Key Considerations for RFID Pilots and Deployments

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Overview

Over the past several years, we have worked with many retailers (large and small) on their RFID pilots and early-stage deployments. Every pilot and deployment is different and presents its own opportunities and challenges. However, across all of these projects, we have recognized some common errors and pitfalls that retailers face. Accordingly, we have distilled these errors and pitfalls into a list of 10 deployment rules. While following these rules will not guarantee pilot or deployment success, they can hopefully make one aware of the issues and, thus, make a decision to either make a correction or intentionally accept the potential consequences of ignoring the pitfall. Although this is not an exhaustive list, the 10 rules represent the most severe and most common pitfalls.

Deployment Rule #1: It all starts with inventory accuracy …

Almost all retailers have inventory accuracy problems. These problems are multifaceted and occur at different rates within different levels of operations, often compounding upon each other. Many retailers do not want to admit they have a problem, some do not know they have a problem, and others try to solve the problem by throwing labor at it. In continued work with retailers over the past decade, we have seen inventory accuracy as low as 28% and as high as 80%. To put this in perspective: for a retailer with 28% accuracy, only 28% of their SKUs have accurate inventory in their system. How can any inventory system provide actionable business intelligence from data that is wrong more than it is right? Simply, it cannot. Most retailers operating with higher levels of inventory accuracy are spending significant resources to keep their accuracy high. In many cases, they have store associates barcode scan items as they are delivered to the store – removing each item from a box or hanger, scanning it, then returning it to the box or hanger. While practices such as these do serve to increase inventory accuracy, 100% accuracy remains elusive. Many retailers reading this will think: "WE are much better than this! OUR inventory accuracy is 98%." Some may even call the head of store operations to verify this 98% accuracy. "Yes" they will be told, "our inventory accuracy is 98%." The question that should be asked next, though, is "How do we know our inventory accuracy is 98%?" This question will be met with either silence or "The system shows our inventory accuracy at 98%." And, therein is the problem. Retailers either do not know, or they rely on bad data. Virtually *every* retailer has an inventory accuracy problem.

Across numerous retailers – department stores, specialty retailers, big-box stores, apparel, electronics, cosmetics, etc – our studies have shown the average inventory accuracy to be around 60%. Keep in mind that we have worked with some of the top retailers in the U.S. Thus, conceivably, 60% represents a positively biased sample. In contrast to this, during RFID pilot studies or early stage deployments, inventory accuracy has increased to more than 95%.[1]

The major business case for RFID adoption for retailers is improving inventory accuracy. Inventory inaccuracy is the root cause of many of the problems for today's retailers: out of stocks, excessive inventory, customer dissatisfaction, low margins, lost sales. By focusing on inventory accuracy, retailers have the opportunity for the first time in retail history to solve these nagging operational problems clouding strategic advancement and eroding potential revenue.

Only after solving the inventory accuracy problem can retailers turn their attention to more visible, alluring uses of RFID (such as magic mirrors, contactless checkout, etc.). Remember: nothing else matters if inventory accuracy is poor. You cannot have a customer kiosk to help customers locate the product if inventory accuracy is poor. You cannot use a system in the dressing room to help the customers if inventory accuracy is poor. And you especially cannot execute satisfactory omni-channel retail if inventory accuracy is poor. No matter what, your RFID initiative should start with inventory accuracy.

[1] In a later section, we will discuss why inventory accuracy is not 100%.

Deployment Rule #2: Decide what is important to you (beyond inventory accuracy)

Every retailer is unique – the number of items in a store, percentage of replenishment merchandise vs. fast fashion merchandise, demographics served, distribution network, etc. As a retailer, what are your pain points? What keeps you awake at night? Is it margins, sales, customer satisfaction, inventory position, shrink, turns, or simply knowing you could do a better job leveraging your unique competitive advantages? The problems you are trying to solve (beyond inventory accuracy) should drive your pilot and deployment plans.

