Enterprise Decision Support (EDS) versus ERP Systems
Dr. Peter Green

Introduction

Many decades ago, when I was a young freshly-graduated engineer, I was part of a team that was tasked with implementing a system to track and manage the operations of an early-stage high-technology manufacturing company, on a mini-computer the size of a large desk.

After 6 months of night and day software development, we met with the CEO, who was a brilliant MIT Sloan School graduate named Larry, to show him the stack of all the reports we could produce with our new computer.

We thought he would be very pleased with our success, but instead he pushed the stack of reports away with a scowl and said "What I want that very expensive computer to produce is one sheet of paper every day on which it lists the six most important things that I need to pay attention to on that day."

What Larry was asking for was an Enterprise Decision Support (EDS) system but none of us knew it at the time. The goal, however, has always stuck with me through multiple decades of developing operations tracking and management systems for many different organizations.

In this white paper, we address the questions of what is an Enterprise Decision Support (EDS) system, what problems it solves, and how does it compare, contrast and work with an ERP system. We will do this in the context of industrial organizations that make and/or distribute products.

We will also attempt to answer the question of whether you should replace your existing accounting or ERP system with a new ERP system or whether you should simply supplement your existing system with an EDS system.

Enterprise Decision Support Systems
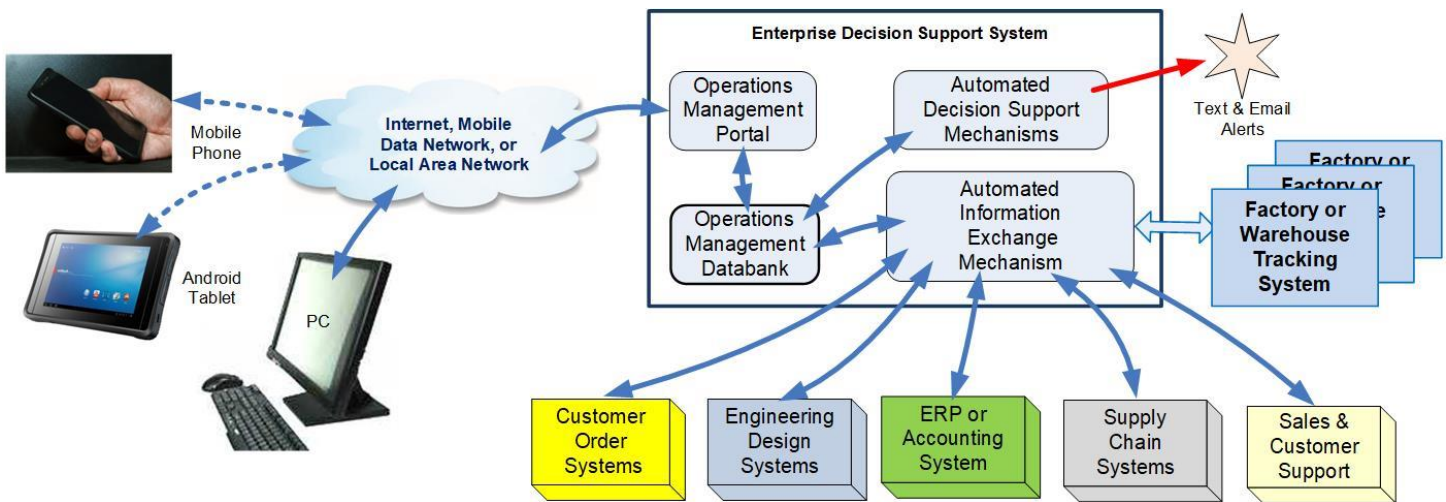
A Decision Support System (DSS) as an information system that supports business and organizational decision-making activities. A DSS serves the management, operations and planning levels of an organization (usually mid and higher management) and helps people make decisions about problems that may be occur rapidly.

