The changing face of automation: the role of a System Integrator

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Current market challenges

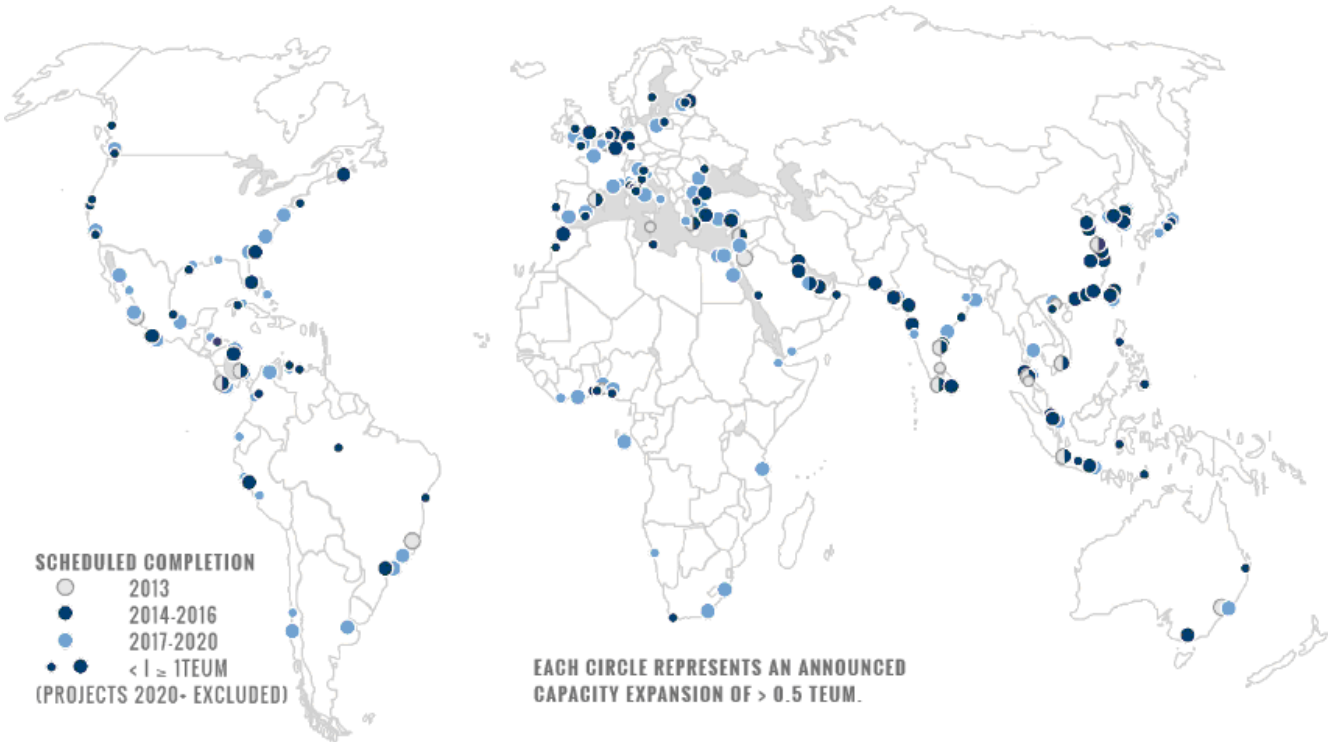
It has been over 12 months since my last look at the port and terminal market when I addressed how market forces were driving change and noted the demand for increased automation across the industry. I had a very good response to that initial paper, with over 1,000 requests coming from the terminal market. I have taken the time to review various comments that touched on the hot-button issues in the industry at present, and now I want to take a much more focused look at some of the specific areas that can be improved within the terminal market with the deployment of advanced applications.