Typically, retailers who primarily sell replenishment items focus on a reduction in out of stocks and an associated increase in sales. For those with more fast fashion product, a major use case is generally margins (i.e., trying to increase margins by reducing mark downs). Many of the more visible, customer-facing RFID use cases are capable of reducing mark downs and increasing margins through facilitating conversion and improving store execution.

For some retailers, shrink is a major issue. Shrink is a primary source of inventory inaccuracy; thus, reducing shrink can improve inventory accuracy. Interestingly enough, reductions in shrink are often incidental to most RFID inventory accuracy use cases. Being able to measure inventory with greater frequency and accuracy can automatically provide insight into the location and timing of potential shrink events.

The location of in-stock products can be particularly challenging to some retailers, especially those with extensive backrooms where only a small percentage of merchandise is on display. Shoe stores are a prime example of this category. Display compliance, for example, has proven to be a good use case. Specifically, for retailers who have only one shoe of each type on display and the inventory in the backroom, it is crucial for each type of shoe in inventory to be on display – otherwise, how would the customer know the shoe exists?

Simply verifying store execution, as in replenishment of items from backrooms to sales floors, can be difficult for some retailers. Ineffective replenishment can be particularly frustrating in that it is very easy and inexpensive to correct when accurately identified.

Regardless of your particular pain point, it is necessary to establish your set of key metrics before the project starts because, as we will discuss later, these will drive the scope and scale of deployment.

Deployment Rule #3: Involve all key stakeholders early on (depending on use cases)

Don't forget that RFID, when deployed properly, will permeate across silos and be pervasive through business units. After identifying the key use cases (see Deployment Rule #2), the next step is to identify key stakeholders. Naturally, this not only includes the project "team", but all influential individuals within the company. Beyond C- and VP-level executive sponsors your effort will most likely include members from store operations / management, DC operations / management, IT, supply chain, and loss prevention.

Who should "own" or "drive" the project? This answer depends on the culture of the company. In several cases, IT has owned the project. A word of caution here: when IT is the owner, be careful that it does not become an "IT project" only. The effort must be driven by the business problems it will solve, not by the novelty of a new technology. IT can own and drive the project, but should have the appropriate executive sponsors and stakeholders actively engaged in the project from an early stage. This can be tricky since RFID is often first discovered and investigated by those in a technology-related role.

In other cases, supply chain or loss prevention has owned the project. Store operations or DC operations have also been project owners. If the proper stakeholders are represented and the project is viewed as an effort to solve business problems, it can be successful with most any group owning and driving it.

When you have successfully identified key stake holders, an effective communication and training plan should be exercised. Common to standard change management practice, this should include the method and timing of only the necessary information per job role or tier.

When the team has been assembled and the plan is being developed for the project, do not be surprised if additional key use cases (and associated metrics) are uncovered. Often, the first set of use cases (from Deployment Rule #2) is not the last set. This is a good thing. While one must be careful of scope creep, it is best to recognize the candidate use cases up front. In many cases, additional use cases can be addressed without additional costs or effort. That is, RFID is a multi-use technology. When product is tagged, it is possible to address many use cases with the same tag and the same reader infrastructure.

Once the pilot is up and running, invite as many key stakeholders as possible to tour the process. Not only does this encourage buy-in, it can also bring unexpected assistance and prevent over-extending authority. Every pilot has exposed unforeseen issues, mostly related to internal processes that, through necessity or ingenuity, have deviated from standard operating procedures. Making the right people aware of these issues in a timely manner is essential.

Deployment Rule #4: Don't spend time on trying to answer the question: "Does the technology work?"

Several years ago, when RFID was in its infancy, we spent many hours proving that the technology worked. Can RFID read a pallet of product as it passes through a dock door portal? Can a handheld read a rounder or shelf of clothes? These and similar questions about the basic functionality of the technology have been answered.

