

The Key to Finding RFID's ROI

To attain the benefits of an RFID-enabled supply chain, companies need to understand how RFID will transform supply chain dynamics and decision-making.

June 6, 2005—Companies that are trying to justify RFID investment wholly on the basis of anticipated savings in labor, operational efficiencies, and shrinkage in their supply chain are merely deluding themselves. In fact, if a company does find significant opportunities in these areas, it means that gross inefficiencies exist in its operations, and that the company can achieve major improvements even without applying RFID.

The benefits of RFID related to lower labor costs and reduced theft represent just the tip of the iceberg. To gain the biggest benefits of RFID, companies will have to rethink how supply chain planning and execution decisions are made, and adopt reengineered supply chain processes. This is nontrivial and requires a deep understanding of how RFID impacts supply chain dynamics.

RFID can provide companies with an unprecedentedly high level of information accuracy and real-time visibility across the supply chain. This capability of RFID has major implications: It will allow companies to redefine the fundamental assumptions upon which today's supply chain management policies, practices and software systems are based.

Here is an analogy to clarify the disruptive potential of RFID technology. In the mid-20th century, decades of research were devoted to determining formulas for the so-called Economic Order Quantity (EOQ), i.e., the reorder or production batch size that a company should utilize to minimize the unit cost. The determination of EOQ was considered relevant because setup times for manufacturing operations were high (often many hours), and hence companies had to strike a balance between producing in small quantities but incurring the costs of multiple setups versus producing in large quantities (and fewer setups) but incurring higher inventory storage costs. The concept of EOQ became a key building block in the development of push-based (build-to-forecast) production systems in the late 1960s and 1970s.

In the early '80s, the introduction of concepts such as Single-Minute Exchange of Dies (SMED) allowed setup times on manufacturing operations to be drastically slashed (literally to minutes). This fundamentally redefined a core assumption (i.e., setup changeovers are time-consuming and expensive) on which the traditional EOQ and push-based production philosophy are based. The introduction of SMED-like concepts for setup-time minimization enabled a whole new approach to production control (namely pull/kanban-based production) that has forever changed the manner in which factories are managed. In a similar way, RFID has the potential for transforming supply chain management by changing the fundamental assumptions and practices on which our current approaches to supply chain planning and execution (e.g., for demand planning and order fulfillment) are built.

By studying the supply chain operations of a variety of companies such as one of Wal-Mart's top 100 suppliers, a global OEM of heavy machinery, and a large multichannel merchant, researchers at the [University of Wisconsin-Madison's RFID Industry Workgroup](#) have gained valuable insights into how information accuracy and real-time visibility impact supply chain dynamics and how this would enable transformation of supply chain processes and policies. It is obvious that poor inventory information accuracy will result in

improper replenishment decisions, leading to out-of-stocks and back orders and consequently lost sales and lower customer satisfaction.

However, a less obvious but more fundamental insight that we gained through our studies is that while the improved information accuracy through RFID deployment will allow companies to substantially reduce out-of-stocks and back orders, they are also likely to find themselves with higher overall average inventory. This suggests a remarkable improvement opportunity, namely that companies can potentially reduce reorder quantities and target inventory levels without hurting customer service levels. This opportunity to reduce inventory and, at the same time, improve customer service levels can be applied not only across multiple tiers in the supply chain, but also within a single store (backroom and on-shelf replenishment). For example, accurately knowing the on-shelf inventory of products will enable replenishment of the shelf stock in an on-demand manner, thereby allowing the company to reduce the overall average store inventory without sacrificing product availability to customers.

Our studies also revealed a valuable insight on how RFID can help companies deal with the commonly experienced but undesirable supply chain dynamic known as the "bullwhip effect". (In the bullwhip phenomenon, variabilities in customer demand, product availability, etc., get magnified and increasingly distorted at every tier upstream in the supply chain, causing excessive inventory, long lead times and improper capacity utilization.) Information sharing across the supply chain is a proven strategy to combat the bullwhip effect. The real-time information sharing made possible by RFID across the supply chain will provide companies unprecedented visibility into unanticipated variabilities, and will therefore allow them to respond efficiently to such changes in a dynamic manner. But there is more that RFID can do to minimize the bullwhip effect.

Recall that better information accuracy can allow companies to reduce reorder quantities. An important characteristic of shopfloor dynamics is that reduction in lot sizes can lead to a significant reduction in lead times. Hence, by reducing order quantities, RFID can also help reduce average lead times in the supply chain. Our research has shown that the combined effects of information visibility and lead-time reduction made possible by RFID are far superior at combating the bullwhip effect than is information sharing alone.

Some may say that RFID is not yet a reliable technology and hence significant benefits from RFID cannot be achieved until the technology matures further. Our research shows otherwise. Even without 100 percent readability, RFID deployment, when combined with appropriate changes in supply chain planning and execution processes and policies, can deliver superior supply chain performance.

Ultimately, my message is the following: If your company is serious about deriving maximum value from RFID deployment, then it is imperative that the company develop a clear understanding of how RFID affects supply chain dynamics, and be willing to question and change the ways in which supply chain planning and execution is done. However, this is far more difficult than it may appear. Our current supply chain management theories, algorithms and software systems are not designed to leverage the high granularity of information and level of visibility that RFID can deliver. I am confident that, in time, technological challenges surrounding RFID technology (such as standards, interoperability, reliability, etc.) will get resolved. However, until companies start understanding and addressing how RFID will transform supply chain dynamics, and how this will affect supply chain decision-making, the promise of real-time supply chain management and the associated benefits will remain out of reach.

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