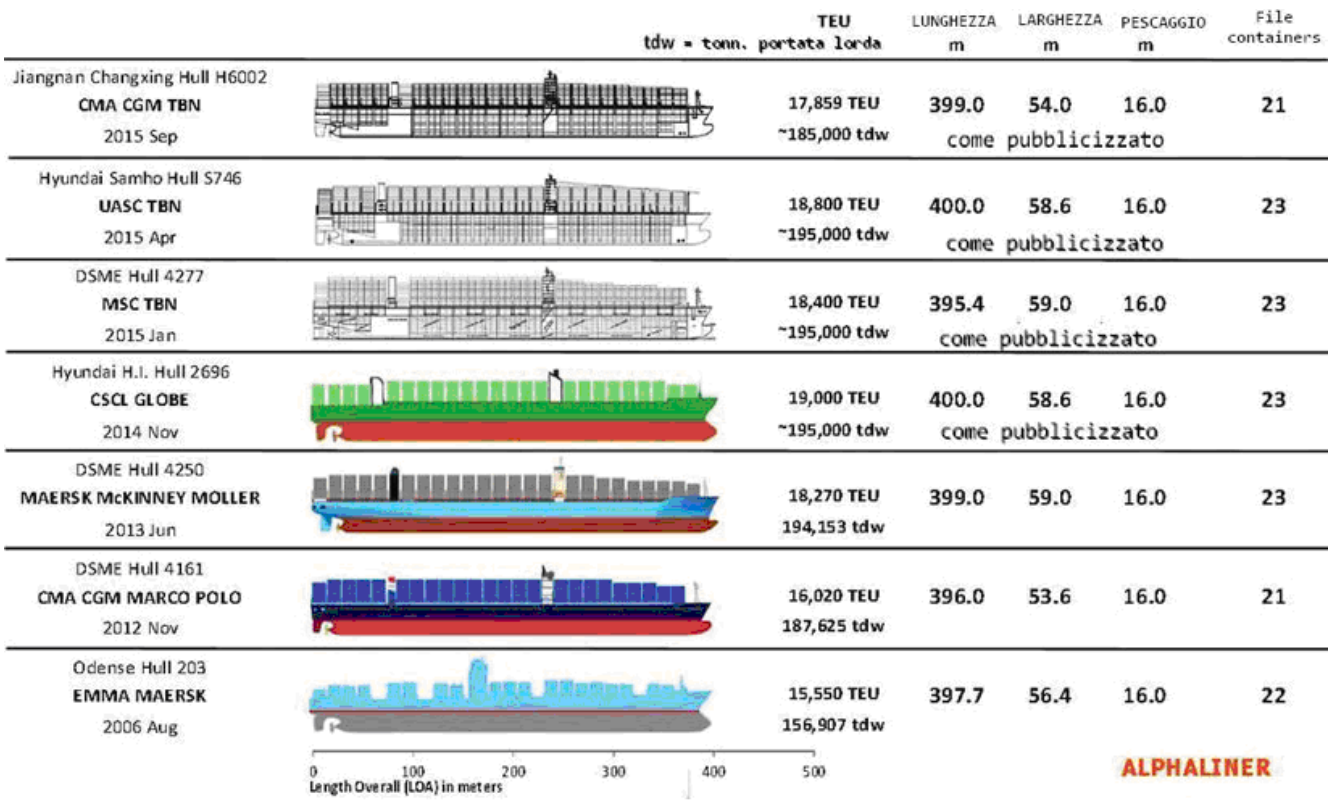
It must be clearly mentioned at the outset that although technology is a key driving factor for improving efficiencies and driving operational costs lower, the need for more effective management intervention and closer control over the overall running of these facilities is essential. Also, technological solutions must be implemented successfully and proper training and support are all essential to achieve the maximum returns for any port or terminal business.

The challenges continue

The overall capital investment into new greenfield ports and the further expansion of existing sites, as well as the conversion of brownfield sites, is continuing with billions of dollars being committed to enhance growing market demand. The carrier-customer base is driving the increase in vessel size and we shall soon witness vessels of 24,000 TEU.

The impact of ever-larger vessels on inland infrastructure and port and terminal operations continues to mount as the sheer volume of traffic continues





to flow within ports' cargo catchment areas. Improved road, rail and supply chain patterns need to be considered as part of the overall logistics strategy and the answer to a growing problem.

