  - Design for change
- Huge computers, not just ‘container movers’
  - More technical staff required to maintain equipment
  - Different skillsets for technical maintenance staff
  - Shift in labor resources

People Considerations

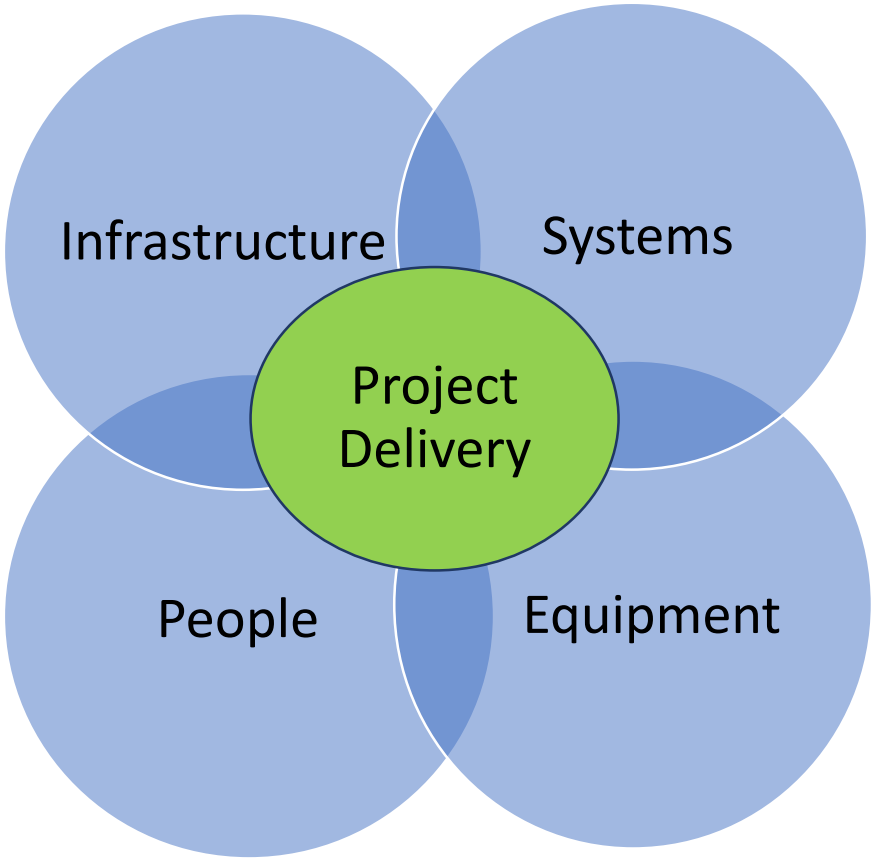
People

- Getting people to adopt, accept, and embrace technology
  - Resistance to technology and automation
  - Complete change of thinking and skillset
- Internal and external stakeholders
  - Operators
  - Customers
- Retraining of a workforce
  - Paradigm shift
  - Technical aptitude

