RSR
Retail Systems Research

A Deep Dive Into Retailers' Views About RFID And The Internet Of Things

Benchmark Report

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Executive Summary

Key Findings

It's been a few years since we've conducted a study on the Internet of Things, and much has changed in that time. The lingering effects of a global pandemic, widespread supply chain shortages and growing economic uncertainty have caused retailers to examine signaling technologies (RFID, beacons, anything Bluetooth-enabled etc.) – *and the visibility they bring to various areas of the enterprise* - with all new interest.

The following are some of the highlights of what we found:

- Retailers have no shortage of external **Business Challenge**s pressing in on them, with the pressure to cut costs and the need to differentiate chief among them. Customers are not even the slightest bit empathetic to supply chain interruptions, they simply want what they want and will buy from whomever can reliably deliver. As a result, RFID-based technologies are rapidly gaining retailers' interest, as 95% say the ability to reliably know where their inventory is – and relate accurate information about it to shoppers - is becoming a key component to their digital transformation strategy. We begin this analysis on page 6.
- Despite all the various **Opportunities** these new technologies can address, retailers' imaginations for what IoT can and will help them achieve from an operational standpoint remain squarely transfixed on the supply chain. RFID – and the Internet of Things, as a whole – are a way to get a handle on inventory and fulfillment issues first and foremost. The ability to see into the ways shoppers shop is appealing (both in the physical AND digital worlds), but four of the top five options they choose relate directly to supply chain (page 11).
- To get the full measure of the benefits that IoT technologies can offer, retail leaders must think beyond the transactional mindset that is so systemic to the operational model. That turns out to be the single greatest internal roadblock to IoT adoption (**Organizational Inhibitors**, page 14): 43% of retailers across performance groups and verticals agree that that "*Business leadership doesn't understand the benefits of Internet of Things*.
- As it relates to the **Technology Enablers** at hand (page 19), over-performers are more interested in using predictive models to <u>automate</u> preventive actions than they are to <u>recommend</u> preventive actions. IoT adoption is a work-in-progress across the retail industry, but when we asked retailers how far they are on the adoption curve, Retail Winners clearly are being more aggressive (To wit: 62% of over-performers are already using events-based alerting and exception management, compared to only 24% of average and underperformers.) FMCG retailers are also looking to these tools to address waste issues, and a majority of ALL retailers have near term investment plans in IoT solutions to *finally* address recycling and sustainability measures in a meaningful way.

Based on our data, we also offer several in-depth and pragmatic suggestions on how retailers should proceed. These recommendations can be found in the **Bootstrap Recommendations** portion of the report.

We certainly hope you enjoy it,

Brian Kilcourse and Steve Rowen

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Research Overview

The Internet Of Things

The last time we studied the Internet of Things (IoT) was in 2019. Three years – *in normal times* – is a long hiatus between research surveys in the retail industry. What we found at that time was that the needle was moving *slowly* on retailers' awareness and appetite for IoT technologies (which we define as all signaling technologies - RFID, beacons, anything Bluetooth-enabled and geolocation technologies - that can be used to track and report the status of people, products, and things in the retail environment). *Very* slowly. So, we decided to let the topic simmer.

However, for two of those three years the world was disrupted by a global pandemic which, as it turns out, had far reaching impact.

Supply chain woes now dominate the headlines. Product shortages, price inflation and uncertainty abound. So, when we set out to study the Internet of Things at the beginning of 2022 we had a going-in expectation that retailers would be somewhat more engaged. What we found however, right from the start, was that their ears and eyes are **wide** open to the possibilities (Figure 1), particularly as it relates to these tools' ability to gain visibility into their inventory and drive down the cost of managing it effectively.

