Yard Management Systems

A guide to better understanding the market, the software and the benefits

WHITE PAPER

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In brief

This whitepaper's objective is to help industry professionals understand the basics of yard management and appointment scheduling systems. Yard Management Systems are software applications that manage trucking activity incoming to and within an industrial site such as a distribution center, production campus, or container terminal. Yard management software is designed to manage the dock scheduling of all incoming loads; optimize and manage labor resources responsible for moving trucking assets on the site; and track all private fleet and third party trucking assets being held on the site or campus. If you think that yard management systems are only of interest to companies with vast complex yards, then you may be surprised to learn that small and medium size businesses are now investing in this technology. Firms that require logistics excellence as a core competency are beginning to understand that a yard management application is an integral component of a supply chain execution suite that also includes warehouse and transportation management systems (WMS & TMS). This document helps to understand who is investing in yard management software and why; the operations that this software manages; the economic benefits that are realized; and the considerations that companies need to think through when buying this technology.

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Introduction

The market for yard management systems (hereafter YMS) is a niche subset of the much larger supply chain execution software market which includes warehouse management systems, transportation management systems, labor management systems, slotting systems, dock scheduling systems, etc. Historically, the companies that have invested in advanced YMS applications have primarily operated vast, complex yard operations that require advanced technology to manage hundreds of trailer units. For these companies, yard management software has contributed to significant operating expense savings by replacing inefficient manual processes. Over the past decade, the market for YMS applications has expanded to include a greater diversity of firms that are investing in this technology to gain a competitive advantage. For example, some small and medium sized businesses (SMBs) that require logistics excellence to achieve growth are now investing into advanced YMS software. These SMBs are seeking to improve the control, scheduling, and tracking of inbound trucking operations, incoming inventory, and overall fleet assets. This white paper investigates this topic in further detail, as well as discussing a number of important topics that relate to YMS software including:

1. Who is investing into YMS and appointment scheduling applications and why?
2. What is a YMS application? What are the logistics functions that it manages?
3. What are the differences between a "best-of-breed" YMS application and a WMS "Yard Module"?
4. Are there any special considerations that a buyer should think about when buying a YMS solution?
5. What are the economic benefits that a YMS solution provides?

YMS Market Overview

In general, the demand for yard management software is derived from companies with several distinct types of logistics operations:

1. Retail distributors with large regional distribution centers that have expansive yard operations requiring the management of hundreds of private fleet and third party tractor and trailer units. For example, the grocery industry generates the highest overall amount of over the road trucking activity because food is the highest volume commodity that people consume. Most major grocery retailers/distributors rely on the use of YMS applications to manage trucking assets in the yard.
2. Large postal and parcel distribution operations where there is a significant traffic volume of incoming and outgoing trailer units that require precise scheduling, tracking and control to optimize fleet utilization rates and internal facility operations.
3. Large import container receiving and handling operations such as can be found in container staging yards. The need to store, track and retrieve import containers with accuracy and timeliness is a critical component of providing required service levels to customers.
4. Manufacturing and distribution companies that operate in a "campus-style" environment, whereby trucking assets move between buildings throughout the day to transfer raw materials, packaging supplies, and/or finished goods. These operations benefit from YMS by ensuring the timely movement of inventory between facilities within the campus. This in turn minimizes labor costs and production delays throughout the overall operation.
5. Companies that need to prioritize and expedite incoming loads as a strategic element of optimizing inventory fill rates. For example, by prioritizing the receipt of incoming loads and trailers staged in the yard, outbound order fill rates can be maximized. This is particularly the case when incoming goods or inventory in the yard is aging or on back order. Similarly, firms that operate with limited dock space leverage YMS applications to ensure that dock doors are turned quickly and intelligently.
6. Companies that operate an extensive flow through or cross docking operation whereby YMS is a critical component between the WMS and the TMS to manage all incoming and outgoing loads.

7) Manufacturing companies with a high turnover of throughput volume, such as in the food and beverage industry. Some of these firms utilize automated material handling systems such as high bay warehouse automated storage and retrieval systems (AS/RS), or automated truck loading systems (ATLS). Higher levels of automation inherently imply lower levels of flexibility, hence the need for precision management of truck traffic flow on the site to ensure the success of the operation. This is especially true in the situation where automated truck loading systems are deployed and outbound trucks are loaded in as few as 6 - 10 minutes.

