KnarrTek Real-Time Decision Support Systems for Manufacturers and Industrial Distributors

Overview

KnarrTek provides real-time Decision Support Systems (DSSs) for mid-sized manufacturers and industrial distributors. These Decision Support Systems are especially focused on the needs of make-to-order manufacturers and industrial distributors who need to deliver customer orders quickly and on short-notice.

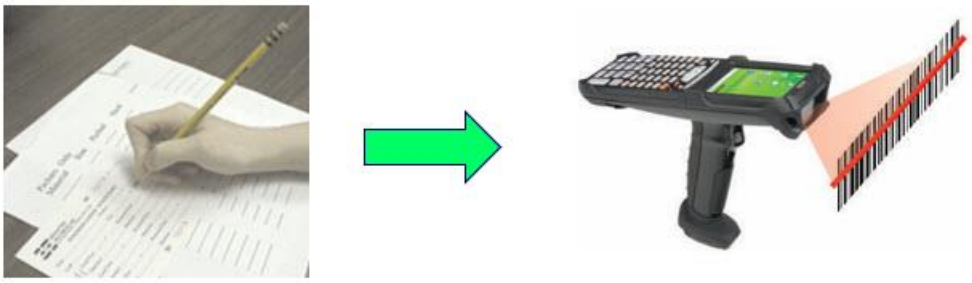
The goal of these real-time Decision-Support Systems is to make sure that everyone in the organization has the information needed to efficiently do their job, where and when they need it.

This can result in:

1. Increased sales due to delivering quality products, when promised, and improved customer service by being able to keep customers informed as to the status of their orders.
2. Being able to have higher throughput with less people by eliminating time wasted on overhead tasks, such as manually tracking available inventory or a continually changing mix of customer orders.
3. Reducing employee turnover by eliminating many sources of stress due to people making mistakes or being “blind-sided” by events or decisions taking place elsewhere in their organization or with suppliers and customers.
4. Cutting costs by enabling lean, just-in-time, inventory management combined with making efficient use of equipment and people resources.
5. Easily capturing and using cost and production throughput data to enable profitable bidding of new jobs, based on the best available data from real-life experience.
6. Easily capturing operational performance data, including the reasons for product defects, on which to base process improvement activities.
7. Being able to quickly determine the source of product defects, and then to minimize the scope of any needed recall, which can prevent major financial losses

KnarrTek’s real-time DSS systems range from simple job tracking systems, which enable production managers to keep track of the status of customer jobs and make sure that their orders get shipped on time, to complex operations management systems, which enable a small team of

managers to efficiently run their manufacturing and/or warehousing operations, including automated information exchange with their suppliers and customers.



KnarrTek's real-time DSS systems enable industrial organizations to transition:

- From writing data down on paper forms and notebooks, possibly followed by manual keyboard data entry into Excel spreadsheets or an accounting or ERP system, which is labor intensive, mistake prone, and does not provide real-time information.
- To the use of technologies, such as barcode scanning and mobile computers, to automatically capture data in real-time and to provide point-of-action warnings when the user is about to make an operational or data entry mistake.

Through the use of Cloud computing technologies, KnarrTek real-time DSS systems can then securely provide real-time information about the status of jobs, inventory, and customer orders anywhere, anytime a user of the DSS system has Internet access. Further, KnarrTek DSS systems can monitor the changes taking place and automatically notify people by text or Email messages when they need to take some action, such as ordering more products, or there is a situation where their attention may be needed.

Capabilities

KnarrTek's industrial real-time DSS systems:

1. Provide managers and their staff with the real-time information they need, when they need it, to efficiently run their operations.
2. Enable managers and their staff to ensure customer orders to be delivered on-time at the lowest possible cost.
3. Make sure that materials are materials are moved to where they are needed, when they are needed so there is no hold up in production.
4. Assist managers to make sure that customer jobs are scheduled to be made in the correct order, including the manufacture of needed intermediate materials.
5. Assist materials managers to make sure that inventory is ordered from suppliers when needed in time for making customer orders.
6. Prevent mistakes by warning machine operators and material handlers if they pick or use the wrong or defective materials for a job or customer order.

7. Reorder schedules in real-time when things go wrong.
8. Keep customers, as well as their sales and customer support people, appraised of the status of their orders in real-time.
9. Capture actual cost data for jobs in such a way that it can be used for bidding new jobs.
10. Capture data about which materials and machines were used to make products and who were the people involved. This is to enable rapid trace-back to the source of the problem, its correction, if defects are found in products and rapid recall of defective products.

