Supply Chain RFID: Direction or Distraction?
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A Little Background

The fact that Wal-Mart is using RFID raises a series of questions: Is this a new direction? Can other retailers be far behind? Can any/every company benefit from the technology even if downstream retailers or wholesale/distributors are not using it? Is there some way to reduce supply chain costs without investing in RFID? These questions spawn other questions. Confusing and conflicting answers hinder understanding and lead to half-truths and *hype*. This essay will discuss RFID in the context of reducing supply chain costs. And it offers a strong remainder: Understand your processes first, then find the technology(s) to improve them.

First of all, about Wal-Mart. Companies supplying products to Wal-Mart are being asked to apply RFID tags to (at least) shipping containers. The mandate and a general lack of understanding about RFID causes all kinds of half-truths, untruths and general confusion. People who want to know what this is all about should go right to the source: http://www.walmartstores.com; enter *RFID* in the *Search* at the top of the page. Also look under *Supplier Information* on the home page. If you need a primer on RFID go to www.insightu.org/rfid.htm.

But is RFID, although a required **direction** for some, a **distraction** for many? As a consultant working with many wholesaler/distributors, manufacturers, and entire supply chains, I see two major problems. First people are not devoting time to really understand their business process that RFID (or any technology) can improve. Secondly, although somewhat related, the lack of understanding about RFID coupled with the glamour of RFID (new technology) is causing people to be distracted. The distraction results in people studying a *technology* rather than evaluating *business processes* that could and should be streamlined. The emphasis is on the *technology cure* rather than on the *process ailment.* The processes that can be improved deal with inventory control and product flow through the supply chain. If people understand the processes that can be improved then they may find that they can make those improvements today by using standard labels and bar codes. I'm not pro or con on either RFID or bar code. To me it's "tastes great vs. less filling" as the beer advertisement goes. My first point is that people need to understand how the information from RFID and/or bar codes can improve their business processes. Secondly, only exploring RFID without understanding its cousin, the standard product ID and shipment label (carrying bar codes) is only exploring half the story.

The truth is that, for many companies (other than Wal-Mart and a few others), the benefits provided by Electronic Product Code (EPC) RFID are simply not there **today**. Rather than trying to figure out how to use RFID **exclusively**, many more companies should be looking for ways to improve systems by whatever means; RFID and/or standard labels carrying standard bar codes. **A suggestion: companies should devote the same amount of time to understand RFID as it does to understand what bar code and standard labels could do to reduce costs today.** Supply chain efficiency really results from understanding the value of passing 100% timely and accurate information up and down the supply chain. The fact is that few supply chains or trading partners are passing product and shipment information between each other today. This shortfall is being addressed by the Global Data Synchronization Network under the guidance of UCCnet and by EDI Advance Ship Notices under the guidance of GS1. The misconception is that RFID, somehow, will magically *make* this happen. The fact is that the networks necessary to make EPC RFID work are more complex than the relatively simple communications networks and databases that companies are struggling with implementing today.

So, It is not **just** about understanding the RFID technology. It is about understand how to improve business processes.

The Fundamentals

Functionally, bar code and RFID are very similar. They are both forms of automatic identification and data collection (AIDC). Either one can be used to identify a person, place or thing. They are also used in similar applications to report on the flow of material through a supply chain.

RFID technology can be '*read only*' like a bar code or it can be '*read/write*', where the information in the RFID tag can be updated to new conditions (This is distinctly different from bar codes that carry only static information). But the read/write capability comes at a cost and is not currently part of the shipping carton or pallet applications at Wal-mart. Rather, another benefit, the fact that RFID tags do not require line-of-sight between the RFID tag and the tag reader (sometimes called an interrogator) is the one frequently mentioned. Theoretically, at least, you can read all the different tags in a pile of products on a pallet or in a shopping cart. However, there are some real limitations that must be addressed in system design. For example, because of the physics of different frequencies some RFID chips do not work well on RF *scatter* materials like metal cans or RF *absorbent* materials like liquids. The system designer can use tags operating at different frequencies, mounting materials and antenna systems to address these issues. Another design issue is that if one RFID tag is directly between the reader and another tag behind it, the shadow will hide one of the tags. There are also problems when two different RFID readers are located in close proximity. In this situation, reader 1 picks up tags that are actually passing reader 2 or the radio field from reader 1 interferes with the field of reader 2. So the bottom line is that solutions must be carefully engineered.

The fact is that RFID does offer many benefits but, like any new and powerful tool, the user must have an understanding of how to use it. People using RFID have a responsibility to obtain a working knowledge about it. This is the only way to avoid the *hype* that is frequently greater than the current capabilities of the technology. Furthermore, users must find a competent RFID system designer to address the many application and performance challenges. For more information, go to www.aidc100.org. See **OPINIONS and WHITE PAPERS,** *Truth in Technologies.* Also see the RFID non-technical primer RFID at www.insightu.org/rfid.htm.