Terminals are now under greater financial pressure to reduce their operational and overall running costs, whilst they must also look at driving higher profitability. As I mentioned in my last paper the need for improved automation levels is pressing and terminals are evaluating all areas of their business where automated solutions can be deployed in order to drive efficiency and spend less.

As ship sizes increase, the terminal market seeks ever more advanced software to manage and drive business. Pressures are therefore being brought to bear on various industry software vendors as solution providers try to keep up with market demand. Although many are raising to the challenge, there is a tremendous pressure to meet customer expectations and deliver, implement and support solutions. This is where this paper addresses the potential role of Global Systems Integrators can play a fundamental role in the future enhancements of the automation market.

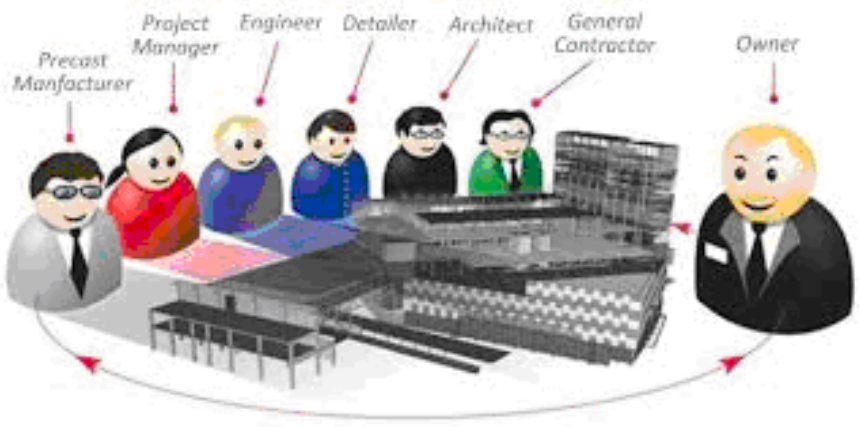
Greenfield market growth

The cost for a new greenfield site is anywhere between US$200 million to $1 billion. The physical location, selection and feasibility of new terminals are the key driving factors, and at all levels of the decision making process many parties are involved from the initial financial funding and feasibility through to the various planning and environmental issues. The physical development and construction of a terminal involves multiple parties, and much emphasis is given to cost and the speed to ensure that capital costs and timeframes for the "go-live" schedules are maintained across every area of the build process.

Enhanced BIM Planning and Data Modelling tools

With any new greenfield site, it is vital that the physical layout and configuration of the facility enable visualisation of the cost of development and to monitor the key stakeholders involved in the design and build phases. Highly advanced Data Modelling solutions are being used for these sole purposes of process and cost control to measure every step of the design and build process which is essential for a successful project.

Enhanced four-dimensional planning tools can integrate all aspects of a build and bring together the various elements involved during a project. BIM (build information modelling software) allows planners to define any necessary or required changes at any time of the build process, and these advanced tools recalculate changes and deliver a new time frame. They also recalculate an overall impact of the project from either a positive or a negative standpoint.



BIM applications change the way that construction projects are undertaken, they allow for highly complex situations to be clearly planned and mapped out before any physical construction is undertaken. Build considerations and costs can be highly complex areas, and these tools help port and terminal operating groups to become even more focused and have a much better handle on how a project will run from pre-planning to go–live phase.

Life cycle cost (LCC/Energy saving)

Applications can offer tremendous flexibility in controlling a total project, and look at areas where construction materials can be analysed in order to reduce build costs, as well the life expectancy and overall maintenance cost for the duration of the facility. As with all large scale highly complex projects, there comes a point when an operator seeks external support, and this is where the role of large global systems integration groups come into play.

The role of a Systems Integrator

Large greenfield sites are being planned to integrate new technology and smart automation will require tremendous planning to ensure that all the necessary components are laid in the right areas. That way it is clear that overall project management and coordination between various parties is properly managed.