It is to be noted that KnarrTek's decision support systems do not replace people in the decision-making processes in industrial organizations. Instead. these systems provide managers, staff, material handlers, machine operators, and other people involved in the manufacturing or distribution process with the information they need, when they need it, in the format they need, to do their jobs, in such a way as to enable the whole organization run as efficiently as possible, with minimal mistakes.

This enables the organization to take advantage of the specialized information gathered by one or more computers, sifting through large volumes of data, with the general situational knowledge and decision making capabilities of people gained through many years of experience.

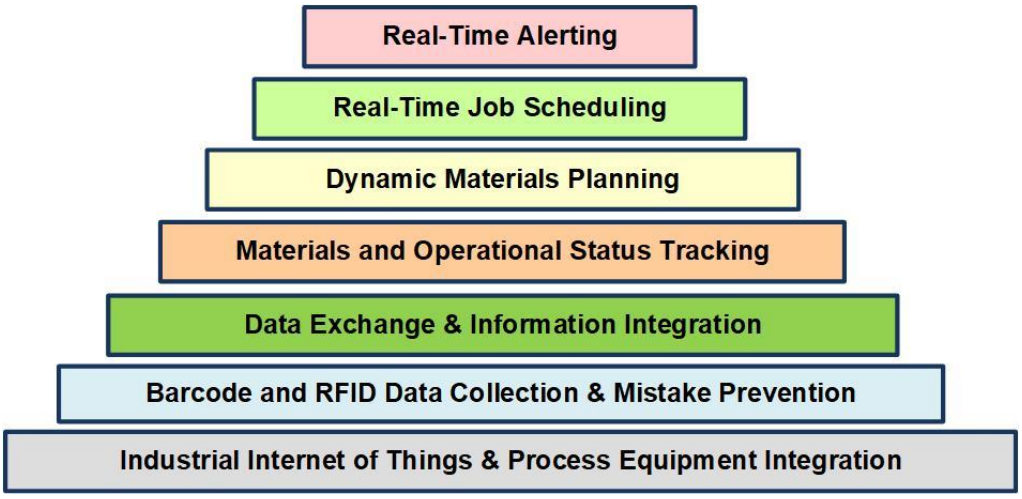
That is why, for example, when scheduling which jobs to be run next on a machine, we can have a computer sift through all the inventory and production status data, combined with the customer order data, and then recommend which job to run next but give the machine operator a number of alternatives.

This is because the machine operator, for example, may use his own (general) knowledge to realize that the recommended job to work on cannot be completed in time before the operator needs to leave for a medical appointment, which would be unknown to the scheduling algorithm, whereas he can complete the second choice in the available time. This decision may then, however, result in a cascade of adjustments to other schedule recommendations, in real-time for other machine operators and material handlers.

Equally, when a new customer order arrives, the decision support system may compute what materials need to be ordered and made to fulfil the order. But the decision support system does not order the materials directly from the supplier because a supply chain manager may, for example, choose a different supplier from which they can get a better price or order an increased quantity to get a price-break.

Again, we are not supplanting human judgement, but augmenting it in such a way as to make sure that the organization as-a-whole runs efficiently and not just individual "stovepipe" departments within the organization.

KnarrTek's Layered Decision Support System Approach



At the core of KnarrTek's approach is the use of the BellHawk real-time work-in-process, job, and materials tracking system which is used to capture the operational status of jobs, materials and customer orders and to provide real-time warnings when machine operators or materials handlers are about to make a mistake. This layer includes full warehouse management capabilities, using License-Plate-Number container tracking methods, the same as is used by organizations such as Amazon.