While early adopters were right to be skeptical of the technology's performance, today's pilots should not waste time on trying to answer the question "Does the technology work?" Rather, the emphasis should be on the use cases and how well the technology helps solve a particular business problem. Here, the emphasis shifts from one of a pure technology question (does it work?) to a business question (does it solve this problem?) and a deployment question (how do I make it work for me?).

A word of caution: a technology not deployed properly will not work properly. This is different from "Does it work?" It works, but is not deployed properly. For example, one consideration in a store is taking inventory on the sales floor and in the backroom. If a retailer is using two types of technology to capture this information, such as a handheld and a transition door portal, one of these systems may be more effective than the other in giving accurate inventory (depending on the store layout, types of products, etc.). If one of the systems is less effective than expected, but the other system provides for the expected increase in accuracy, it does not mean that the technology does not work. Rather, the pilot did its job by demonstrating the best method of capturing the data in your environment (i.e., answering the question: how do I make it work for me?).

Additionally, don't think only of tags, readers, zones, and processes when ensuring proper deployment. The software providing actionable business intelligence is of vital importance as well. While RFID data is conceptually nothing more than a serialized barcode, when improperly understood, the differences in collecting the data can quickly confuse software logic. Make sure your software provider, whether internal or external, is capable of embracing the differences between traditional barcode data and RFID data. There are currently many competitive software providers who have developed, through trial and error over years of RFID pilots and rollouts, enterprise scalable software solutions requiring only minimal customization.

One last note about the technology: it is important to vet the appropriate reader systems for your operations, and to monitor and insure that the tags and tagged items are properly certified to support your required levels of performance.

Overall, the technology works when deployed properly. Do not spend time and valuable resources on answering this question. It works, move on!

Deployment Rule #5: Choose your pilot strategy

Choosing the pilot strategy is a crucial element of project success, but, for a reason that will become clear, is the step most often glossed over or treated superficially. Ultimately, the pilot strategy will determine the confidence one has in the results. First, let's examine some of the considerations in the pilot strategy, then, we will discuss their importance.

In choosing a pilot strategy, two broad strategies quickly emerge: should we tag all items in a few stores or a few categories in several stores? Of course, this answer depends on many things such as the size of the stores, the SKU mix, and the use cases being investigated. Some heuristics to guide this decision include: (1) if less than 50,000 items in a store, then tag all items in a few stores; (2) if more than 100,000 items in a store, choose two or more categories in several stores; (3) if between 50,000 and 100,000 items, then look at a combination of 1 and 2 – i.e., tag almost everything / several categories in several stores.

If tagging less than 100%, choose the categories wisely. Recall Deployment Rule #2: what are the key use cases driving this project? These use cases should provide insight into the category choices – i.e., what categories exhibit the problems we are trying to solve. Generally, some considerations for category selection include: (1) high velocity; (2) high shrink; (3) high turns; and (4) similar looking yet distinct SKUs (i.e., hard for associates to distinguish visually between many of the SKUs, but customers won't substitute SKUs). Again, let the use cases identified in Deployment Rule #2 drive the decision.

What happens if the categories are chosen poorly? RFID may not have an opportunity to address the key use cases; thus, a wrong decision is made regarding its ability to improve the situation. For example, let's assume a retailer wants to improve inventory accuracy (remember: this is a must for all retailers), reduce out of stocks, and increase sales. The category chosen for the pilot sells very few items in a typical week, is not a target of theft, and has so few items on the sales floor it is easy to see when the product is running low. This category may not have an accuracy, out of stock, or sales problem. Therefore, RFID cannot fix a problem that does not exist. The best case scenario is that these metrics are improved only slightly. It is likely the pilot would be deemed unsuccessful. In reality, of course, the use cases were addressed, but the category chosen was not ideal. Choose a category that gives the technology an opportunity to show what it can do. The ideal situation is to tag all items in a few stores. By doing so, the visibility provided by RFID can potentially yield insights into categories that were not considered trouble areas. Because retailers often do not know the depth of issues associated with each category, a strategy of tagging everything will provide visibility into all categories.