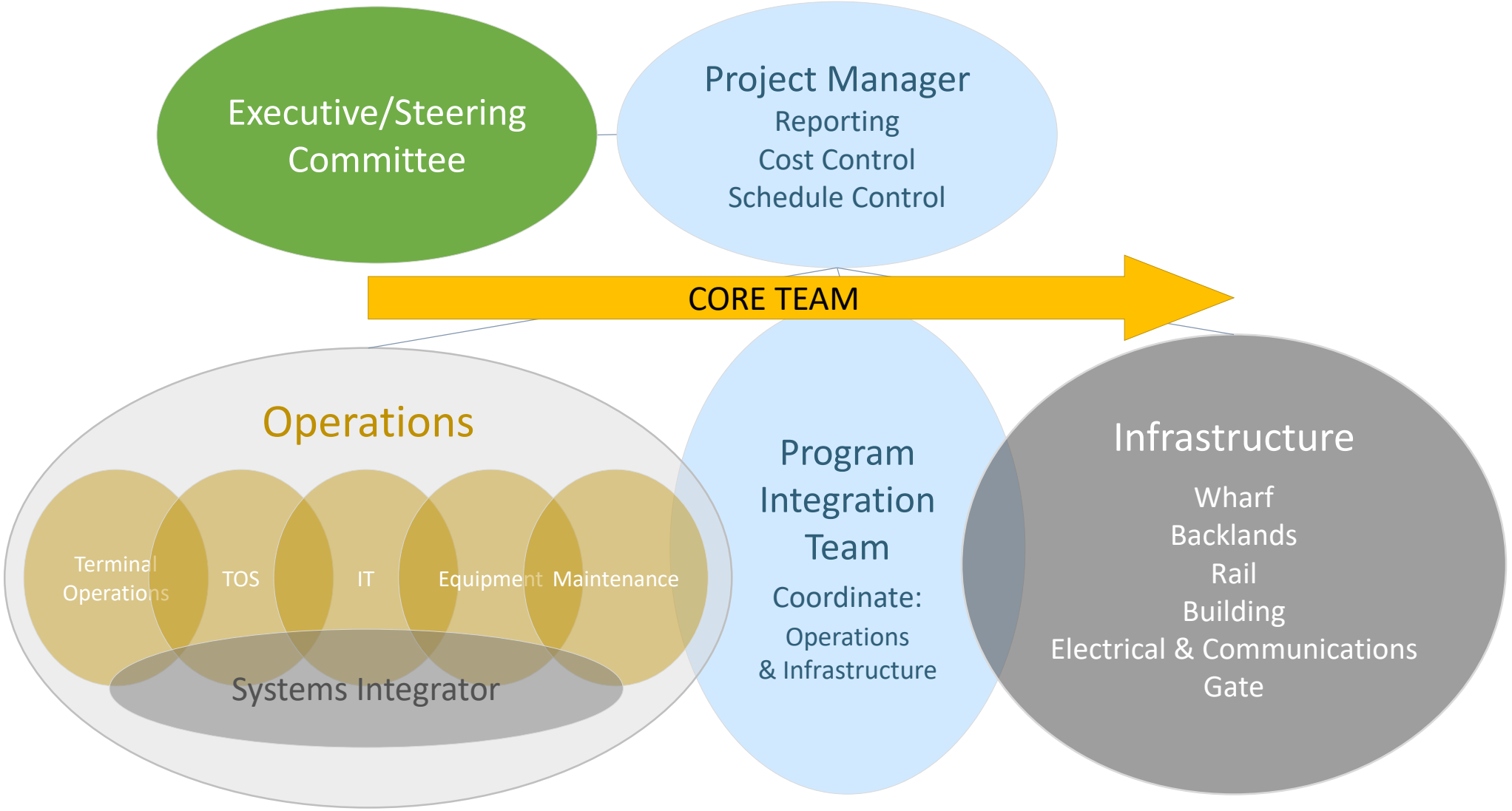
Integrated Project Delivery Methodology

Integrated Project Delivery

- A successful technology implementation depends on a fully integrated project delivery method
- Each component is interconnected and dependent on one another
- Project delivery must focus on big picture idea where all aspects work in harmony, no silos



Project Organization and Team



Project Realization Challenges

- Schedule and cost control
- Interface management
- Vendors/contractor management
- Integration management
- Implementaion management

Schedule and Cost Control

- Schedule control
  - Continuous redefinition of must have and nice to have
  - Change impact analysis and adjust realization schedule
- Cost control
  - Budget cost shall reflect the level of unreliability of some of the past costs
  - Take a holistic realization budget view – understand the full cost of ownership
  - Change impact analysis and adjust realization budget

Interface Management

- Interface of project components
  - Infrastructure
  - Technology
  - Equipment
  - People
- What are the touch points and where are the interdependencies?
- Defining the critical path and major milestones

Vendor and Contractor Management

- Multiple vendors must work together to deliver an integrated solution
- Vendors should have concise scope and interface requirements
- How will vendor interaction be managed?
- Diligent management of master schedule and interdependencies is a **must**
- How does vendor/contractor engagement change once the project is delivered?

Integration Management

- Integration Management
  - Integration of systems
  - Integration of systems + equipment
  - Integration of people + systems + equipment
- Typically most technically complex piece of project delivery
- Who will act as the integration manager, understanding the risk?

Implementation Management

- Successful implementation requires a huge amount of planning preparation, and practice
- Testing
  - Systems, equipment, and processes
- Training
  - Operations, M&R, IT, finance, customers, partners, etc.
- Go Live
  - Critical to communicate realistic expectations early on
  - Create a recovery plan

Overcoming the challenges

- Engage stakeholders and project delivery team early on
- Know your business case inside and out
- Define, document, and communicate clear requirments
- Set realistic expectations early on and create a roadmap for continual improvement and optimization
- Plan, prepare, practice ... and repeat!

Thank You

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