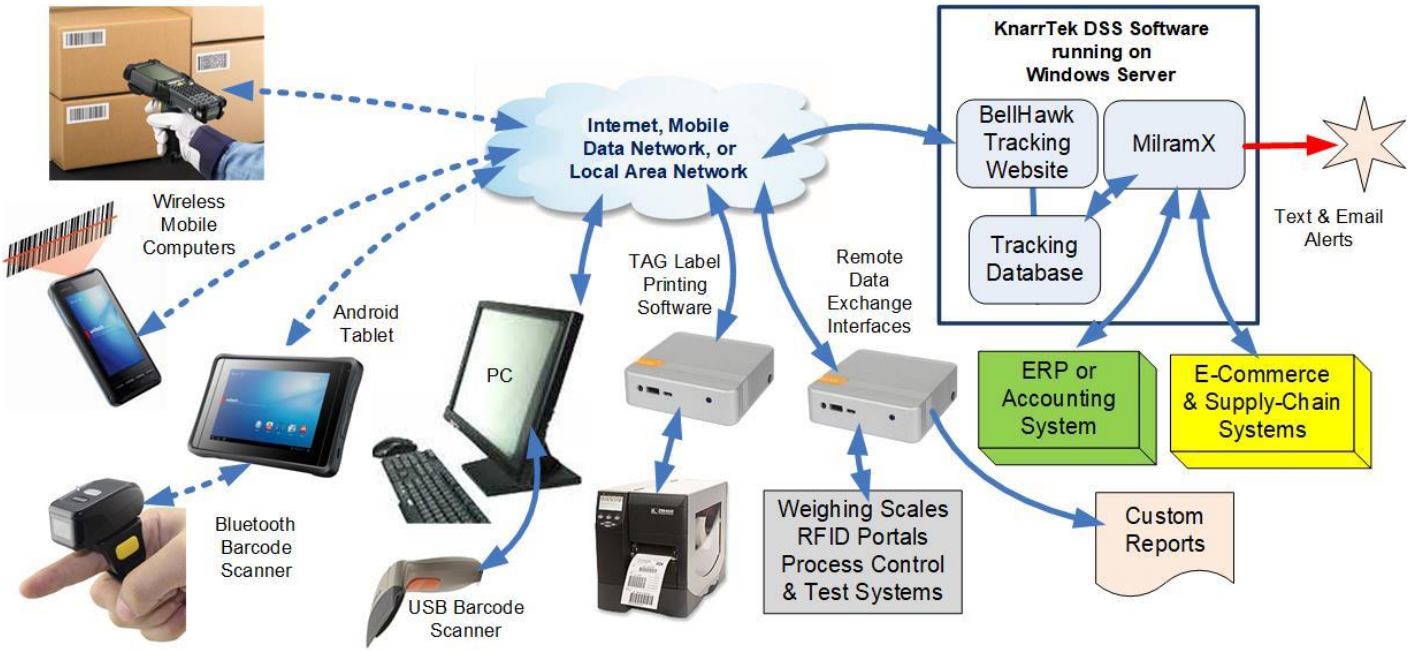
This operational status tracking layer may (or may not) exchange data with process control equipment, PLCs, weighing scales, and RFID portals as well computer-controlled process lines and materials handling robots. It may also feed data to barcode labeling and RFID tag encoding equipment This is typically done through the use of Industrial Internet of Things (IIOT) processors on the shop-floor.

A KnarrTek real-time DSS system often needs to exchange data with other systems such as ERP and accounting systems as well as engineering computer aided design (CAD) systems. This is done using the MilramX automated information exchange and decision support software platform, which is also responsible for monitoring the data captured by BellHawk and generating Email and text messages to the appropriate people when there are events (or lack of events – such as job completion not occurring on time) .to which they need to pay attention.

Finally, there is the real-time scheduling and pull-based materials planning layers, which are performed by the BellHawk platform. BellHawk is used to dynamically present tasks to machine operators and material handlers based on the real-time priorities of those tasks. As always, the advice given by the DSS system can be over-ridden by a person who has more general knowledge.

The same approach is taken in pull-based/demand-based materials planning, where we use a person to do the decision making about what to make and buy and then support that person with real-time information captured and extracted by a computer.to wade through the large amount of data required to make a meaningful decision.

Decision Support Systems Architecture



KnarrTek's real-time decision support systems are built upon the BellHawk automated data collection and MilramX automated information exchange software platforms.

BellHawk consists of a specialized website, coupled with a SQL Server database, running on Windows Server computer. MilramX is typically run on the same server.

Data is captured using a wide variety of barcode scanning devices, over the Internet using a web-browser interface which typically avoids loading any custom software on the data capture device. Similarly, any web-browser device, including smart phones, can be used to securely view the status of work-in-process, inventory, jobs, and customer orders in real-time, anywhere there is an internet connection.

Interfaces with barcode label printing devices and other process equipment is typically performed through Windows IIOT based processors in each local manufacturing plant or warehouse. BellHawk also supports a local store-and forward database that can be run on a Windows Workstation or Server in the plant to exchange data with BellHawk or to produce custom reports locally.

Comparison with ERP and Accounting Systems

Enterprise Resource Planning (ERP) Systems typically consist of an accounting system, with the ability to track inventory (on a historical basis) as well as to do long-range materials planning, based on sales forecasts and the route of operations and the BOMs (Bills of Materials) needed to make products. They sometimes also integrate a CRM (customer relations management function) which is used for sales and marketing support.