8) Manufacturing companies with just in time production operations, such as in the automotive industry, whereby delays incurred with incoming loads could potentially result in costly production line slowdowns. These operations require strict controls to be in place to ensure that every driver is assigned a dock door for delivery at the exact time that the inbound parts are required.

9) Companies that regularly hold perishable food inventory in refrigerated trailers within the yard. In this environment, it is essential to monitor the fuel level and inside temperature of refrigerated trailer units in the yard to prevent product spoilage due to adverse conditions.

10) Small and medium size businesses (SMBs) that require logistics excellence as a core competency to achieve competitive advantage. Many of these firms have already invested into warehouse and transportation management systems (WMS & TMS) and are now investing into YMS applications as the next frontier. The investment into YMS and appointment scheduling systems is rationalized as a strategic component of inventory management. Many of these firms are interested in improving the management of in transit inbound inventory that is approaching their distribution center from vendors or other warehouse/production sites. Companies are increasingly using YMS to improve inventory visibility for the purchasing department. This allows purchasing managers to strategically reprioritize the sequence that loads are received with the goal of increasing outbound order sales fill rates.

YMS and Dock Scheduling Functions

Yard Management and Dock Scheduling Systems are applications designed to manage and optimize inbound trucks in transit towards the distribution/production facility/campus, as well as within the yard. To this end, there are a number of important features required within a YMS application including, but not limited to:

1) The scheduling of appointments for incoming loads such that trailers are assigned to dock doors on a timely basis defined by user-defined priorities. Scheduling should consider the time required to unload the trailer based on load-specific attributes (e.g. floor loaded container versus palletized goods).
2) The management of a site gate whereby incoming trailers are quickly identified and assigned an identifier and/or communication device. Drivers are provided with real time instructions based on prioritized rules that have already been determined while the load was in transit.
3) The establishment of user-defined prioritization rules that govern system-directed trailer movement tasks assigned to the yard drivers (i.e. shunters, yard jockeys, switchers, or hustlers). The ability to establish these rules ensures that trailer movements are performed according to the priorities of each facility/site. Flexible rules configuration is ultimately what drives the optimization of yard labor resources, inbound inventory assets, and the movement of trucking assets.
4) The provision of a control room that enables centralized real time tracking of all private fleet and/or third party trucking assets incoming to the site and/or within the yard or campus. This ensures the optimal movement of equipment, inventory and labor resources.
5) Integration to a company's fleet maintenance software application to ensure that trucking assets are not allocated to activities when they are already scheduled to be moved to the maintenance operation.
6) The use of "agents" as the basis for intelligent decision making on a minute-by-minute basis. Agents are software entities that react to events occurring in the yard and that influence how decisions are taken to optimize trailer movements due to changes taking place throughout the work day. This is very different than setting up a one-time static rules-based configuration. Agents are a powerful tool to enable the software to be highly responsive to operating issues where priorities need to be altered due to real life constraints. For example, agents can be used to automatically request the unloading of certain inbound trailers, with specific trailer characteristics, to avoid a shortage of specific trailer types that are needed for the outbound operation.

"Best-of-breed" YMS Versus a WMS "Yard Module"

There are numerous warehouse management systems (WMS) that offer "Yard Modules" as application extensions to manage yard operations. For some companies, a WMS Yard Module is sufficient to manage their yard operation, but for many companies the benefits of a best-of-breed YMS application are critical to the success of their logistics operations. Perhaps the best way to explain the differences between a WMS "Yard Module" and a "best-of-breed" YMS is use an analogy based on the WMS market.

In the WMS market, there are inventory control applications that keep track of where operators have stored inventory in the past so that inventory can quickly be located when it is needed. These basic applications do not necessarily optimize the work being performed, rather they identify what has already taken place in the past as a means to controlling inventory. This is a very different scenario than a best-of-breed WMS that enables the optimization of personnel, equipment, and order picking/packing processes, to support world class operations at the highest levels of efficiency.

This same principal applies to the YMS software market. A "Yard Module" that is a WMS application extension typically tells you where to find trailers in the yard based on where they have been placed in the past. This allows the yard driver to move trailers to dock doors without having to manually search for the trailer in the yard. This is the equivalent of an inventory control system in that the software tells you where the trailer was placed without any real intelligence aimed at optimizing resources or assets.