An Enterprise Decision Support System is a DSS that is specifically designed for use by industrial enterprises in an analogous manner to ERP (Enterprise Resource Planning) systems.

The primary purpose of an industrial EDS is to give managers and their staff the information they need, when and where they need it, in a useful format, to do their jobs efficiently. This includes being able to advise managers when there are situations that need their attention, advising them as to the best decisions to make, and, where appropriate, automating routine decision making.

EDS systems can be used to improve the management of a single manufacturing plant or warehouse but they are truly beneficial when applied to the coordinated management of operations in enterprises with multiple manufacturing plants and/or warehouses, hence the word Enterprise in the name.

At the heart of an EDS is a central Operations Management Databank, where all the operations management data, from all the different systems used by an organization is collected. The Operations Management Portal then provides a web-browser interface through which managers and their staff can securely view all the operational status and history information, throughout the organization, over the Internet wherever they need the information, wherever they are located.

An EDS includes an automated information exchange mechanism that gets the latest operations management data from multiple systems, converts this to useful information for operations management, and puts it into the operations management databank. This same mechanism is used to take relevant information from the databank and to distribute it to the departmental systems which are used by different managers. This includes exchanging data with the systems used to track and manage operations within each manufacturing plant and warehouse.

In addition, an EDS contains an automated decision support mechanism which is continuously monitoring the information in the databank. This mechanism may send alerts to managers and their staff when situations arise that they need to pay attention to. It may also use AI (Artificial Intelligence) methods to analyze the data and place the results in the databank for viewing by managers through the portal or sending to other systems.

Why a Central Operations Management Databank?

If the goal of an EDS system sounds like the goal of ERP systems, which is to provide one system that would provide for all the information processing needs of everyone in the organization, it is. This is because the operational goals have not changed since that fateful meeting with Larry.

While the vision of ERP systems was to provide one system that would meet all the information technology needs of everyone in different departments in thousands of different organizations, this has not happened in practice, at least in mid-sized industrial organizations. Instead, we find each department, in each organization, uses a different IT system that meets their specific needs, with the ERP system mostly being used as an accounting system.

While this arrangement works reasonably well for each individual department, much information still needs to flow between departments. For example: a purchase order may be generated as a result of a customer order being converted into a bill of materials by engineering, then a materials requisition has to be generated by production planning, which is converted into a purchase order by a materials manager, if additional materials are needed. Then a copy of the purchase order needs to go to receiving for use in receiving the materials and, after approval from receiving, a copy needs to go to accounting, so the supplier will get paid.

This results in much duplicate data entry in the different IT systems involved, with the possibility of mistakes. Also, if managers need to make informed decisions, such as make-or-buy or quantity to buy, they have to look in multiple different systems, or spend a lot of time interacting with people in other departments. As a result, countless hours are wasted in "coordination and planning" meetings, which would not be needed if people had ready access to the information they need, when they need it.

We could develop interfaces to automatically move the needed data between each system and all the other systems, directly giving each user the data which they need in their own systems. But, if there are 6 departmental systems then we would have to develop $6x5x4x3x2 = 720$ different interfaces, which would take a long period of time to develop. Instead, in an EDS, we have a central repository of the information, the operations databank, and, as a result, we only have to develop 6 interfaces between each of the systems and the databank.

The other big benefit of the databank is that it provides a single, well documented, place from which a wide range of business intelligence and reporting programs can get their operations management related information, in a well-organized format, without needing to get the information from each of the individual departmental systems.