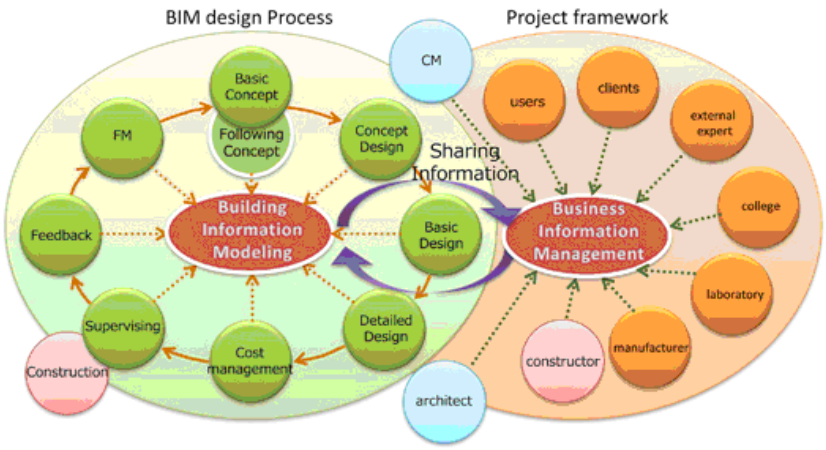
Software applications such as the BIM tools can be deployed and used during the planning phase, but with many large scale projects having a central point of contact becomes a fundamental element for a successful go-live.

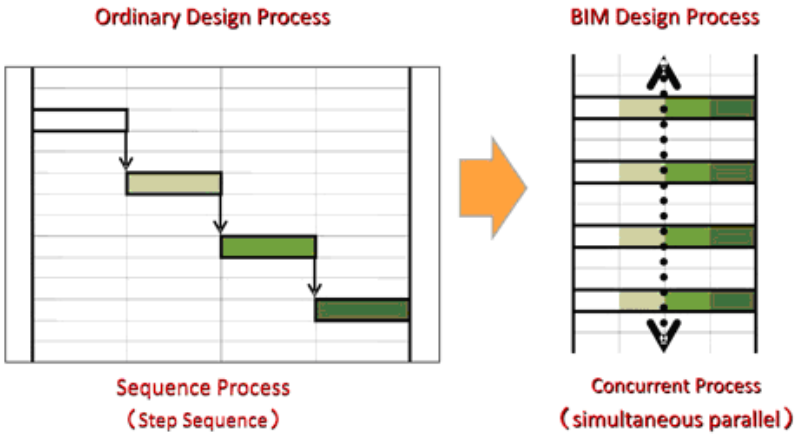
As the overall foundations and constructions of a new facility is finalised, a Systems Integrator will work closely with equipment manufacturers to ensure that systems operate smoothly and allow data to be streamed and to be relayed back into the main control solutions.

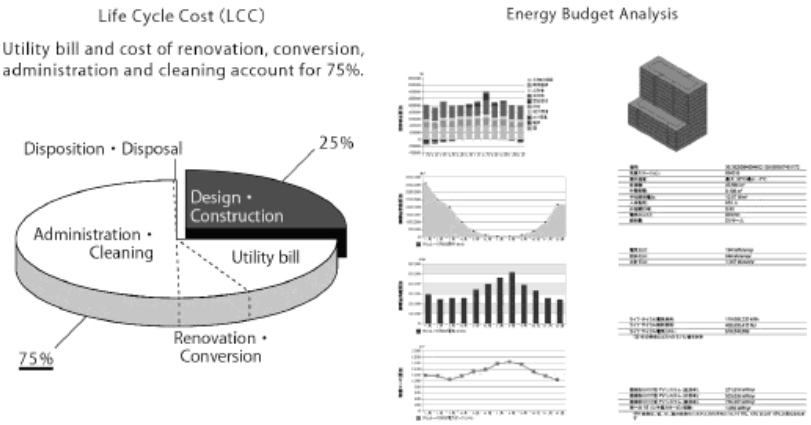
Depending on the level of automation being implemented across a port, the role of project coordination becomes essential – especially when a port or terminal is implementing fully or semi-automated facilities. Therefore, the ability for solutions to fully interact between one another becomes vital to the success of a facility. The diagram above depicts a semi-automated facility which involves a certain element of IT integration and key technology 'touch points' will address the following areas:

