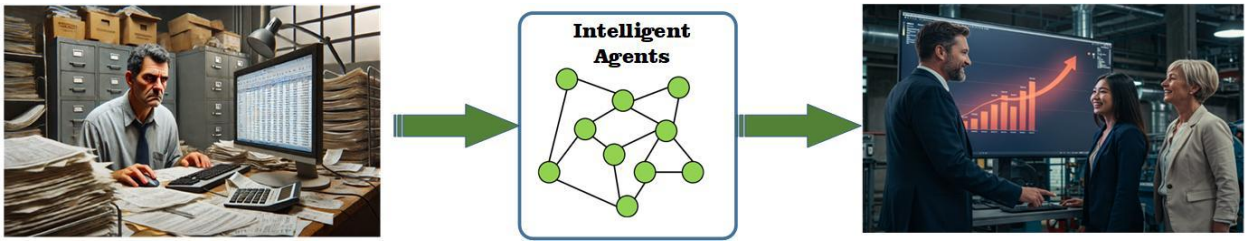
Using Practical AI to Mitigate Labor Shortages in Manufacturing

Dr Peter Green



Introduction

First, let us define "practical" artificial intelligence in an industrial environment, and specifically for operations tracking and management purposes. What we mean by practical AI is using computer technology to do all the "Intelligent Grunt Work" tasks that front-office, shop floor, and warehouse personnel would otherwise do.

For warehouse and shop-floor workers these tasks include recording materials received, moved, and shipped, as well as work performed on jobs, using paper forms or Excel spreadsheets. For managers these include time spent in endless planning, scheduling and coordination meetings. For other staff this includes time spent keyboarding duplicate data into a variety of computer systems, as well as, for both groups, sending duplicative reports to senior management, other departments, and government agencies.

This does not include all the time spent expediting customer orders to make sure that they get out on time or time wasted because materials needed for a specific job step are not available when needed.

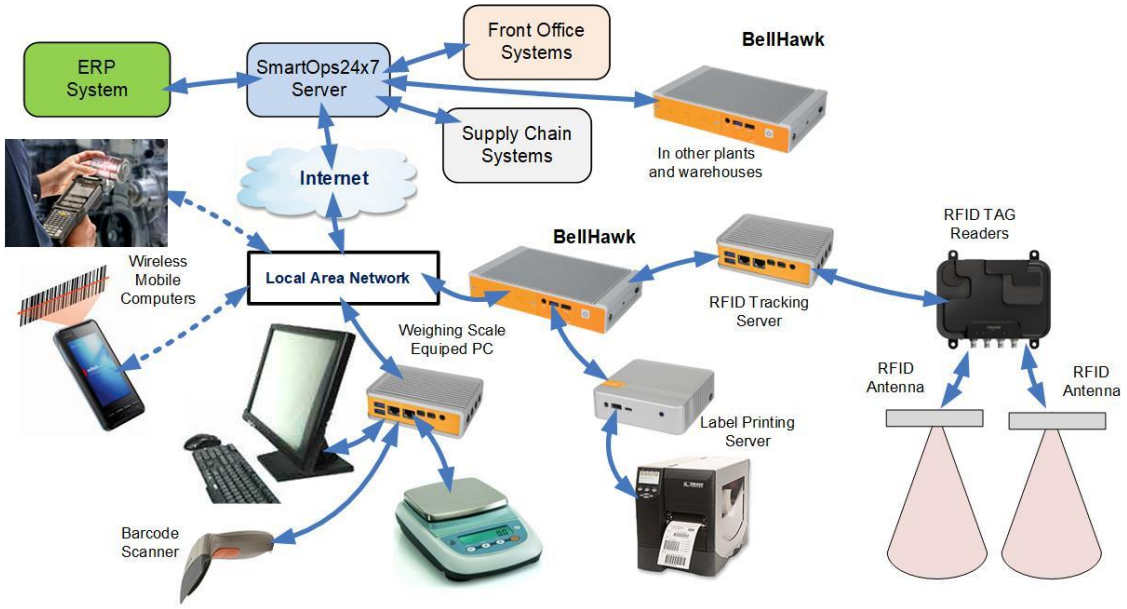
Experience has shown that the labor time of between two and ten full time equivalent (FTE) employees is wasted doing "intelligent grunt work" in a typical warehouse or mid-sized manufacturing plant, at a loaded labor cost of over $6,000 per month per FTE employee.

In the USA we currently have over 400,000 non-supervisory job openings in manufacturing. And this is expected to get much worse in sectors such as the food supply chain. Here there are an estimated 1.3 million undocumented immigrants, currently working in areas such as food packaging and processing, that ICE is in the process of deporting.

At the front-office management, staff and supervisory levels we probably have between 10,000 and 50,000 unfilled positions in the USA, although exact numbers are harder to come by. The problem here is not so much the labor cost of "intelligent grunt work" but the distraction of these skilled professionals from their true task of managing operations.