The caution with Deployment Rule # 5, and the reason that pilot strategies are often inadequately scoped, is balancing the level of effort with potential reward. Correctly overseeing a months-long pilot is hard work and can take discipline. Remember that you're trying to do something you've probably never done before: regularly count each serialized item within your test population at multiple locations across a variety of processes. Not only are shortcuts enticing, but there may be internal political reasons for keeping the pilot low-key. Mathematically, the smaller your category size, the more easily mistakes will skew your data. Unfortunately, smaller category sizes also often have lower turns, meaning it can take many months to collect convincing pilot results.

Deployment Rule #6: Use Cases should drive technology, NOT vice versa

Although it may seem obvious to suggest that use cases should drive technology, it is surprising how many companies get this wrong. Too many companies decide up front they will exclusively use handheld RFID readers, for example. While handheld readers satisfy some use cases, they do not satisfy all. Generally, for in-store RFID and the corresponding use cases, the following technology is suggested[2]:

- Cycle counting: handheld reader
- Replenishment / Out of stocks: receiving door portals, handheld readers, transition door (backroom to sales floor) portals
- Point of sale: fixed point of sale reader or handheld reader
- Loss detection / shrink: fixed portals at receiving and all employee and customer egress
- Locating product: handheld reader

A common approach is to only use handheld readers for the pilot because they are easy to deploy and require no infrastructure (i.e., they utilize a wireless network and have an independent power source that can be recharged). Simple is good, but it may prevent you from investigating the full set of use cases that are important to you (Deployment Rule #2). For example, for complete inventory management, a retailer must know when product is received and when it moves from the backroom to the sales floor. Although, theoretically, it is possible to use handhelds to read product when it is received and for moving product from backroom to the sales floor, in practice, execution failures remain prevalent. Store associates get busy and forget to use the handheld reader to read product coming into the backroom – the inventory count is now wrong (because the system does not know the product is in the store). The handheld reader cannot be located easily, so product moving from the backroom to the sales floor is not recorded – the inventory position (i.e., what is in the backroom, what is on the sales floor) is now wrong. Remember the following key to choosing the proper technology solution: as much as possible, reduce the human touch. We often refer to this as 'move to 0HIO'- zero (0) Human Intervention in Operations.

You will also need a method for re-tagging product in the store (for returned products, for lost tags, etc.). The best approach is an encoding station where the barcode for the product to be tagged can be read and the RFID tag accordingly encoded. A less attractive approach is a handheld reader for encoding. Of course, this depends on the tagging strategy utilized as well. If the tags are pre-encoded, then the solution simply has to read the tag and the barcode and associate them. In this case, a handheld may suffice.

A pilot is not the time to save a little bit of money on the technology – it is the time to really understand the technology and how it can be used to address the use cases. Cost can be considered in deployment as weighed against the benefits of using RFID. And, remember to stay focused on the fundamental use cases. Save use cases such as 'magic dressing rooms' for later.

[2] Zonal monitoring systems are an additional RFID technology method capable of satisfying all of the above use cases. We mention them separately due to the fact that, while there has been significant developmental progress made on these systems in recent years, extensive deployment within retail environments is currently not as widespread as the more traditional fixed and handheld solutions mentioned above. Nonetheless, zonal monitoring systems promise more continuous and ubiquitous automated inventory visibility and therefore should not be discounted.

Deployment Rule #7: Who will tag What, When, and How?

Ultimately, for RFID to be cost effective, tagging must occur at (or very near) the source (point of manufacture). For pilots, while tagging at source is ideal, it is possible to tag at the retailer or supplier DC or at the store. Keep in mind that tagging at the store will necessarily eliminate some of the use cases (such as DC shipping accuracy or store receiving accuracy). For large scale deployments, tagging at the DC or the store is not scalable, but it can work for pilots with very careful planning. A word of caution, though: if tagging at the store or DC, do not consider the additional costs of tagging (e.g., labor) when determining ROI – this form of tagging is temporary for the pilot only; for widespread use, tagging must be done at or near point of manufacture.