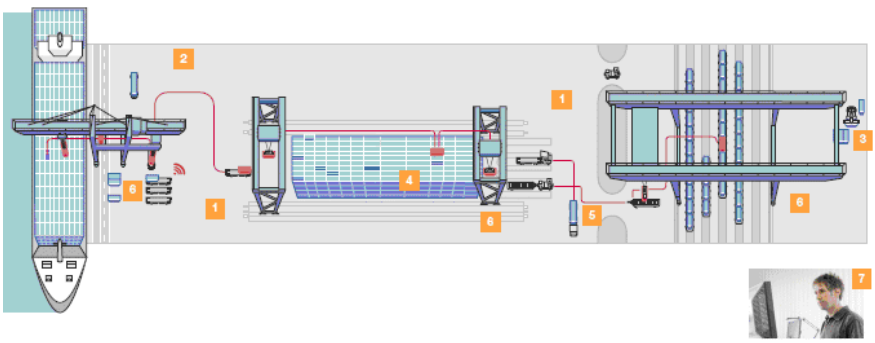
Operations and engineering

- Work flow patterns
- Traffic flows









- Equipment availability (engineering data)
- Mechanical breakdowns
- Productivity (vessel op's / gate moves / quay crane performance / yard movements / stacking levels)
- Work force and resource planning
- Vessel schedules (ETA's/ETD's/ delays and berth conflicts / vessel dwell times)
- Accidents and incidents
- Reefer hubs

Security
- Automated gates
- CCTV and port security systems
- Cargo checking – visual and x-ray systems
- RFID and tagging of containers and cargo

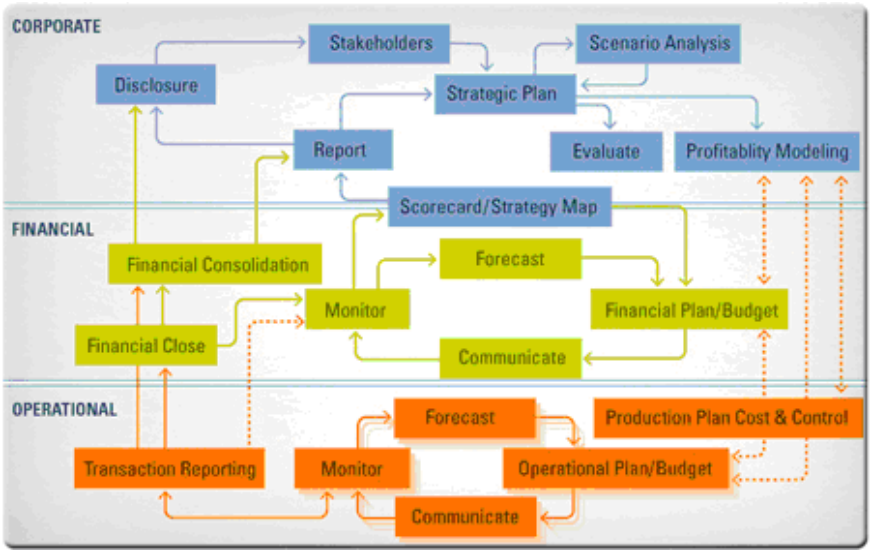
Fully automated terminals

A large proportion of new container terminals are moving towards implementing fully automated facilities. These terminals take a lot of careful planning as to the physical layout and intended traffic flow of containers and AGV's operating within the facility. Greater focus must be expended at design and construction levels, when the relevant fibre optics and power must be positioned in the correct position.

The level of control between the various solutions also becomes paramount as automated AGV's, RTG's, quay cranes, and automated gates must all be synced and allow for an accurate flow of data and information to be shared. The operating software that controls all of the machinery must be synced with the terminal's selected operating solutions and this is where the issues of integration can occur.

Job orders and work flow patterns must be generated within the heart of a terminal's operating solution and must also obtain feeds from such areas as the ERP for engineering and asset management to ensure that the necessary equipment is available and functioning correctly to ensure continual flow of containers to and from the stack to the quay cranes. Complex vessel stowage plans must be ready so that automated quay cranes are given the correct loading, discharging and re-stowing orders that will ensure a vessels ETD is met.