Operations Management Problems that EDS Systems Solve
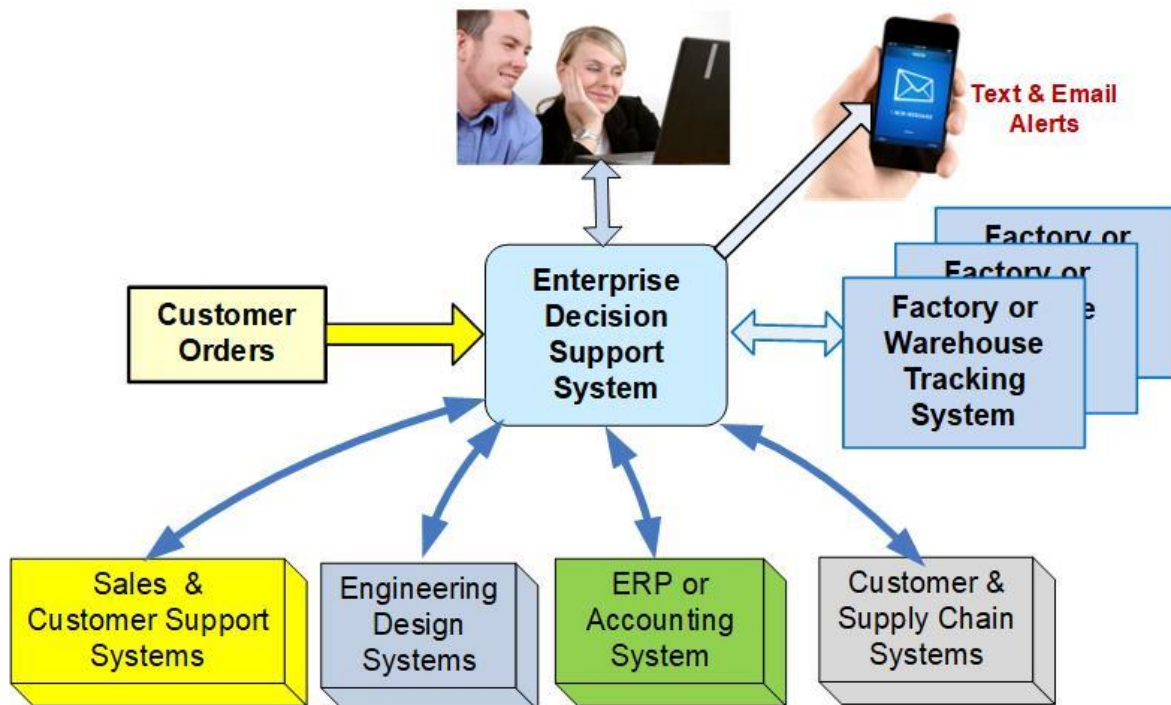
1. Losing Track – one of the biggest problems that managers face is that they do not have a good grasp of the current status of customer orders or projects and related inventory, jobs, material movement and shipping. An EDS provides a single source for this information throughout the enterprise.

2. Detecting Problems – in an industrial enterprise, problems occur all the time: delivery trucks run into ditches, materials do not arrive on time from suppliers, machines break down, people use the wrong or contaminated materials to make products, products are loaded on the wrong trucks. It is a manager's job to detect when these problems occur and to take corrective actions before a minor problem becomes a major disaster, such as requiring an expensive product recall. Many managers spend countless hours "walking the floor", reading reports, scrolling through screens, and in review meetings trying to detect problems, so they can be quickly corrected. An EDS solves this problem by monitoring the data in its operations databank and alerting the appropriate manager when a problem arises so that they can take immediate action.

3. Preventing Late Delivery of Customer Orders – which can prove to be a very expensive problem if, as a result, customers are lost, and do not reorder from the enterprise.

   Besides providing a real-time update of the status of each customer order, an EDS can monitor the progress of purchasing, receiving, manufacturing, and shipping orders to alert managers, as soon as the progress on each customer order falls behind schedule.

   This can prevent the need for subsequent excessive overtime or expedited shipping costs to get the order delivered on time. It can also eliminate the need for expediters to manually track the progress of customer orders.

4. Improving Customer Satisfaction - there is nothing more disconcerting to a customer than to call in to find the status of their order (usually because it is now past the scheduled delivery time) only to have a customer support person tell the customer that they will have to have an expediter go down to the factory floor or warehouse to try to find their order. An EDS can provide customer service people with the real-time status of each customer order, so they can provide immediate feedback to the customer, or avoid the customer having to make the phone call by preventing late deliveries.