For tagging at the DC, product involved in the pilot is generally 'diverted' to a special tagging station(s) for RFID tagging. If tagging everything in one (or a few) stores, then product could be tagged at the DC before it is loaded on the truck going to the selected store(s). If tagging at the store, the targeted products will need to be set aside for tagging before moving to the sales floor. Please note the danger of this strategy is similar to the issue discussed in the previous section – if associates are busy or a mistake is made, some product may fail to be tagged properly. Historically, we have observed DC tagging execution failures in every pilot where tags are meant to be applied at the DC. Often, the DC associates are just simply unaware or uncertain precisely which cartons need to be opened and tagged. Another common reason for DC execution failure is that DC associates are often temporary hires measured on productivity, and may consciously defer the added tagging process to their downstream colleagues at the stores. As a result, many items assumed DC-tagged can arrive at the store untagged, and substantially skew data when undiscovered.

For a pilot you will also need to determine who will buy the tags. Will you purchase the tags for your suppliers to apply at source or at their DC? Will they pay for them, or will you let them add to the cost of the product? What types of tags will you use? Will you use the same tag for all types of products or different tags for various products? Choose a tag that works for the product you are planning to tag – do not buy the wrong tag just because it may be slightly cheaper. If a tag does not read or read well, you haven't saved anything with the lower cost.

Auburn University's RFID Lab ARC program is a tag performance testing program that ensures tags, products, and their environments work well together. Tag performance is tested in-situ in the stores, then in repetitive, scalable, benchmark testing in the lab, and then verified through numerous auditing back in the stores. The system has been found to very accurately predict performance of tags and tagged items in all manner of store data capture systems. In addition to directly testing tagged items, this method has produced freely available lists of tags appropriate for use in many different use-cases, and has prevented some questionable tag brands and styles from market deployment. The lists are available from the Lab's website at http://rfid.auburn.edu. The ARC program has been adopted by GS1 US as a guideline for a grading system for gauging tag performance.

Next, determine how the tags will be affixed. Generally, tags can be inserted into packaging, sewn into the clothes, affixed via adhesive (stuck) to the product or packaging, or affixed as a hang tag. Of special consideration here is the presence in the store of 'stray' tags that have become detached from the product they belong with. Remember that with barcodes, an associate probably would not pick a stray ticket off the floor or the back of a shelf and scan it into inventory (one would hope!), but with RFID, this stray tag can report itself,

unseen, as a whole, intact, saleable item. Naturally, if the product this tag belongs with is no longer in the store then this is an overstock. It is possible that stray tags such as these may go undiscovered for extended periods, so be wise in your methods of attaching the tags to the products. Hangtags are commonly more prone to detachment. Because RFID does not need line of sight to read tags, this problem may be completely eliminated when tags become integrated into the product.

Finally, decide how item association will be made – i.e., when/where/how the tag will be encoded. Tags can be purchased pre-encoded and the association made at point of attachment (using a 'scan-read' approach of scanning the barcode, then reading the tag and associated the two in software). If tags are not pre-encoded, then they will need to be encoded shortly after being applied to the product (e.g., before it leaves the DC). This allows utilization of use cases upstream of the store such as DC shipping verification or store receiving verification. Encoding can be singulated (i.e., tags are encoded one at a time) or bulk encoded (i.e., many tags are coded almost simultaneously). Bulk encoding works when you have the same SKU in a carton, such as the same color/size/style of a shirt in a box (the same SKU) – all can be encoded together. If mixed SKUs are put in a carton, the tags will need to be encoded before being packed.

