Terminal operating system selection

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The terminal operating system (TOS) is the primary instrument of record-keeping, planning, control, and monitoring for the modern marine terminal. The TOS serves, and is served by, labour, planners, supervisors, managers, liners, truckers, railroads, visitors, regulators, and analysts. The selection of a TOS will have profound impacts on both the tactical performance and strategic viability of the terminal, its customers, and its operator.

Foundations

Any TOS rests on three foundations: infrastructure, database, and development platform. The essential qualities of any foundations are durability and stability, as replacing them is not feasible. We must recognise that the TOS is mission-critical, and that its missions will evolve over time. As such, all three foundations must be judged on: stability, high availability, performance, scalability, security, redundancy, effective vendor support, ease of service, precision, accuracy, extensibility, ease of integration, ease of customisation, and the ready availability of professionals who can maintain and improve them. The foundations must be highly resistant to failure. Failures must be open to rapid repair. The foundations must be designed to accommodate change, growth and evolution without pain or disruption. The foundations must both reflect and foster mature and sophisticated quality control.

Business complexity

The marine terminal is the meeting place of an incredible array of competing and cooperating entities, almost none of them in the direct control of the entity that owns the TOS. The TOS must serve many different user needs, and the way in which it serves each need must be sensitive to the tensions between cooperation, competition, transparency, and privacy. Each interface must be customised to reflect the strengths and weaknesses of each user. Labourers need simplicity. Planners need comprehensive visibility. Liners need freight control. Truckers and railroads need transport flexibility. Regulators need the ability to intervene. Analysts need unfettered access to history. The terminal operator needs to intelligently balance conflicts of interest. Everyone needs to make a living.

Economics

Terminal economics are dominated by routine box revenue, revenue for special services, the cost of operating labour, and infrastructure capital amortisation. The cost of information technology, while highly visible, is not materially significant. The selection process for the TOS must return, again and again, and again, to fundamental economics: attract more volume by providing excellent service, charge for what is handled, and keep labour costs in check. When it comes to the TOS, it is the thrifty operator who spends the most.

Operator interfaces

The operating labour is there to run the equipment, to move the freight, and to go home safely at the end of the shift. Productivity and efficiency are not of primary interest. Staying alive and making a living are. To foster productivity while serving these operator interests, the TOS's operator interfaces must reflect the highest level of thought and design. Each interface screen must only present output and input directly associated with small, basic operator tasks. The operator should not have to take precious time and thought away from safety and machine control in order to read a wordy TOS interface screen. Each terminal must deal with its own operator culture, and so the TOS must provide the architecture and tools that foster custom creation of effective safe, efficient interfaces.

Customer interfaces

The marine terminal's liner customers are all sophisticated international businesses, evolved over decades as survivors in a highly selective environment. Each customer has its own business systems that meet its particular business needs, in the context of their internal culture, their regulatory framework, and their own customers' desires. Each customer may wish to interface with the TOS in a different way. The TOS must be open to these variations. The TOS must have sufficient flexibility to support creation and long-term management of interface elements for each customer. The TOS must be able to absorb new customers, and new customer needs. It must provide absolute privacy for each customer, so that the security of the freight and the competitive position of each customer are not compromised.

Regulator interfaces

Each marine terminal sits in its own local web of regulatory influences, while simultaneously supporting a growing international framework of safety and security controls. Local and national regulatory frameworks are widely variable, and are subject to change in response to the whims of sovereign powers. The roles of the regulator are to permit, detain, stop or otherwise meter the movement of containers. The TOS must present interfaces that allow regulators to grant permission for movement as quickly as possible, while allowing regulators the ability to detain or stop movements, while preventing regulators from overstepping their bounds. As this balance varies widely between jurisdictions, the TOS must be open to controlled regulatory programmability at the site level.

Machine interfaces

TOS's are expected to interface with a variety of machines and instruments. Optical character recognition, radio-frequency identification, biometrics, geospatial positioning, digital imagery, proximity detectors, threat detectors, and safety instruments are just some of the technologies the TOS must serve. The TOS

Photo courtesy of Ports America

Ports America Chesapeake's Seagirt Marine Terminal, Baltimore, Maryland, USA

must be designed for openness to both known and unknown instrument interfaces. This openness must be reflected at the foundational level and in the institutional support for the TOS. The TOS must have sockets where new technologies can be accommodated based on standard protocols, and must have an architecture that allows the ready deployment of development and support staff to serve new needs.

Tactical planning

Interfaces are vital, but the fundamental job of the TOS is to improve terminal performance. The TOS must provide tools for the terminal's tactical planning staff that allow them to rapidly prepare detailed work sequences, to efficiently allocate machine and space resources, to provide clear instructions to operators, and to adapt to sudden changes in external logistic forces. The most difficult challenge for any planner is the balance between space utilisation, which drives capacity and revenue capability, and productivity, which drives labour cost and customer service. The TOS must incorporate tools for the planner to balance space and performance. This is still an evolving field in TOS development, so the flexibility to sustain steady improvement in this area is essential.

Performance reporting

The only way to operate better is to understand performance. Again - return to fundamental economics. The TOS must provide a broad, accurate suite of key performance indicators (KPIs), and must support the collection of KPIs into customised reports that support the needs of each individual stakeholder for the facility. These KPIs must be rigorously defined and structured, so that each user can understand how each KPI influences their own success.

Strategic analysis and planning

Nothing is more certain than change on a marine terminal. No terminal logistic pattern stays stable for more than a few months at a time. The terminal manager must constantly adapt strategic space and equipment resources in response to new volumes or shifting logistics. The TOS's role in this is to provide a deep, accessible well of historical transaction data that can be readily accessed by the analyst to understand the true demands on the facility, and the utilisation of the terminal's least-flexible strategic resources.

The Future

"The future ain't what it used to be", said the Sage of the Yankees. Be prepared.

ABOUT THE AUTHOR

Thomas Ward is the chief engineer for Ports America, the largest private marine terminal operator in the US. Prior to joining Ports America in 2006, Mr Ward's consulting engineering practice focused on operational analysis, marine terminal planning, and port engineering worldwide. At Ports America, he oversees facility planning, engineering design, facility construction, operations analysis, new technology development, and crane procurement.

ABOUT THE ORGANISATION

Ports America handles container, dry bulk, break bulk, military cargo, automobiles, RO/RO, project cargo, and passengers at over 42 ports and 85 locations, serving all port markets in the United States. Ports America is a leader in the development and deployment of new terminal technologies and control systems, including its own Terminal Operating System and related service platforms.

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