5. Enabling sales people to be able to accurately quote and bid customer projects and delivery times – currently this is often based on obsolete cost information and guesswork from the sales people. An EDS can base its recommendations based on actual cost and delivery time data collected from like jobs by the EDS. Here model-based reasoning can be used as the basis of providing advice to the sales team. The EDS can then continuously update its advisory models, based on actual time and cost achieved, as well as win or lose ratios on bids.

6. Providing the needed decision support to enable managers and their staff to quickly convert customer orders, as they arrive, into needed purchase, manufacturing, picking, packing and shipping orders and assign these to the correct plants and warehouses. This can save an enormous amount of valuable people's time performing intelligent "grunt work" with Excel spreadsheets and can prevent expensive mistakes.

7. Preventing duplicate data entry – in most industrial enterprises an enormous amount of time is wasted in manually entering duplicate data in multiple systems or Excel spread sheets. An EDS prevents this by automating the transfer of information.

8. Eliminating operational silos – data is often entered into one system and then not propagated in a timely manner or not at all, into other systems where it is needed. An example of this is that a customer contacts customer support to update a delivery address but this never gets into the shipping system and so a delivery is made to the wrong address. An EDS can prevent this by automatically updating the data in all necessary systems.

9. Collecting and analyzing historical data for process improvement – an EDS operations management databank is an excellent place to have intelligent agents deposit data they have retrieved from operations tracking systems for subsequent analysis.

10. Running Lean – by automating much of the decision support process EDS systems can enable managers to operate with less support staff. This is analogous to the evolution that happened with the evolution from having secretaries who typed memos on typewriters to managers using word processors to prepare their own memos.

Comparison to ERP Systems

Back in Larry's day, each company had one computer, the size of a house, which was kept in a central air-conditioned "glass house" into which only the high priests of computing were admitted. Today, we all carry around computers, which are many orders of magnitude more powerful, in our pockets in the form of mobile-phones.

ERP systems, which originated back in the days of the central corporate computer, follow that same paradigm of one central computer, which is shared by everyone. Today, in doing our daily jobs, we use many different computers, some of which contain, or need to receive, operations related data. Almost all of the relevant computers keep their data in a database which can be accessed via an ODBC or web-services connection.

In many ways, the vision of EDS systems is similar to that of ERP (Enterprise Resource Planning) systems, which is to provide its users with an integrated view of their organization. The primary difference is that ERP systems do this from a financial viewpoint and industrial EDS systems do this from a materials and operations tracking and management viewpoint.
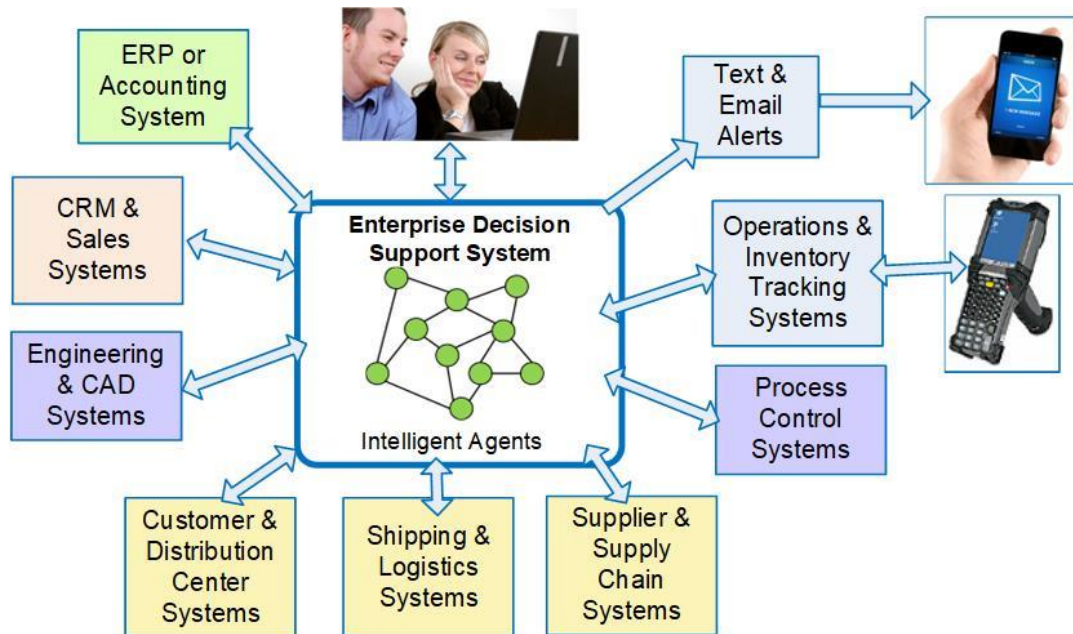
ERP systems started out as accounting systems to which inventory and operations tracking, and then materials requirements planning (MRP) was added and today many also include Customer Relations Management (CRM) capabilities.

