

Scianta Port Operations And Planning

A Design Perspective



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Scianta Port Operations and Planning

Marine terminal and port operations constitute a complex and rapidly growing problem space. Port managers are faced with the necessity of balancing growth with concerns for heightened security and in-depth control (especially the new guidelines imposed by Homeland Security's Operation Safe Commerce.) Ports often manage increasingly high container volumes involving inland, blue-water, rail, and truck traffic. This tension between growth and security and available land use creates a need to understand the dynamics of port traffic now and in the future. Scianta Intelligence's experience in marine terminal operations and containerization management, coupled with its powerful simulation, queuing, and intelligent modeling software gives port management the ability to forecast and analyze the impact of growth, optimize land use, and implement advanced security measures.

Port Operations Overview

A port planning and simulation system supports the commercial pressures on ports to optimize port capacity, terminal security, a cargo management at the minimum possible cost. Generally there are two broad categories of services or functions that a planning system provides: management or policy-driven processes and analytical or model-driven processes. They differ in the nature of their underlying structure. Figure 1 illustrates this deconstruction with a few (and only a few) examples.

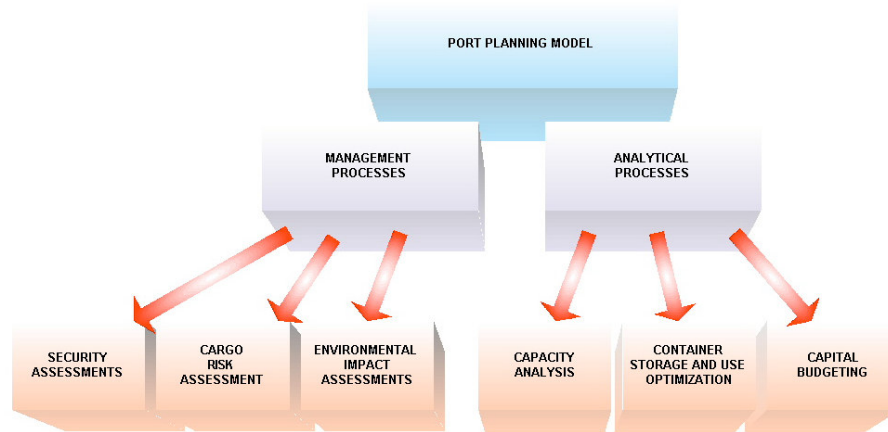


Figure 1. Port Planning Processes

Management processes are most often predicated on surveys which, in turn, are derived from guidelines, business and government policies, regulation, and so forth. These management processes constitute a collection of analog models representing the idealized implementation of a process according to an idealized set of policies. It is the purpose of an assessment, in many cases, to discover the variance between this idealization (in practice or as a goal) and reality.

Models and Methods

Analytical processes differ from management process by attempting to discover and quantify as well as qualify the underlying “laws” which drive the process. These are mathematical, statistical, as well as heuristic representations of these laws or relationships which provide a way of simulating the behavior of a system. Analytical models, like management models, are seldom precise, but approximate the laws of the system. The degree to which this approximation differs from the real world (in terms of the observed behavior or output of the model versus the observed behavior or outcome of the real system) determines the validity of the model. Analytical models often form complex collections of interdependent models which receive input form one or more “down stream” models and provide input to one or more “up stream” models.

An analytical model also supports another set of critical features: simulation and forecasting. Simulation allows us to construct a “virtual world” representing a set of model relationships and, once established, we can test the effects of changes in any of the model characteristics and properties. Such simulations are often critical in queuing models, as an example. We also need analytical models to support another form of simulation: genetic and evolutionary programming – techniques whereby new and optimal answers to configuration, loading, land use, and similar problems are solved by generating and evaluating hundreds (perhaps thousands) or possible solutions.

Forecasting, a related technique, is used to predict the behavior of a system at some future time based on a set of current initial conditions (this is somewhat different than least squares or polynomial regression, which discovers the trend line of a data set and predicts future points based on the underlying linear or non-linear equation. Regression is a technique that can be applied to both management and analytical models. As an example, if we know the staffing for a logistics warehouse service over time – even though the staffing is generated by a set of underlying port or government regulatory guidelines – we can estimate the staff size in the future by running a regression line through the past staff size points.)