Deployment Rule #8: Use the Big Bang approach for initial tagging

For initial tagging, tag everything (i.e., within the scope of the pilot) at one time. Throw a 'tagging party' to tag everything in the store. Generally, a tagging party involves a crew working during off hours (e.g., during the night) tagging product in the store. Depending on the number of items, this may take a couple of nights. Simultaneous with the tagging party, the product staged to come to the store should be tagged (if tagging at source or DC).

For a few days after the tagging party, a dedicated resource (one or more people) will need to carefully audit the store to ensure that all product is tagged and correctly associated in software. A common mistake when associating pre-encoded tags to items – by scanning the RFID tag's barcode (reproduced on the tag label) and associating it to the barcode of the product – is to assume that the RFID tag's barcode always identically matches the RFID tag's code that it transmits to the reader when read. If the software that controls the printing of each tag's transmitted code onto the tag's label as a barcode does not adequately verify each tag, then the potential exists for mis-associated products that will require many frustrating labor hours to hunt down and correct.

Do not use a 'flow through' tagging strategy. Although some retailers have tried this, we have yet to see a successful application of the flow through strategy. In this strategy, product is tagged at source or DC and then allowed to 'flow through' the store (without an initial tagging party at the store). Theoretically, over time, the non-tagged product sells out and eventually everything (within the scope of the project) should be tagged. In practice, it doesn't work. Two major factors affecting it are: How long does it take for non-tagged product to sell out, and when does a store know when everything is tagged (i.e., non-tagged product is gone)? Unfortunately, the answers to both questions are indeterminable. Some retailers have used a hybrid-approach where tagged product starts flowing through the system and then, at a certain point (e.g., 80% of product is tagged), a tagging party is used to tag the remaining items. Two considerations with this approach though: (1) how do you know when you have reached this 'certain point'? (2) It is very laborious to sort through products to determine what is tagged and what is not tagged and then tag the non-tagged items. The only way to know when all product is tagged and the pilot can begin is to use the Big Bang approach, and then take the time to carefully audit the results.

Deployment Rule #9: Running the pilot

Always use controls stores. Control stores are stores that are similar in size, sales, and geographic region to the test stores involved in the pilot. Control stores are essential. When a pilot starts, both the pilot and control stores will be baselined for the key metrics (e.g., accuracy, out of stock, etc.). Without control stores, we may make the wrong decisions regarding the success of the pilot. For example, after eight weeks of using RFID, sales only improved 1%. With this piece of information only, a retailer may decide 1% is not worth the effort. However, if control stores are used and, during this same eight week period, sales declined by 5%, then a totally different picture emerges. Now, the net improvement in the pilot stores is 6% (1% plus the 5% that they didn't lose in sales). A 6% net increase would likely suggest a different evaluation of the success of the pilot.

Generally, you will need at least two pilot stores and two control stores. The fewer categories you tag, the more stores you need to include. Also, for the categories, you need enough SKUs and enough sales to draw conclusions from the pilot. 'Enough' is usually a few hundred SKUs consisting of several thousand items. Spend one to two months establishing the baseline for the pilot and control stores. During this time, you will use RFID in the pilot stores to count inventory, but do not use the RFID data to correct the system or to create replenishment reports – only use it to count. In the control stores, you will need to take inventory by hand (i.e., barcode) to establish inventory accuracy and out of stock baselines, in particular. Establishing baselines is necessary to evaluate improvement in the pilot stores. After establishing the baselines, turn on the RFID system in the pilot stores (i.e., allow RFID data to update the system counts, generate replenishment reports, etc.). Keep the system in place a minimum of two months; preferably four to six months. The key is to keep the system in place long enough to establish patterns and trends of use and improvement. If your products have high seasonality, then the pilot should span at least one season. Also, be aware that many barcode item counts performed in retail stores today do not count every item, some approximate by counting the first item in a row and assuming all inventory behind it is of the same type. If your pilot includes product categories with high SKU complexity, these approximate hand counts can skew your baseline data.