The strength of ERP systems was supposed to be in having one system that integrated all the needed capabilities for all departments within the organization. The weakness that came with this was the impossibility of implementing an ERP system that would meet the needs of all the departments, in thousands of companies (necessary to justify the development and maintenance cost of the ERP system).

As a result, in many industrial organizations, most ERP systems are used as glorified accounting systems and all the other functions are handled by different systems used by different departments or even worse, supplemented by extensive use of paper forms and Excel spreadsheets, or both.

The reason for this is that most departments find that the ERP system (typically chosen by the CFO for its ease of use as an accounting system) does not meet the needs of their department. As a result, they use other more suitable software, typically on subscription basis in the Cloud.

While this works for the individual departments, it brings with it the problems of delayed or non-existent communications between departments and duplicate data entry in multiple systems which can result in inefficient management of operations and expensive mistakes.

An EDS system solves this problem by automatically monitoring data entered in each of the systems used by the individual departments, analyzing it to extract meaningful information, and then sending this information to the departmental systems that need it, in real-time.

An EDS system builds an enterprise databank containing current operational status and history for the whole enterprise, which can then be interrogated by managers and their staff, without the need to access many different systems. Also, this enterprise databank can be monitored by intelligent agents to alert managers and their staff when events arise that need their attention.

In this way managers and their staff, in each department, get the best of both worlds by being able to use the system they have chosen which meets their daily needs and at the same time knowing that this is automatically updated with the latest information from other systems. Also, through the enterprise management console, managers and their staff are able to view the status of operations throughout their enterprise without needing to look in multiple systems or wasting time in "coordination" meetings.