In this white paper we look at how proven practical AI methods can be used to cut much of the time wasted on "intelligent grunt work" by shop-floor and warehouse personnel, as well as that wasted by managers, supervisors and their staff.

Savings in Operations Tracking



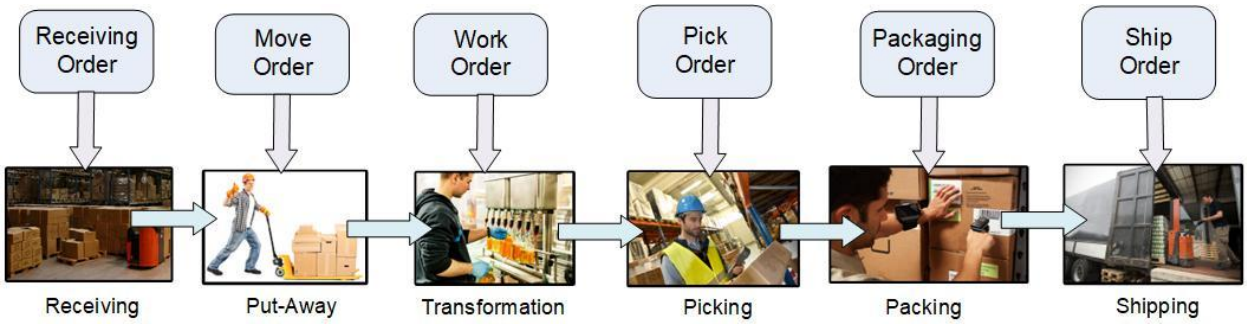
The first and most important step is to automate the collection of real-time data about the status of jobs and materials, as they flow through manufacturing plants and warehouses. This can be done in a number of ways:

1. By using barcode scanning using PCs equipped with barcode scanners, or mobile computers with integral barcode scanners, instead of writing the data down and manually keyboarding the data into a computer.
2. By using tracking barcodes and/or RFID tags on each container of materials so the data about the contents of the container only has to be entered once.
3. By automatically tracking the movement of materials using RFID
4. Automatically collecting the weights of containers of materials to avoid mistakes
5. Automatically printing out correctly formatted barcode/RFID tags upon demand
6. Automatically exchanging data with a system such as SmartOPs24x7 which can automatically relay the data to ERP and other systems, thereby avoiding duplicate data entry.

The solution shown above is based on the use of the BellHawk software and ruggedized industrial IOT (Internet of Things) computers to capture the operational data in real-time. By using IIOT computers, running in each plant or warehouse, collecting data over the local area network, such a solution quickly pays for itself and avoids the problem of production stopping when the Internet goes down.

When the Internet becomes available, the BellHawk software, which collects the data in a local database, is able to exchange data on a store-and-forward basis with a central Windows server. This server may run a system like SmartOps24x7, which can then use Intelligent Agent Processes to relay the data to a variety of systems, including remote ERP systems.

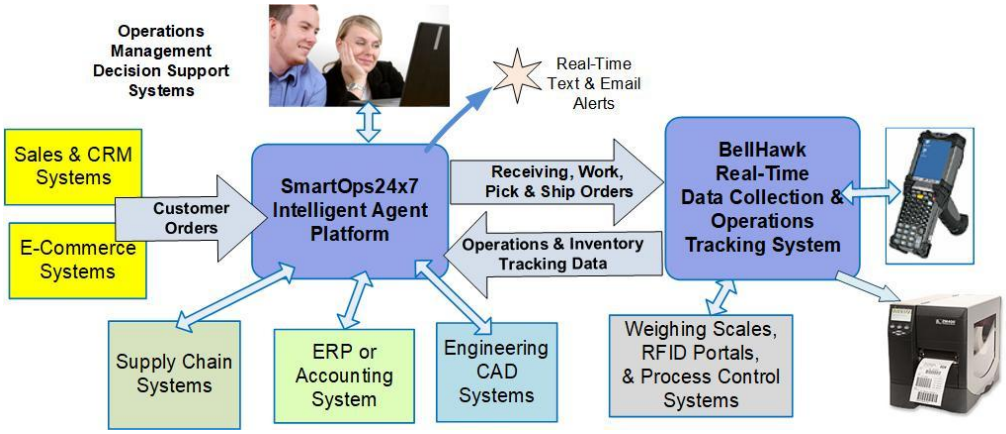
Savings in Operations Management



Most manufacturing plants in the USA work on a make-to-order basis, making an array of semi-custom products from a common set of intermediate materials. This enables these plants to deliver a wide-array of products, to order, at an economical cost and with rapid delivery.

To manage such a manufacturing plant, or a warehouse with secondary operations, efficiently we need a series of orders, such as receiving, move/put-away, work/manufacturing, picking, packing and shipping orders.

These orders may originate from ERP systems, or an engineering design department, but more likely they have their origin in the flow of customer orders from a variety of sources.