Another fact: RFID is not a direct replacement for standard labels carrying bar codes. Here's why:
- Labels will always be necessary because a person needs to identify products at some level.
- Bar code is proven technology and there is a huge installed base.
- Read rates for bar codes printed according to specification approach 100%.
- RFID tags are significantly more expensive than bar code labels.

Why Do People Want To Use Either Bar Code Or RFID?

It is really about reducing costs. There are huge costs associated with ***not knowing:*** what something is, where it is, how much of it there is or what condition is it in (is something past it prime, or worse spoiled) At the foundation of the RFID *movement* is a great deal of research done by MIT, Procter & Gamble, Wal-Mart and others that show giant cost savings by knowing what, where, when and condition. **BUT** much of this is specific to Wal-Mart distribution and is based on the Wal-Mart communication network. The **network** is an integral part of the system. The cost savings will not exist today for organizations that do not have a network (such as GDSN) on which to pass the EPC information. In order to take advantage of many of the benefits, companies must have a database (such as UCCnet Data Pools) in which to match EPC number and other product information.

Do bar codes reduce costs? As much as 35% of a company's overhead is a direct result of misidentification and double-handling resulting from not knowing exactly what something is, where it is and how much of it is there. Quad II researched the errors and handling costs and found that almost all of them could be reduced or avoided if items were properly labeled. The study was done long before RFID was promoted for these operations. Since the time of the study, companies using standard labels and bar codes have enjoyed the reduced costs. An Excel™ spreadsheet calculating savings at a receiving dock is available at www.insightu.org; go to the "Free Stuff" section. Also consider an easy to read book, RFID Compendium: The Technology and Where to Use It

People considering RFID must evaluate it in the context of their own operations and for information exchange in their supply chain. See RFID Strategy -- The Three R's…
http://www.industryweek.com/ReadArticle.aspx?ArticleID=10472.

Clearing up Some Confusion

Most people are simply unfamiliar with RFID technology, its capabilities and the business problems it can, if applied properly, overcome. It is only natural for misunderstandings to occur when people only hear bits and pieces of information about one technology. So to begin with people must understand that no one technology like RFID is inherently better than another. RFID is only one of several automatic identification and data collection (AIDC) technologies. Others include bar code, magnetic stripe, and smart cards. Each of these AIDC technologies has different strengths and limitations. A short list of the differences between the AIDC technologies includes: encoding and reading complexity, cost, data density and the read/write capability. The AIDC technologies differ in the *way* they encode and carry data. Bar codes carry the data in a printed symbol. RFID uses a chip or electronic circuit. Magnetic stripes use a little piece of magnetic tape and smart cards use a computer chip with memory. People should also know that the **data** carried by any one of the technologies could be carried by any of the others.

At the risk of over simplifying some very complex issues and falling into the *bits and pieces* trap, I'll address several of the major points of confusion. Confusion about using RFID as a replacement for bar codes probably stems from people hearing about one application and then transferring what they heard to another situation. For example, Wal-Mart has been getting a lot of press lately about using RFID. People have heard about using RFID to replace bar codes, so people assume that Wal-Mart is going to replace bar codes with RFID at the checkout lane. The fact is that Wal-Mart is using RFID in the distribution centers to track pallets and cartons on pallets that they receive. Using RFID at the checkout is possible and is being tested (note limitations) but is still 2-5 plus years off…maybe.

Then there is confusion about the far reaching capabilities of RFID technology. People hear about the cost and value of the RFID *read/write* capability as mentioned earlier. Confusion arises because, as valuable as *read/write* capability is, people don't see the advantage in many supply chain applications. The fact is that the EPC tag used on cartons in the retail supply chain is the simpler and less expensive *read only* technology. Then there is concern about having to change all the product ID numbers to the EPC item identification number. The fact is that the supplier and product ID carried in the EPC RFID tag is the same as the global trade item number (GTIN) found in databases related to the U.P.C. bar code today. The same basic information carried in the EPC RFID tag could be carried in a bar code, exclusive of some inherent overhead characters in EPC that define the data type and data key partitioning instructions. Data bases using the GTIN could be used with EPC tags. The GTIN is the 14 digit number found in the bar code on products today. So, people can use the bar code today and if and when RFID is to be used there is a natural migration path.

The bar codes we see everyday provide a great deal useful information that is still not being used.