EDS Implementation Issues
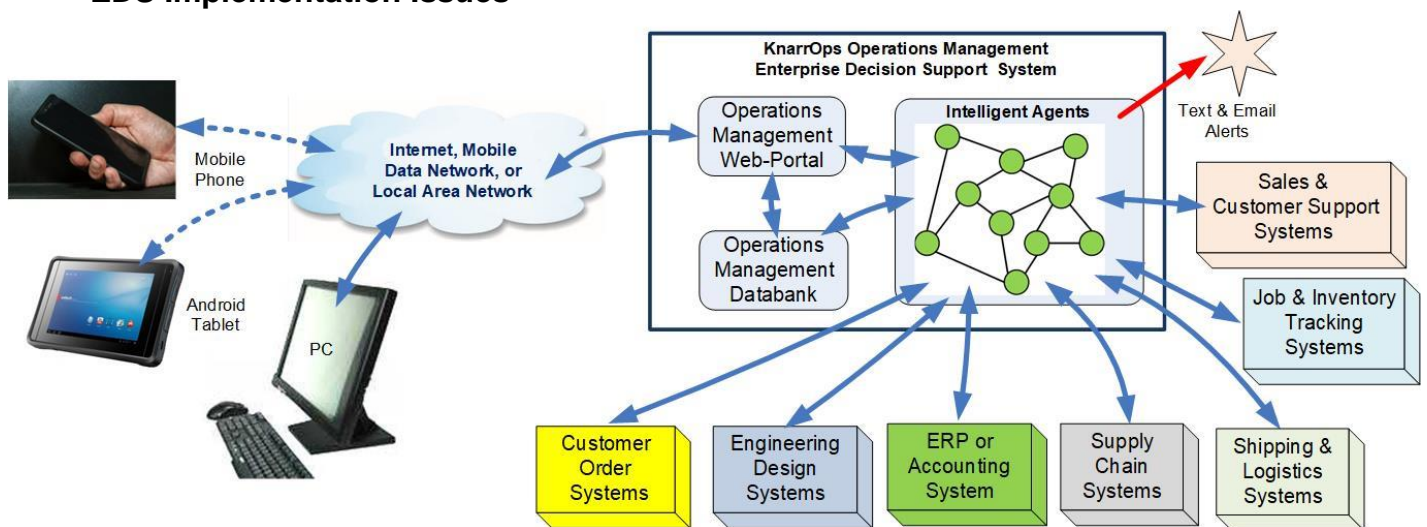
When implementing an EDS system, it is important, from management buy-in viewpoint, to quickly have success in solving some practical operations management problem. This cannot be achieved by developing a totally custom EDS system. As such, it is important to use an EDS software development platform, such as KnarrOps from KnarrTek Inc., which typically provides over 90% of the needed code pre-developed or automatically generated, to quickly and cost effectively implement an EDS in a matter of weeks and not years.

An important aspect of KnarrOps is its use of intelligent agents, which are code threads that can be executed in parallel, on multi-threaded computers, to move data between multiple systems at the same time. These intelligent agents can also interpret the data they collect and generate text and Email alerts for users as a result. As they are written in Python, they can also run various AI algorithms on the data in order to provide advice to users.

These intelligent agents do not directly interface to the databases or web-services interfaces of the different systems but instead interact with the interfaces through an expert system that automatically generates the interface code based on rules loaded into KnarrOps, thereby avoiding the need for code development, in most cases. This enables interfaces to be developed much quicker and with fewer errors than if each interface had to be coded by hand.
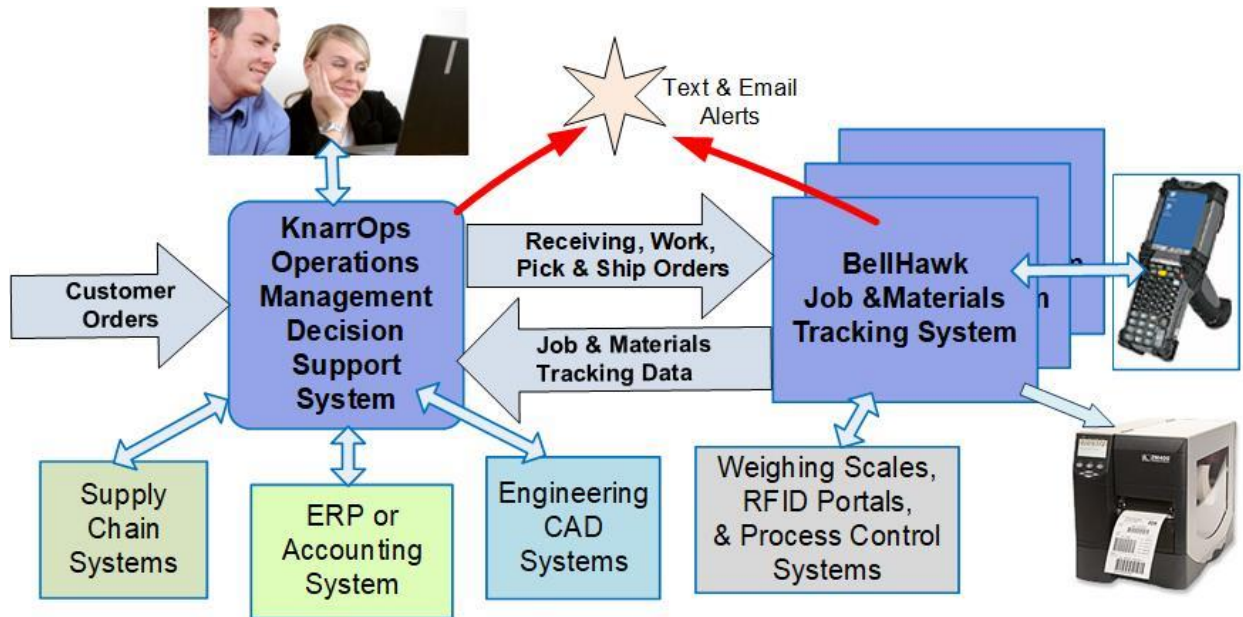
The success of many industrial EDS applications depends on close integration with systems that manage and track operations in each warehouse and factory. Unfortunately, in many cases, we often find that much of the operations tracking is performed using paper forms and manual data entry into Excel spread sheets.