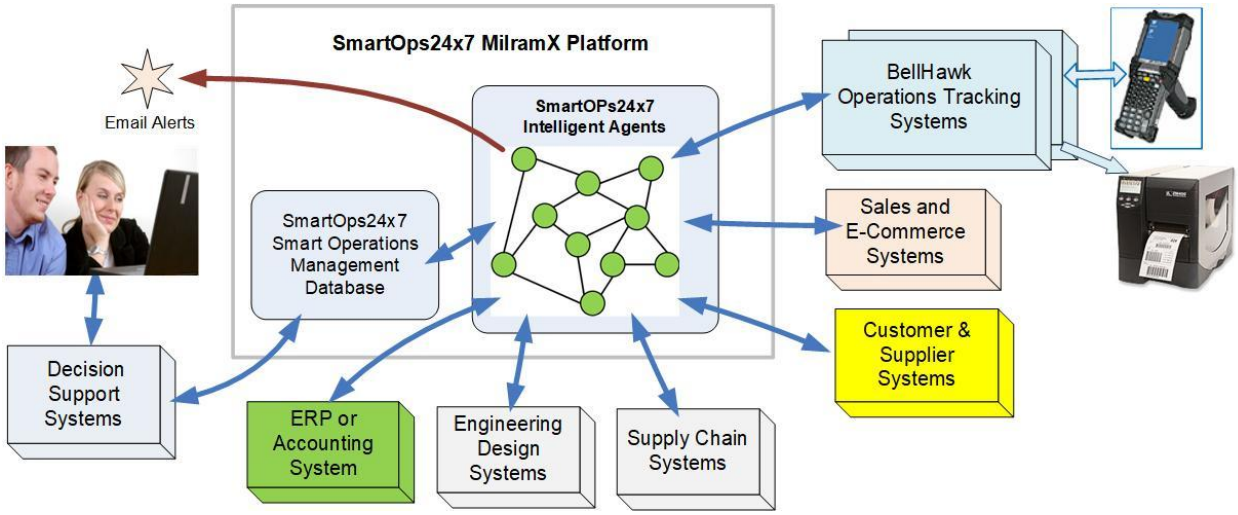


Alternately, the flow of customer orders can be automatically converted by intelligent agents, in a system such as SmartOps24x7 into a flow of design, work, picking, packing and shipping orders, as well as possibly generating purchase orders to be sent to suppliers, either directly or through an ERP or purchasing system.

This saves an enormous amount of intelligent grunt work for managers and their staff, in generating all these orders. Other intelligent agents can then automatically route these orders to the appropriate departments, plants and warehouses for action, typically through the operations tracking systems they use. This again can save a lot of time in generating action orders and speed the handling of customer orders.

These action orders, along with the real-time status of work and inventory in each plant or warehouse, can then be used to dynamically schedule operations and material moves at each site to make sure that customer orders get shipped on time.

This also avoids the need for time-wasting coordination meetings, trying to organize the flow of customer orders. Or, even worse, trying to follow out-of-date schedules generated by the MRP algorithms in an ERP system. It also makes sure that everyone in the plant or warehouse is working on the most important tasks, at any one time, and is not wasting time waiting for their supervisor telling them what to do or waiting for needed materials to arrive.



The real-time status data for each plant and warehouse is continuously fed back to the SmartOps24x7 server, where it is stored in a Smart Operations Management database. From here, this data is used by intelligent agents to create more orders, based on incoming customer orders and to feed the results to other systems depending on their available capacity and capabilities.

Unlike the use of one-large regenerative AI algorithm, that requires running on a large expensive super-computer, SmartOps24x7 uses the concept of running a swarm of simple agent processes running in parallel on inexpensive Windows based servers. Each agent is responsible for making a few decisions, which can be controlled by a Python script, which is deterministic and easy for business analysts to code and managers to understand.

While a single intelligent agent only replaces a small fraction of the intelligent grunt work that otherwise would be preformed by people, together these agents can result in a much more efficient operation of a single plant or warehouse or a coordinated group.

Commentary

Labor shortages, both on the shop-floor and industrial distribution warehouses, are proving to be a major impediment to the growth of manufacturing in the USA. So are the lack of skilled and knowledgeable managers, supervisors and staff members needed to run these operations.

Intelligent Agent technology, such as that provided by the Smart Operations Management (SmartOps) company, can help alleviate these shortages by making the most efficient use

possible of the available people, enabling these organizations to be able to pay high wages and salaries, to attract competent people who are willing to work hard in a manufacturing environment.

For more information about the SmartOps24x7 system, please see www.SmartOps24x7.com.

Author

This white paper was written by Dr. Peter Green, who serves as the Technical Director of a number of software companies. Dr. Green also consults to manufacturing companies on the application of real-time intelligent systems to improve their manufacturing and supply chain operations.

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 implementing real-time operations tracking and 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 SmartOps24x7 real-time artificial intelligence software platform and the BellHawk operations tracking software.

For further discussion, or to send comments, please contact Dr-Peter-Green@SmartOpsMgt.com.

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