Fully automated terminals take a lot of pre-planning and nurturing – they must run like a 'Swiss clock' – and the levels of integration is one of the hardest factors to manage. Currently, the roles of integrating applications has fallen to a combination of equipment manufacturers, which can also vary as terminals have the choice of selecting different machinery and have a choice of various software vendors.



Players such as Navis and Kalmar have a good understanding on these applications, however, as mentioned the eRTG's and AGV's might come from Kalmar but the quay cranes might be sourced from ZPMC or another main line manufacturer. Different control systems and operating software can create logistical nightmares for terminal operators as interfaces and integration must be defined in order for these solutions to run and provide the necessary data to ensure full automation is running.

The System Integrator can play an integral role in acting as the interface, getting engaged with data requirements and defining interfaces required from both the back end TOS applications and the software from the equipment providers.

Terminal operating solutions

As greenfield sites move into the operational phase, there will be a requirement for the necessary data centres and communication networks to be established. Again, the Systems Integrator can provide these services with either the development of the required centre or provide the necessary hosting capabilities for any applications that are sourced for deployment. As well as the data centre, a number of technology solutions will be selected and these will form the core operating applications for a terminal's business. In my last paper I touched on these applications, covering:

- ERP applications (finance, human resource planning, procurement, commercial and asset management)
- TOS systems (operations, commercial, yard planning, vessel planning, gate management, equipment management, optimisation and management information modules)
- OCR and gate solutions (automated optical character recognition systems)
- Engineering and asset management applications

I also touched on next generation applications such as:-
- Asset management

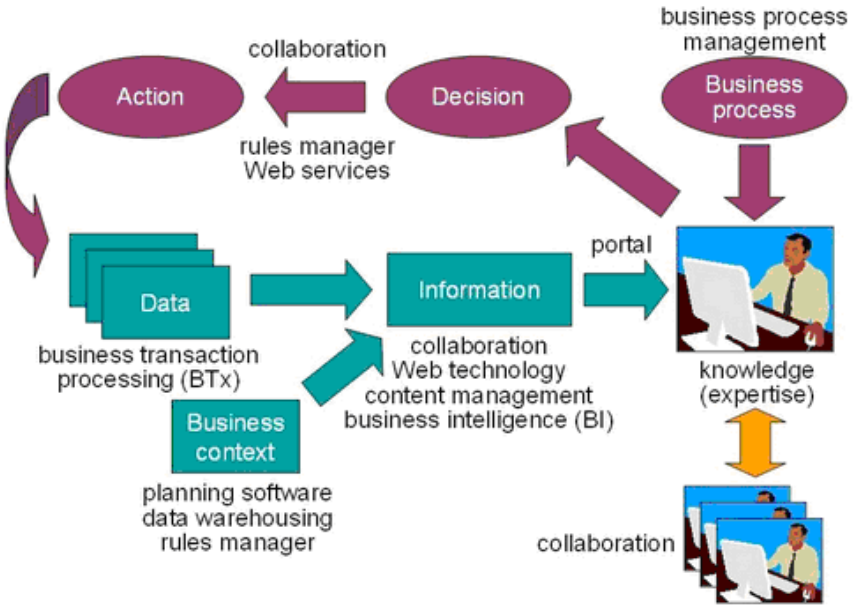
- Business Intelligence systems
- Mobility and data access solutions.
- Revenue management and forecasting solutions

These more advanced applications will play a key role for terminals seeking greater management control over their business.

Value added service

With all terminals, whether they are existing facilities, greenfield or brownfield sites, a level of technology will need to be deployed and it's here where the System Integrator can play a key role. Many solution providers deliver products that are not always tailored to the needs of a terminal, although they might provide the fundamental functions, the need to obtain optimal functionality cannot always be delivered within the original terms agreed between the vendor and terminal management. Experts that can come in and tweak these solutions and fine tune them in order to deliver great functionality and data information can ensure greater productivity and a more proactive business model.