WMS "Yard Modules" typically manage the yard operation as an extension of the warehouse operation. As such, it is worth noting that WMS software applications are principally designed to:

- Track and control the movement of inventory being stored and handled within different types of fixed and mobile equipment environments.
- Optimize the storage capacity utilization of the distribution center.
- Manage labor resources that are tasked to store and retrieve inventory.
- Manage the execution of inbound and outbound orders.
- Optimize tasks assignment to direct labor associates responsible for picking/packing orders, moving inventory, etc.

With a "best-of-breed" YMS, the application is specifically oriented towards optimizing the use of labor resources and the movement of trailers within the yard. Since the characteristics of each logistics site are different, the priority on how trailers are managed within the yard needs to be managed differently for each site. A best-of-breed YMS enables a firm to specify the exact priorities of how work tasks are assigned to yard drivers based on site-specific operational requirements. For example, the emphasis for one site may be on maximizing yard driver labor efficiency, while another site may need to maximize inventory fill rates. The key point is that the "best-of-breed YMS" provides a much more robust and flexible toolkit to managing the overall logistics operation.

It is important to understand that best-of-breed YMS applications are designed around a fundamentally different set of operational requirements than WMS applications. YMS applications are principally designed to:

- Track, control and optimize the movement of trucking assets within one or more yards associated to a campus or site; including yard driver vehicles, trailers, containers, and trailer chassis.
- Optimize the use of driver labor resources that are tasked to move equipment within the yard/ campus by minimizing task time duration and/or distance travelled.
- Manage the use of receiving and shipping dock doors and parking locations.
- Manage the scheduling and receiving of inbound loads based on configurable priorities.
- Adjust priorities continuously throughout the work day in response to pressures resulting from peaks and valleys in receiving and shipping volumes.
- Manage communications between a centralized control center and all yard driver labor resources thereby eliminating the use of less reliable radio-based or paper-based communication processes.

- Leverage GPS mapping technology to manage the movement of all trucking assets incoming to the site or within the site, particularly in large un-marked parking areas.
- Forecast vehicle availability through the use of agent technology that looks ahead to ensure no equipment shortages are on the horizon.
- Provide advanced key performance indicators (KPIs) that provide managers with intelligent information designed to continuously improve the quality, efficiency and accuracy of their overall logistics operations.

Most importantly, best-of-breed YMS applications enable the establishment of user-defined rules to manage how the work is executed. Some examples follow:

- A trailer staged in the yard may have high priority inventory with seasonal SKUs that are on back order or that are related to a forthcoming event. The purchasing department requires SKU-level visibility for inventory being held in the yard so that buyers can reprioritize the receipt of this inventory to maximize outbound order fill rates.
- There may be accessorial charges incurred on third party trailers being held in the yard. These costs may come in the form of detention/demurrage charges, redelivery fees, and non-usage fees. The need to minimize accessorial charges may be a firm's top priority by ensuring that the oldest trailers are prioritized for receiving first. This requires real time visibility and status monitoring of trailer dwell time, accessorial charge tracking, email alerts, and carrier notification as soon as trailers are made available.
- There may be a need to maximize labor efficiency of the drivers responsible for shunting trailers in the yard, especially if the operation is contained within a large campus environment whereby trailers are being transferred between multiple buildings. In this situation, the priority may be having the YMS issue trailer move tasks to minimize travel distance by eliminating empty bobtail travel.

In summary, there are significant differences between the benefits of deploying a system-directed "best-of-breed" YMS versus a more basic "Yard Module" extension of a WMS. Either solution may suffice for your operation but it is important to understand the differences between these solutions to make the appropriate choice for your business.

Buyer Considerations for a YMS Software Application

When investing into a YMS application, are there any special considerations that a company should think through as part of needs definition? We list several examples below to illustrate the types of questions that should be asked during the requirements definition phase.