Purchase orders and sales orders are often entered directly into ERP and accounting systems or are imported from materials management and E-Commerce sales systems so that these can be

integrated with sales forecasts for performing long-range materials planning as well as being used as the basis for accounts receivable and accounts payable activities in the finance department.

Attempts to have machine operators and materials handlers directly enter operations tracking data into ERP systems has been universally met with failure as these systems are designed for use by office personnel and are simply too complex for use on the factory floor or warehouse. As a result, data is usually written down on paper forms and keyed into the ERP system the following day.

As this tracking data is typically a day (or more) old before it is accessible to mangers, it is not a good basis for real-time decision making, especially in a rapidly changing, make-to-order environment.

To solve this problem, some organizations have integrated item-locator inventory tracking or warehouse management systems (WMS) with their ERP systems. Some have also integrated job shop tracking systems. While these improved the situation somewhat, managers now had to look in three systems to find out what was going on and, even then, obtained conflicting information due to delays in updating data in the different systems.

A KnarrTek DSS does not do accounting, as this ties system updates to the whims of the IRS. Instead, a KnarrTek DSS can automatically exchange data with a wide variety of ERP and accounting systems, which perform this accounting function well.

Rather than integrate accounting functions, a KnarrTek DSS integrates real-time tracking of work-in-process, jobs, materials and integrates a full-capability WMS. This enables the system to provide a real-time view of operational status and forms the basis for the decision support capabilities of the KnarrTek DSS systems.

In the area of materials planning and job scheduling there are also significant differences. The Materials Resource Planning (MRP) function of an ERP system integrates sales forecasts with current customer orders to generate a multi-month view of the required materials to purchase and schedules manufacturing jobs accordingly.

This works well, if you are Toyota or some other organization with months of lead time on orders. It does not work at all you are a make-to-order shop with only days of lead-time visibility on upcoming orders and no idea what your sales mix will be like next week, let alone next month.

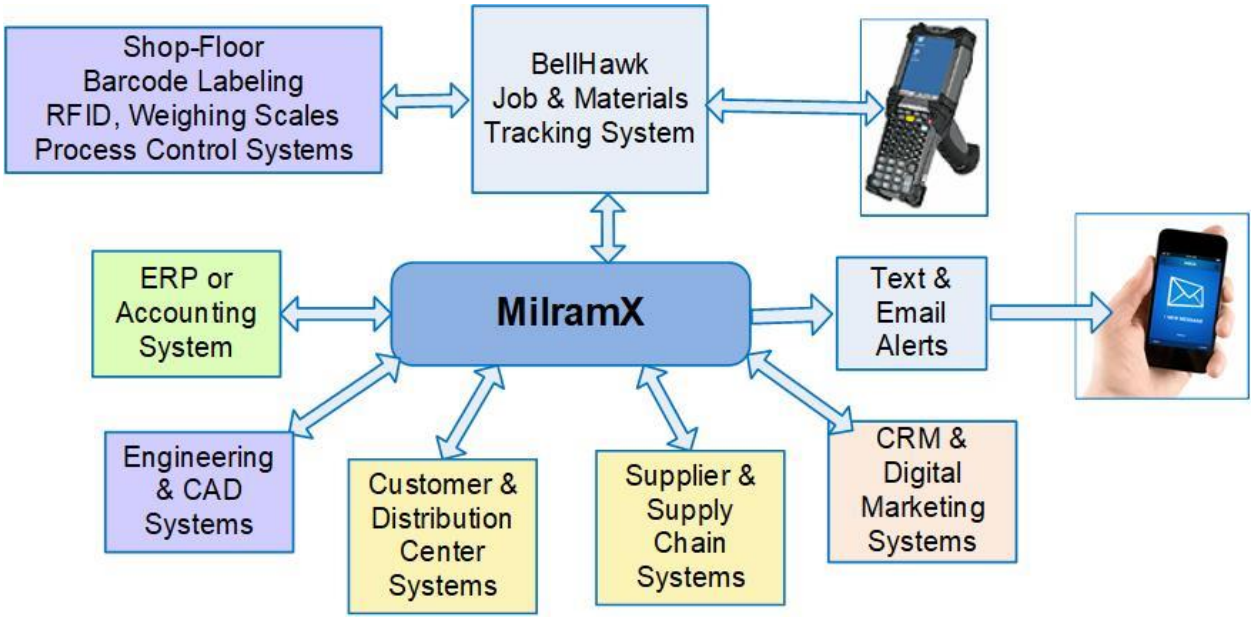
A KnarrTek DSS system, by contrast, can do dynamic pull-based materials planning, as each order arrives creating purchase orders and jobs incrementally for the new orders, rather than having to reschedule work-in-process (which is what ERP and MRP systems do). Also, scheduling is completely dynamic in real-time, and can take into account availability of materials and when orders have to be delivered (as well as unforeseen events such as the truck with the needed materials ending up in a ditch, or a machine breaking down).