Having the ability to use a versatile Systems Integrator that has deep domain knowledge of all aspects of the port and terminal business as well as having exposure in deploying the relevant IT solutions can be a significant added value for the operators. In the current market, many groups have deployed centralised ERP applications, however, these applications have a tendency to be very generic and vanilla in content, and it's rare that the top ERP providers offer



ISSUES FACED BY THE TERMINAL / PORT	THE INTEGRATOR	VALUE ADDED SERVICE
Large projects (greenfield sites)	High levels of project management experience co-ordination with all companies	Single point of contact for complex IT projects
Mix of technology and automation being Implemented	Project management and integration services	Deep domain expertise
Solutions not specific for the operator	Tailoring, consulting and development services	Offshore resources lower cost
Poor or slow vendor implementation services	Large well-trained support and implementation team	Skilled, industry specific experts
Lack of software tailoring	Bespoke development service	Lower IT development costs
High internal IT costs	Outsourcing across all areas can help reduce internal costs	Allows a terminal to focus on their core business and driving costs down
Lack of pre-consulting services	Skilled industry-specific consulting advisory service	Skilled industry experts
Data centre and support issues	Outsourced service or hosting option	Reduced operational costs and higher support levels

The benefits

experienced domain experts that can provide tailoring and enhancement to core applications.

Systems Integrators can bring that level of operation and business acumen to the table, combined with a vast knowledge of the leading ERP applications and considerable industry knowledge, the Integrator can work with a terminal or port's key management in defining the additional functionality. Interfaces and modules can then be built into the core application.

Areas that can be defined and enhanced can cover the following:

- Business Intelligence applications: many of the core applications deployed across a terminal provide a certain level of management information which offers operators key data, yet a lot of these solutions run independently. Considerable time is taken for the extraction of this data and results in excel spreadsheets that can create operational issues. Decision making and having up-to-date information on all aspects of the business is essential for an effective and streamlined terminal
- The Systems Integrator will help to define the necessary KPI's within all of the various operating solutions. These can be extracted through defined data interfaces. The data can then reside on a centralised dashboard. The dashboard can be predefined by individual users and, according to their level of access, it will reflect the level of data they can view and respond on

Integrated Business Intelligence suites allow for the following benefits:-

- Asset management: with any highly automated terminal facility, the need to have readily available equipment is vital to the success of operations. Capital equipment costs can run into US$100 million quite easily for a fully automated terminal, and the ability to manage these expensive assets becomes key from an engineering standpoint. Asset management applications are essential for tracking the life cycle and running costs of all assets deployed. Standard ERP applications cover some of the core essential elements for the lifecycle of the equipment, however, when it gets into more focused areas such as the engineering and tracking of equipment downtime, and looking at planned maintenance, these solutions can lack in these areas. Data not being received or processed in a timely fashion can hamper the operational work flow. Yard operations run on pre-determined work orders (these can change and flexibility within the operations TOS is required) but terminals look at their cargo flows and have a relatively good insight as to the number of containers being handled on a vessel basis. Complex re-stowing and work orders are pre-determined and these are based on a number of factors, with one of these being that the necessary handling equipment will be available and fully operational. If data from engineering departments is not uploaded, or delays on equipment availability occur, this will severely alter premade plans and can exert tremendous pressure on the smooth running of a terminal. By engaging a Systems Integrator, the process of defining these missing elements and building applications that can capture and record, and more importantly transfer back into a terminal's TOS and ERP applications, the essential data will help with the pre-planning and all important workflow during a vessels scheduled call
- Data mobility is becoming fundamental with terminal operators: with so much automation being deployed across their business, the ability to receive and act on data is essential. Management at all levels need the ability to monitor the overall performance and operational efficiencies, with new integrated Business Intelligence solutions being designed and deployed, having this data sent to the appropriate responsible party to act and respond is essential. The ability for key personnel to receive the data via a range of medians such as tablets, handheld units and smart-phones, in a format they can relate to and act on, is essential. Systems Integrators can help to bring, define and deliver these data mobility solutions, and these will help to reduce delays or lost productivity across the whole operation. The complex interfaces and data presentations will all be part of the overall offering provided