- Will your firm benefit from having a multi-site system that allows you to manage yard operations at the enterprise level rather than at the site level?
- Does your firm require real time enterprise-wide visibility of yard activity, trailers in the yard, and inventory on the trailers?
- Does your firm need an integrated appointment scheduling system to optimize trailer scheduling, even before the trailer arrives at the yard?
- Is it necessary to deploy RFID or GPS technologies to facilitate trailer tracking and gate processes as part of the YMS solution?
- Do you need to receive yard-related information from other systems such as a Transportation Management System?
- Is it necessary to optimize trailer movements based on a user-defined set of priorities - that may change depending on conditions throughout the workday (e.g. average versus peak season, yard capacity, etc.?)
- Is it a benefit to have users receive alert notifications for things like idle assets, aging equipment, dwell time charges being incurred, refrigerated trailer temperatures, low fuel conditions in a refrigerated trailer unit, or any other type of time-sensitive information?
- Is it of benefit to manage yard operations with the help of a pictorial yard map that depicts all active trailer assets as objects that can be clicked on to obtain information or to invoke move tasks?
- Does the WMS system manage all the inventory that is handled by your company, including merchandise held in trailers staged within the yard or a seasonal overflow yard? Often the visibility of inventory kept in the yard is not tracked within the WMS system for a variety of reasons.

These questions highlight some of the functional capabilities of a more sophisticated "best-of-breed" YMS application. It is important to assess if there are any strategic or economic benefits to be derived from these features on a case by case basis. If many of these benefits are important to your firm then there is a higher probability that a more robust YMS solution is the right strategy for your business.

Economic Benefits of YMS Software

Many large and sophisticated companies continue to use Excel spreadsheets, chalkboards, or card systems to manage their yard operation. This simplistic approach may work some of the time, but the reality is that it only takes one or two human errors per week to result in significant cost issues. Problems relating to manual yard management can quickly result in misplaced trailers that contain valuable merchandise needed to fulfill customer/store orders. The cost penalty of sending a yard driver into the yard to search for a lost trailer is relatively minor. The real penalty is the negative impact on sales revenue when critical inventory is lost in the yard prior to a major promotional or seasonal event.

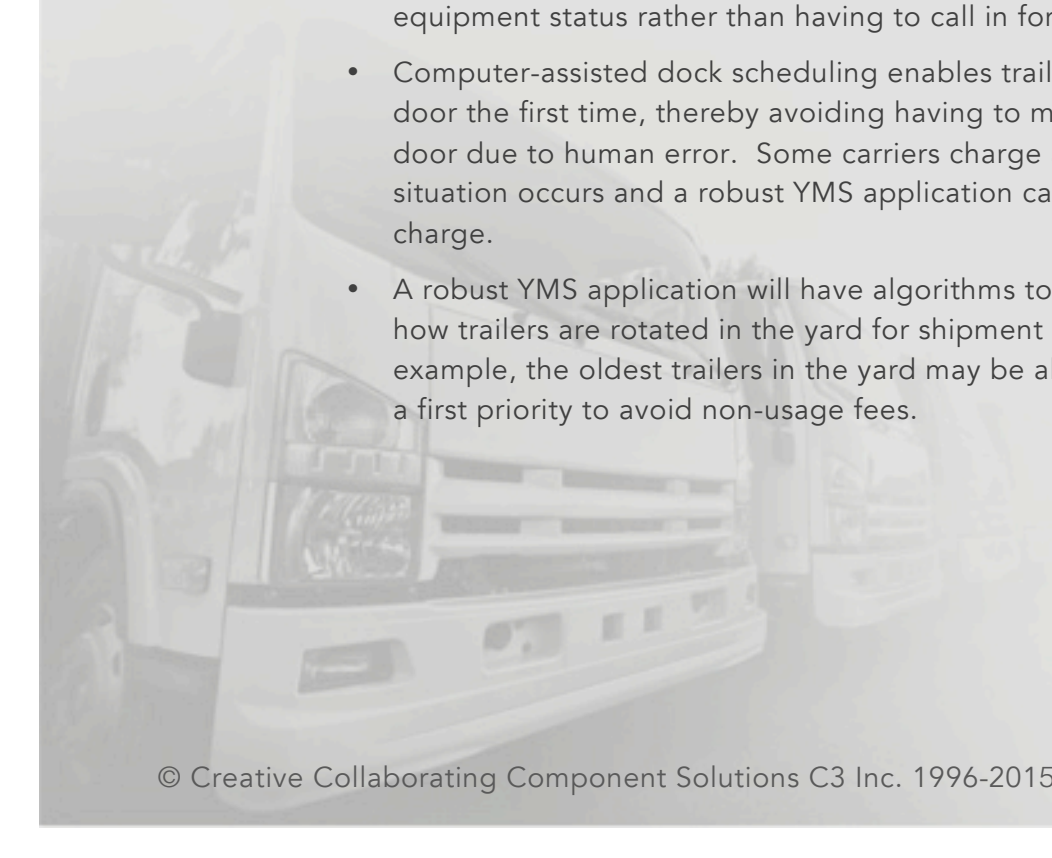
When developing the return on investment for advanced yard management software, it is important to understand the direct and indirect costs that may apply to your logistics operation.