In any experimental setup like a pilot, a control is necessary to establish a sufficient quantity of stable, protracted, and comparable data not subject to the test variables. Normally, a control store would be another store that sells the same items using the same process at very similar volumes. Of course, two stores are seldom identical but efforts should be taken to ensure that in spite of most differences, the two sets of data are substantially comparable and differences are explained by mostly the test variables executed in the test store. Any control selection should be independent of the test selection. Often, internal stakeholders who wish to thwart an RFID pilot's efforts will cite the differences between control and test stores when arguing to discount the pilot's results.

While using two or more stores as a comparison is ideal, it may also be possible to use items within the same store; however, this is generally *not* recommended and results can therefore be more open to interpretation. For the purest result, the control and test items need to function entirely independently of each other, and this is seldom the case within the same store. Items in the same store are often either competitive or complementary and therefore affect each other's sales patterns. Additionally, if the control items differ from the test items in appearance, or position then their appeal to the customer may cause differences in both purchasing or shrink patterns within the same store.

Finally, without some type of control group, it is difficult to conclude whether the magnitude of change (e.g., to inventory accuracy) is due to RFID or simply to the Hawthorne Effect (i.e., people modifying their behavior when they know they are being watched or are participating in an experiment/test). A control and test store is ideal in that people will most likely behave similarly in both stores, thus the Hawthorne Effect would be consistent across the stores, and any changes can be more easily isolated and attributed to RFID. Without control stores, we do not know if RFID caused the changes or if the people simply modified their behavior and did a better job.

Choosing which stores to use for the pilot can cause much internal debate. Regardless of who gets the final say, make sure the stores are easily accessible by the people who need to pay the most attention to the pilot (most often store operations). If simple and quick travel to the stores is impossible, be prepared to set up camp at nearby hotels. Much of a pilot's success is determined by the level of hands-on oversight the pilot receives.

Again, control stores are essential. Don't be tempted to take shortcuts.

Deployment Rule #10: Perform audits during the pilot

During the pilot, it is necessary to periodically perform audits. First, perform audits of the store execution. Are cycle counts being performed completely and on time? Are products being retagged properly (i.e., from returns, lost tags, etc.)? Second, audit the read rates. What are the effective read rates? For items less than 100%, what are the sources of the errors (e.g., bad tags, weak tags, missing tags, etc.)?

The Auburn University RFID Lab has been performing inventory audits on several categories across retailers for several years. This data has shown that inventory accuracy of 100% is reasonably difficult to achieve due mainly to endemic, often non-RFID related store and supply chain operation processes, or, more simply put, execution failures. In apparel, for example, a more realistic inventory accuracy number when using RFID is 95%.

Errors in apparel, ranked most-common to least-common, are:

1. No tag on a product that is supposed to have a tag – approximately 2.3% error split evenly between suppliers not tagging things they're supposed to tag, and retailers not reapplying tags to returned items (the opposite is also true, see No. 3 below). A minor portion of this total consists of items that have simply lost their tag – often a hang tag.
2. Poor performing tags – approximately 0.3% error when proper performance testing and product tagging compliance monitoring are maintained, can be 30% or more for stores not monitoring product tagging or requiring performance and quality testing for tagged items.
3. Double tagged items – approximately 0.5% and mostly due to store associates tagging returned items.
4. Dead tags – approximately 0.35% split evenly between damaged and undamaged tags.
5. Incorrectly encoded tags – approximately 0.3% with the majority showing an attempt to match the UPC with the correct EPC, but getting it wrong. Most often an error by the supplier or their integrator.
6. Stray tags – approximately 0.1%. Stray inlays are tags that have become separated from their products and remain on the shelf or on the floor reporting themselves to any reader that scans the area as inventory that's present and accounted for. Along with out of stocks, these frozen in-stock items are commonly considered one the worst kinds of inventory inaccuracies.

Finally, audit for anomalies. These are often uncovered during the store execution and read rates audits, but should be noted and audited separately at a later audit to ensure they are indeed anomalies and not systemic errors.