From PRO # 12345		

From
Comapny Name
Address

PRO # 12345
B/L # FR 1234890

Ship to:
   Company Name
   Address

Ship to postal code | PO NBR 098098
   Department

(420)80008

Order Number
Carton 9 of 20
Pallet 3 of 20

SSCC (00) 1 0065300 555555555 8

Wave
Lane

Shipment ID

No Name Company

BG 103   Qty. 20 ea.
Bright Green Stuff

(01)19421123450011

Carton ID

0 12345 67890 5

Item ID

To explain a little bit more about RFID, it involves a chip or circuit that will emit the radio message at a specific frequency through an antenna. An energy source, needed to power the chip, can come from a battery on board (more powerful and expensive, active tag) or from electromagnetic energy that is provided by the interrogator/reader (less expensive passive tag). Note that all EPC tags are categorized

as passive tags. Because of the circuitry, antenna and energy, RFID chips are more expensive than bar codes. Another issue is recycling the tags that contain metallic and silicon materials.
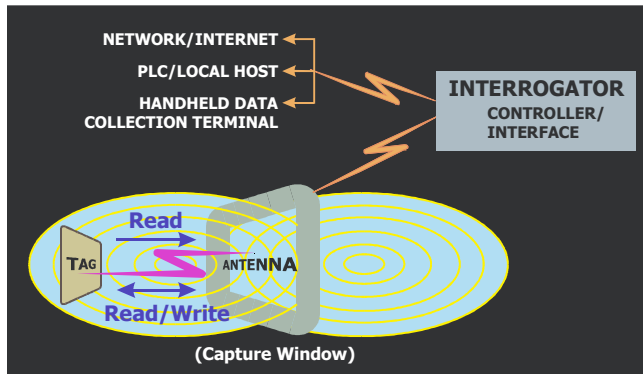
RFID tag antenna and Interrogator
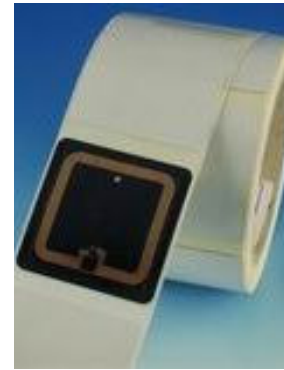
Label with RFID chip and antenna

What About The Hype?

So, how is RFID *hyped* to businesses? The hype is on the *technology*. Statements are made that "RFID" will (1) stop the counterfeiting of things like drugs, high-fashion clothes and critical fasteners for airplanes and (2) will drive down costs because it facilitates collaboration. The fact is (1) counterfeiting will really be reduced by the use of a special network and database, not the RFID technology alone; and (2) supply chain collaboration is possible today and is happening in many supply chains right now with bar code providing the primary input data.

Hype continues because of confusion. RFID does offer some different capabilities that could be useful in many applications, **but** people must be aware of the limitations and design demands mentioned earlier.

After evaluating the many benefit statements, it becomes clear that the real benefit does not just rest in the RFID chip. Many benefits come from the EPC **network** and **database**. **Benefits are limited if companies are not part of a network.**

According to Bruce Philpot, formerly with the UCC (now GS1) and who is President of BEP Creative Consulting, three *truisms* deserve comment:

1. *The bar codes are not going away at any level of packaging.*

2. *The Global Data Synchronization Network (GDSN), a product of UCCnet, addresses the issue of partners having the same (accurate) data. Use of Data Synch makes sense independently of RFID/EPC implementation (such as when partners rely on bar coded information and GTIN product codes in item databases). It won't make sense for enterprises to try and implement RFID/EPC without first having synchronized their data through UCCnet (or any of a number of authorized Data Pools.)*

3. *The 'Network' part of 'The EPC Network' is still poorly understood and - to my knowledge - not close to being in place yet. 'The Internet of Things' won't be a reality until the EPC Network is up and functioning.*

What To Do?

Gene Fedors, Director of RFID Education Programs for the RFID Technical Institute, offered some additional insights on working through the hype:

1. *The starting point for evaluating barcode, RFID, or any new technology's capacity for business benefit, should be with education. Unless you have an accurate and thorough understanding of a*

technology's capabilities, benefits and limitations, it is risky to undertake any technology enabled business process change.

2. *Barcode and RFID should not be thought of as individual component technologies, but as several technologies that must act together to deliver a viable, cost effective solution. If your barcode/RFID education program doesn't include a comprehensive look at all the "pieces of the puzzle", it's difficult to determine which solution approach makes the most sense.*

3. *Unlike barcode technology that is far along in its duty cycle, various RFID solution components are in different stages of functional maturity. The key to determining if RFID is suitable and justifiable for a particular supply chain application depends on the subset of solution components needed, and collectively where they are on this maturity curve.*

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