Direct Costs

Direct costs are measurable operating expenses that relate directly to the yard operation including yard driver labor, fleet equipment costs, and accessorial charges.

1. The cost of yard drivers including labor costs, fuel, maintenance, and equipment costs. For many firms, these expenses are embedded within the overall transportation budget so it is important to develop the operating expenses associated specifically to the yard operation.
    - Companies that have deployed advanced YMS applications typically gain efficiency with shunting (yard jockey) labor in the range of 25% - 35% because the software eliminates all manual searching processes in addition to maximizing yard driver efficiency by minimizing empty bob-tail miles.
    - Yard operations with advanced YMS typically enjoy a minimum increase of 2 - 3 more trailer moves per worked hour as a good "rule of thumb".
    - Yard operations with advanced YMS also spend far fewer hours performing yard checks which provide a means of verifying data integrity in the yard operation. These are similar to cycle counts in a WMS operation. The need to perform yard checks is significantly reduced because the YMS has robust trailer tracking capabilities.
    - These efficiency gains typically translate into reduced labor requirements and less yard jockey truck requirements.

2. Improvements in trailer utilization rates because of the significant improvement in how trucking assets are managed in the yard.
    - The standard time required for trailers to pass through a main security gate is typically in the range of 5 - 10 minutes. This time can be reduced to 30 seconds (or less if green-lined) if the YMS manages all site check-in procedures *while the load is in transit towards the site*.
    - The ability to provide advance appointments to drivers combined with the optimized management of trailers within the yard typically results in a 10% - 15% reduction in the number of trailers required to support a large logistics operation. This can either translate into a reduced trailer leasing expense or a reduced capital investment into transportation infrastructure.
    - Reduced operator errors that result in moving the wrong trailer due to the replacement of paper instructions and radio communication devices with real time GE integration and/or telematics.
3. The avoidance of third party carrier accessorial charges including detention/demurrage fees, redelivery fees and non-usage fees.
    - It may be overly optimistic to assume that a YMS can completely eliminate third party carrier accessorial charges, but a robust YMS application will certainly go a long way to avoiding many of these expenses.
    - The ability to turn third party trailer assets to avoid accessorial charges can vary depending on whether or not this is a cost penalty being incurred in the first place. Companies that deploy advanced YMS applications typically avoid this expense by having the system closely monitor when third party assets need to be liberated based on dwell time limitations. An advanced YMS application also enables third party carriers and/or customers to see on-line equipment status rather than having to call in for status updates.
    - Computer-assisted dock scheduling enables trailers to be assigned to the right door the first time, thereby avoiding having to move the trailer to another door due to human error. Some carriers charge a redelivery fee when this situation occurs and a robust YMS application can help to avoid this excess charge.
    - A robust YMS application will have algorithms to determine rules to govern how trailers are rotated in the yard for shipment loading purposes. For example, the oldest trailers in the yard may be allocated to shipping doors as a first priority to avoid non-usage fees.



Indirect Costs

Indirect costs are subjective costs that are incurred due to ineffective yard management operations and that are typically more difficult to measure. Indirect costs include: Warehouse wait times, warehouse labor inefficiency, reduced order fill rates, reduced product spoilage, etc.