by a System Integrator

- Terminal operating solutions are being selected by terminal groups and many are heading towards the market leaders such as Navis. The TOS solution providers all have defined core functionality within their various modules. However, terminals that appear to have similar operational processes all differ and this can involve considerable system enhancements and customisation to these core modules. A common problem for the majority of these IT vendors is the size of their organisations. Dealing with a complex project that involves considerable resources can be a drain for a software company and they can switch and delay projects for their clients. This can lead to major issues for a terminal, especially as they are totally reliant for these solutions. A System Integrator can provide that all important bridge between the terminal and the software vendor. The Integrator can provide valuable resources in the pre-consulting and product definition phase, working in supporting the delivery process. The Integrator can also play a key role in the implementation of the TOS solution, providing trained experts that have domain experience and a detailed understanding of the TOS application. Other solutions such as the security systems, OCR gate systems, engineering applications and ERP suites can be similar delivered and supported by the System Integrator
- With the drive for greater performance and improved productivity, the terminals are turning their focus towards revenue retention and greater profitability. Management are seeking to identify the true value of each customer and container that they handle on behalf of these accounts. They need more detailed information from their various operational and financial applications, and as new Business Intelligence applications are considered, the drive to capture revenue and costs is becoming paramount. The ability to drill into the fixed and variable costs involved, measured against TEUs and the ability to focus on value added services that can drive greater revenue above and beyond the standard THC charges. The Systems Integrator can help to identify these key areas and introduce the necessary applications into a terminal. The Systems Integrator will be able to drill into the existing operational and financial applications and extract all the relevant data that resides in these core solutions. Revenue and yield management can help management evaluate their capacity and the value of every yard slot. This will allow them to better address areas such as peaks and troughs in their business, as well as when to introduce seasonal price tweaks, especially when space and capacity are limited
- System Integrators can provide a valuable outsourcing capability for terminal operators. Having access to a third party resource all year round which can provide remote help desk support, integration and implementation services, and provide a terminal with bespoke tailoring and software enhancements above and beyond those services provided by the Software Vendors, are all essential elements for terminals to consider implementing. A terminal operator's core business is to run and manage their facilities, then select the most efficient automation solutions and technology that will allow for a seamless cargo flow. Having the ability to outsource the technology and automation aspects to a reliable and value added Systems Integrator will allow them to address their cargo handling process more efficiently and will help to lower the overall IT running costs across the terminal

Summary

The content of this whitepaper has been drafted in order to highlight the key benefits that a port or terminal operator can achieve through the engagement of an industry specific System Integrator. With evermore complex automation being introduced and the demand for better data flows between all the applications, the Integrator can really come into the frame. The Integrator looks at the problem and addresses these with a defined and a clear plan to achieve a successful 'Go-Live'.

The global terminal and port markets will continue to develop and new facilities are being planned. The role of the System Integrator will become a key component in making these large scale projects run at higher level of efficiency and give a significant level of confidence to the world's largest port and terminal operating groups.

I welcome your feedback and comments and I hope that this paper will generate interest. The group that I work for is considered as one of the largest most sophisticated Systems Integration companies and our port and terminal division are geared to deliver on all of the areas that I have raised in this paper.

About the author

Richard Butcher has been involved in the maritime shipping and port sector for the past 30 years, having consulted for a number of leading Ocean Carriers as well working very closely with some of the industry's leading technology companies. Richard currently holds the role of Global Head and Director for Wipro Technologies: Port & Terminal Division – one of the world's largest System Integration Companies. Richard has worked on projects all over the world and has spoken at a number of industry events and seminars on terminal automation and technology.

About the organisation

Wipro Technologies is headquartered in Bangalore, India with offices across the world, they employ around 157,000 full-time staff and have a revenue in excess of $9.0 billion. They support and hold global partnerships with all of the world's largest software companies, including IBM, Microsoft, Oracle, SAP and HP. Wipro can deliver on a wide range of value added areas such as Business Intelligence, Mobility Solutions, and asset management applications.

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