Fortunately, KnarrOps has a pre-built integration with the BellHawk, which speeds this process, by enabling quick replacement of these manual processes with automated data collection using technologies such as barcode and RFID scanning as well as mobile computing.

Data collection in BellHawk is driven by Receiving, Work, Pick, Pack and Ship Orders. These can be directly entered into BellHawk or imported from a KnarrOps EDS. In exchange the BellHawk system, at each site, can feed the EDS system with operational status information to put in it operations management databank.

Often operations management process improvement projects start with a high-level management objective, such as reducing late deliveries of customer orders or reducing waste or rework. The first step in such projects is to use BellHawk, or some similar data collection program, to instrument the factory or warehouse to get a baseline measurement of the problem. This data is collected and analyzed in an EDS, such as KnarrOps, during normal operations, to have the data on which to base process improvements.

Commentary

Today, Larry's successor will still not get his single sheet of paper but instead get a text message on his phone whenever there is a problem that he or she needs to pay attention to. Other than that, today's EDS systems finally meet the objectives laid out by Larry in that fateful meeting a long-time ago.

Fortunately, today we have the technology available to quickly implement EDS systems and the affordable computing power to make EDS systems a reality.

I see many clients who replace their existing ERP systems in the hope of gaining EDS operations management and possibly real-time operations tracking capabilities only to be disappointed when they find that their new ERP system does not meet their operational needs

EDS systems do not replace ERP systems but can work as a valuable addition to these systems by providing a real-time operations tracking and management view of the enterprise, in addition to the financial/accounting view provided by the ERP system.

For those organizations that are thinking about replacing their ERP or accounting systems, an EDS system can extend the life of an existing system, by simply using the ERP system as a financial system. If replacement is necessary, it can also enable the use of a lower cost accounting system rather than an expensive ERP system.

Author

This white paper was written by Dr. Peter Green, who serves as the Technical Director of KnarrTek Inc. Dr Green obtained his BSC (Hons) in Electrical Engineering and his Ph.D. Degrees in Electronics and Computer Science from Leeds University in England. Subsequently Dr. Green was a senior member of technical staff at Massachusetts Institute of Technology and a Professor of Computer Engineering at Worcester Polytechnic Institute.

Dr Green is a Systems Architect who is an expert in using real-time artificial intelligence methods to implement real-time Inventory Tracking and Operations Management systems for Industrial Organizations. He has led the implementation of over 100 such systems over the past decade. Dr Green also led the team which developed the BellHawk job and materials tracking software, the MilramX intelligent information integration software platform, and the KnarrOps EDS software platform.

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