1. Improvements in order fill rates can be realized when trailers are expedited for receiving on the basis of assigning the highest priorities to loads containing inventory that is in high demand.
    - For most firms, it is a difficult to place a dollar amount to this benefit because the metrics needed to measure the "size of the prize" are typically not tracked.
    - For example, if during the next operating shift fifty trailers will be received, are all fifty trailers equal in priority? What if some incoming trailers contain goods that are critical to keeping a production line running without disruption? What if some incoming trailers contain promotional inventory that needs to be expedited for receipt before the next order wave release? If the purchasing department has greater visibility of inventory held in the yard and also in transit towards the site, would there be an improvement in sales order fill rates? By extension, would there be an increase in sales revenue if buyers have greater control over how the receiving of incoming loads is prioritized?
    - The answers to these questions are different for every logistics operation based on dock constraints and the volume of inbound trucking activity. Suffice to say that many smaller and medium sized firms are now investing in YMS primarily to achieve these inventory-related benefits. For these companies, YMS is an integral software component needed to manage operations outside of the WMS and the TMS.
2. Reduced inventory losses:
    - For example, refrigerated trailers containing perishables inventory that spoils in the yard can be avoided if YMS agents notify the control center that the refrigerated unit is low on fuel or that the temperature inside the trailer is too high.
    - Trailers held in the yard with dated inventory can be prioritized on the basis of product expiration dates to prevent newer stock from being transferred before older stock.

3. Improvements in warehouse efficiency are common with companies that deploy advanced YMS applications.
    - For large retail/distribution centers, the general assumption is that trailers are being brought to the dock doors on time so that the warehouse is able to load and ship trailers in a timely manner.
    - Warehouse loading delays, caused by trailers not being brought to the doors on time, can result in shipping dock congestion and inefficient outbound labor productivity. If loaders are waiting on the dock for trucks to pull up then any idle time (as applicable) comes at a cost. If operators in the warehouse have to travel further because dock staging/marshaling lanes are backed up due to dock congestion then this extra travel time comes at a cost.
    - During peak operations, these inefficiencies are typically more apparent because the consequences of dock congestion become more pronounced as shipping volumes increase.
    - Companies that deploy advanced YMS solutions are reporting increases in warehouse throughput efficiency in the order of 10% - 12% for outbound operations during peak season. This benefit is directly tied to YMS because the application works to avoid delays incurred due to trailers not being brought to the shipping doors on time.

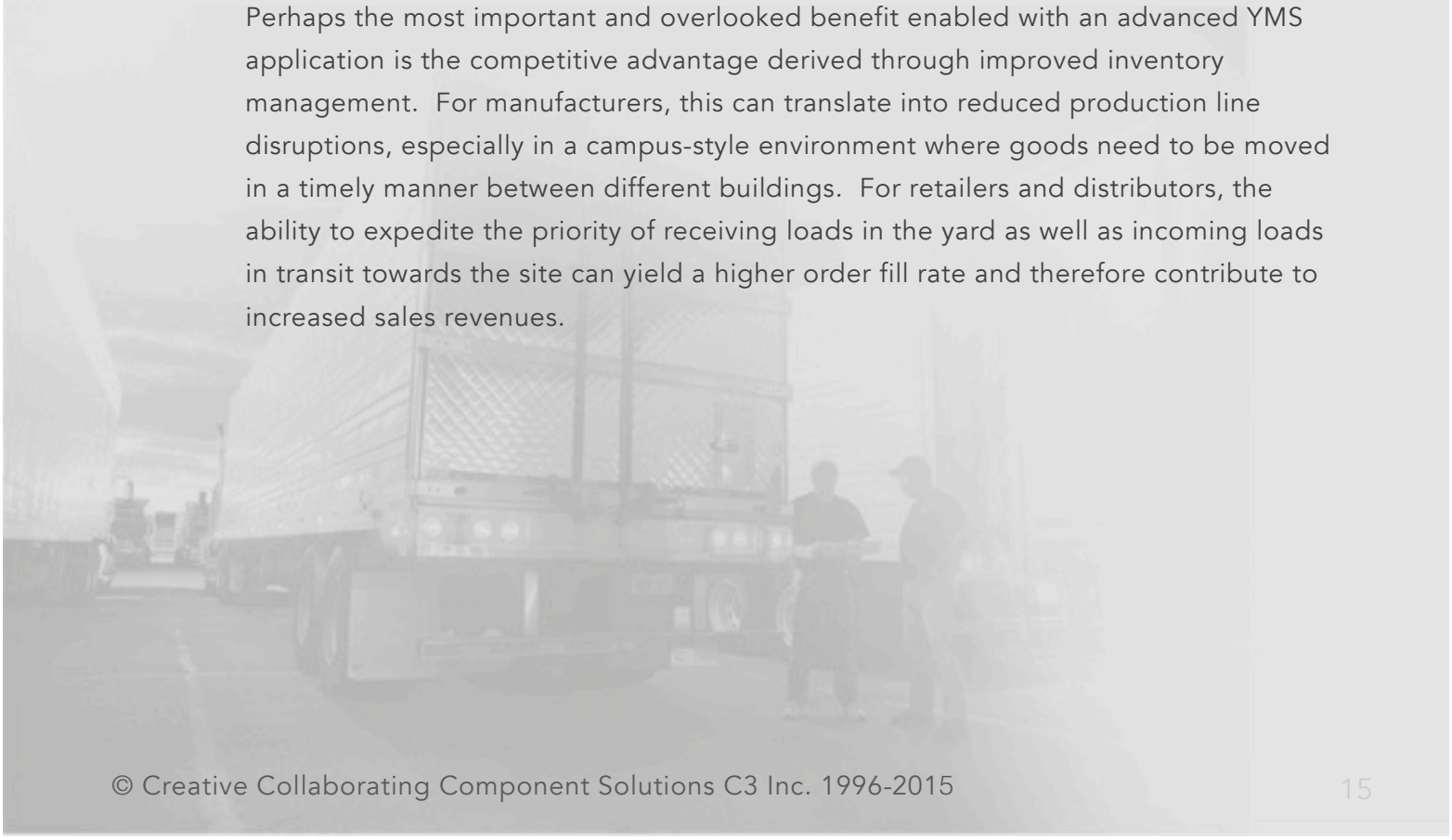
Lastly on this topic, a trailer that is late in departing the distribution facility is likely also going to be a trailer that is late in arriving at a retail store. The retail stores hire labor resources to unload trailers based on set delivery schedules. These labor resources may incur inefficiency or overtime expenses as a direct result of late incoming trailer loads as a byproduct of an inefficient yard operation.