Need for Analytical Models

Port planning models involve a fusion of both management and analytical models. How they are fused determines the robustness and power of the model. Yet port models are becoming a critical component of marine terminal operation since they address many if not most of the demanding challenges faced by the owners and operators of today's ports - such as:

- Limited availability of land for expansion
- Constantly changing cargo handling technology
- Constantly changing regulatory frameworks
- Privatization of government regulated port activities
- Rapidly changing markets and commodities
- Increased and complex physical security demands
- Increased and complex cargo security demands
- A steady downward pressure on costs
- Demands for higher returns
- Environmental impacts and pollution control

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An intelligent and agile port planning system provides comprehensive planning services for port development that address these needs. This is achieved by integrating a design and analysis methodology with advanced machine intelligence technologies and sound, experienced project management.

Scianta Model Services

Port Planning Services and Features

- Traffic forecasts
- Assessment of future technological changes in shipping and cargo handling
- Competitor surveys
- Condition surveys and asset valuation
- Evaluation of port capacity
- Formulation and Evaluation of alternative development strategies
- Preparation of outline designs and cost estimates
- Financial analysis
- Economic analysis
- Risk analysis
- Environmental impact assessment
- Security and safe harbor analysis
- Preparation of development, business and operational plans

Building a complete system to provide all of these features is often a difficult and time consuming task. Figure 2 provides a high level schematic of a possible architecture for such a port planning and simulation system (with many of the finer details omitted for clarity).

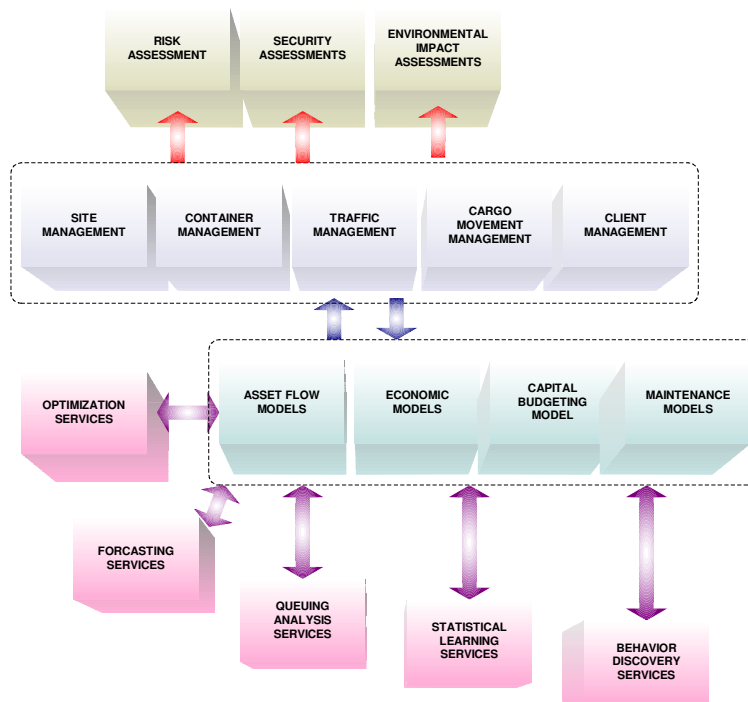


Figure 2. A Possible Port Planning System

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The Scianta modeling framework, with its plug-and-play components, significantly reduces both the development time and the cost of delivery and maintenance for port operations and planning models. The framework combines software, methodology, vision, business policies, as well as crucial regulatory constraints and guidelines. Instead of an off-the-shelf, one size fits all approach, Scianta consulting services and its advanced state of the art software delivers a model that directly addresses your needs and solves your specific problems – with an eye toward maintainability and extensibility.



As part of its logistics and terminal management services, Scianta Intelligence works in partnership with Transportation Security Solutions (www.tssinc.org), a leader in the application of advanced technologies to port infrastructure, commerce, and operational security

For more information or to schedule a presentation call (919) 678-0477 or visit www.scianta.com.

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