Best of all, a KnarrTek DSS, because it is an advisory and not a command-and-control system, does not require an army of people to support it. A KnarrTek DSS, once the rules are established, does not require any more data beyond that captured through barcode scanning or imported from other systems, to provide its materials planning and scheduling advice in real-time.

Both ERP and DSS systems have their place. ERP systems do a great job of managing the finances and for doing long-range materials planning, if that is needed. Decision Support Systems do not do accounting, but do capture operational cost data, and do a great job of providing real-time information and advice and, where needed, warnings, to those who need this information. DSSs typically do not do long-term materials requirements planning but do a great job of real-time pull-based materials management and job scheduling.

While, for smaller organizations, a DSS system, possibly combined with an accounting system such as QuickBooks, may be ideal, larger organizations will undoubtedly benefit from integrating a KnarrTek real-time decision support system with their existing ERP system. Also, adding a KnarrTek DSS system to an existing ERP system will, in most cases, result in much better outcomes, at much lower cost, than purchasing a new ERP system.

Custom vs Out-of-the-Box Real-Time Decision Support



Both BellHawk and MilramX are based on the Tau-Adaptor Real-Time Rules Based Engine, which enables systems based on these platforms to provide or automatically generate over 90% of the needed code for these systems working out-of-the-box. This is why the KnarrTek DSS systems are based on these software platforms.

Simple decision support applications, such as tracking the status of customer orders through a sequence of manufacturing operations need little or no customization. More complex implementations, with the need to generate application specific warnings and alerts, tend to require customizations.

Many integrations with other systems, using the BellHawk MDEX interface may require little or no custom code development. More complex, multi-systems integration may require significant code development. But, even here, MilramX provides pre-built mechanisms to minimize code development and to make this task as easy as possible.

The one place everyone wants to customize is in the area of reports. Everyone has their own idea of what they need, typically resulting in a large number of reports. To facilitate this, the BellHawk DEX interface enables the RTDS system to be easily linked to a wide variety of report generation and business intelligence applications. Users can then create their own custom reports and/or Excel exports.

Common interfaces, such as printing barcode labels using the contents of the BellHawk database and interfacing with weighing scales are supported by standard code, which requires little or no customization. But other interfaces, such as to PLCs or process control lines, will require custom code development.

By basing its Decision Support Systems on BellHawk and MilramX, KnarrTek is able to quickly deploy pilot systems and then to use agile development methods to work with clients to adapt these standard platforms to meet the specific needs of clients. This is much quicker, as well as lower risk or cost, than developing a decision support system, starting with a clean sheet of paper.

Commentary

Real-time Decision Support Systems are a cross between real-time data capture systems and real-time Artificial Intelligence (AI) systems. At their core these systems are real-time data collection systems but then add many of the techniques used in alerting, scheduling, and planning, as well as interacting with users, which come out of the world of real-time artificial intelligence.

Note that this is different from the world of AI mythologized by the popular media which tends to use “deep reasoning” methods (actually non-linear, self-adapting, matrix correlators) to try to recognize faces or to distinguish cats from dogs. Unfortunately, many of these methods take too long to come up with the best choice and so are unsuited to use in an environment where rapid change is the norm.

The type of AI we use in a KnarrTek DSS tends to use proven methods, such as rule sets, decision trees, and real-time planning algorithms to arrive at the recommended decisions that our systems provide to people. As a result, real-time KnarrTek decision support systems will not take over the world but can make running a manufacturing plant or industrial warehouse much simpler and more efficient.

Because real-time decision support systems are an interdisciplinary mix between traditional barcode data collection systems and real-time AI methods (which are typically used in military applications) it is important to work with a team, such as that at KnarrTek which has many years of experience with assisting clients to implement these systems.

In implementing these real-time decision support systems, KnarrTek works with a nationwide network of reseller and systems integrator partners who provide the needed equipment and supplies, as well as the decision support software and KnarrTek’s services as part of a complete turnkey decision support package.

For more information, please contact Sales@KnarrTek.com or see www.KnarrTek.com.