Conclusions

Historically, YMS applications have been deployed by companies with vast complex yard operations that need to manage hundreds of trailer units. This dynamic is changing as more companies are becoming aware that YMS is a critical supply chain execution software component that tightly integrates with WMS and TMS applications. We expect that the market for yard management systems is poised to grow into new market segments that include small and medium sized businesses (SMBs) that rely on logistics excellence as a core competency.

While a "best-of-breed" YMS application may be overkill for some companies, there are many important differences between a "best-of-breed" YMS application versus a WMS "Yard Module Extension". First and foremost, the requirements of a yard operation are significantly different than a WMS operation. The prioritization of task assignments in the yard are dynamic and can change on a minute-by-minute basis based on pressure points and alert conditions that occur throughout the day. For busy yard operations, the traditional approach of establishing static prioritized rules needs to be augmented with agents that automatically reprioritize how work is performed in the yard.

Perhaps the most important and overlooked benefit enabled with an advanced YMS application is the competitive advantage derived through improved inventory management. For manufacturers, this can translate into reduced production line disruptions, especially in a campus-style environment where goods need to be moved in a timely manner between different buildings. For retailers and distributors, the ability to expedite the priority of receiving loads in the yard as well as incoming loads in transit towards the site can yield a higher order fill rate and therefore contribute to increased sales revenues.



About C3 Solutions

C3 Solutions is an information technology company specialized in **yard management** (YMS) and **dock scheduling** (DSS) systems. Since its founding in 2000, C3 has gained the confidence of clients around the world and across many industries including retail, grocery, distribution, manufacturing and parcel post. Headquartered in Montreal (QC), Canada and privately owned, C3 is dedicated to developing, implementing and supporting the most complete yard management and appointment scheduling products on the market today.

For more information, visit www.c3solutions.com

About MWPVL International

MWPVL International Inc. is a leading global supply chain and logistics consulting services firm that enables companies to significantly increase their competitive position by improving profits and customer service levels. MWPVL provides specialized supply chain, logistics and distribution consulting experience in the following areas:

- Supply Chain Network Strategy
- Distribution Center Design
- Material Handling Systems
- Product Sourcing
- 3PL Outsourcing
- Purchasing and Inventory Management
- Distribution Operations Assessment
- Supply Chain Technology
- Lean Distribution
- Transportation Management
- Achieving Logistics Excellence

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