Figure 1: General Attitudes Are Favorable

Please indicate the degree to which you agree or disagree with the following statements about RFID:

- Strongly Agree
- Agree
- Somewhat Disagree
- Strongly Disagree

Statement	Strongly Agree	Agree	Somewhat Disagree	Strongly Disagree
The inventory visibility and operational improvements that RFID enables can trigger huge saving for us	47%	42%	8%	3%
RFID will one day become a key component of our digital transformation efforts	44%	51%	3%	2%
RFID is currently a key component of our digital transformation efforts	44%	41%	12%	3%
Early experiments with case and pallet-level RFID tainted our opinion of the efficacy of the technology	33%	33%	24%	11%
We can't currently make intelligent use of the data item-level RFID provides	30%	25%	28%	17%

Source: RSR Research, March 2022

The fact that 95% of retailers also see RFID as a key component to their digital transformation efforts is staggering, *especially* when one considers that 55% agree that they currently can't make any intelligent use of the data that item-level RFID provides.

Quite simply: **retailers believe** - even if they are yet to experience a tremendous amount of the benefit. This will be a major theme of what unfolds in the pages of the research.

A Focus On Shoppers

While retailers have high hopes for the big-picture-ways these tools can help them in their day-to-day, some of the most interesting data in this research surrounds the specific ways they think IoT can and will shape the conversation they have with *shoppers*.

As we see in Figure 2, the ability to deliver on omnichannel orders is absolute top of mind in the current supply-chain-gone-wild environment.

Figure 2: And The Opportunities Are Far Reaching

Opportunities for impact from deploying Internet of Things solutions to the following customer-facing processes

Legend: ■ Lot of Value ■ Some Value ■ Little to No Value

Process	Lot of Value	Some Value	Little to No Value
Omnichannel fulfillment	63%	34%	4%
Post sales service engagement	61%	37%	3%
Brand/product authentication	60%	32%	9%
Customer service and support	59%	39%	2%
Customer acquisition	59%	32%	10%
Customer engagement outside of the store	58%	38%	4%
Personalized recommendations and promotions	54%	37%	10%
Self-checkout	50%	35%	15%
Optimized way to share product info in store	49%	38%	13%
Customer engagement in stores	49%	38%	13%
Connected fitting room	32%	40%	28%

Source: RSR Research, April 2022

Customers are getting frustrated with inventory issues, fulfillment issues, lack of service – the list goes on and on. The good news is that retailers recognize this, and now concede that they need all the help they can get. In the current climate, this data makes perfect sense, as we'll examine in

more detail in just a moment. But first, an explanation of a term we'll be using frequently throughout this research.

Retail Winners And Why They Win

In our benchmark reports, RSR frequently cites differences between retailer over-performers in year-over-year comparable sales and their competitors. We find that consistent sales performance is an outcome of a differentiating set of thought processes, strategies, and tactics. We call sales over-performers "Retail Winners."

RSR's definition of these Winners is straightforward. Assuming industry average comparable store/channel sales growth of **7 percent**, we define those with sales above this hurdle as "*Winners*," those at this sales growth rate as "average," and those below this sales growth rate as "*laggards*" or "also-rans."

One trend that will emerge throughout this report is that Retail Winners are viewing the Internet of Things through an entirely different lens. Take, for example, the data we just saw in the chart above, where retailers – en masse – identified the opportunities they believe IoT will have on customer-facing endeavors. When viewed by performance, we can see it is those whose sales are *already performing best* that are driving these trends in completely unique ways (Figure 3).

Figure 3: But We Quickly Learn That This Is A Winners' Game...

Opportunities for impact from deploying Internet of Things solutions to the following customer-facing processes

■ Winners ■ Others

Process	Winners	Others
Brand/product authentication	71%	46%
Post sales service engagement	69%	50%
Omnichannel fulfillment	69%	54%
Customer acquisition	69%	46%
Customer service and support	67%	48%
Optimized way to share product info in store	62%	33%
Self-checkout	60%	37%
Personalized recommendations and promotions	59%	48%
Customer engagement in stores	59%	37%
Customer engagement outside of the store	57%	59%
Connected fitting room	41%	20%

Source: RSR Research, April 2022

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We'd never asked about the role these technologies can play in brand authentication before, and much to our surprise, it is where the best performers see their biggest customer-facing opportunity. Retail Winners view these tools' ability to convey, "Trust us – this product is *exactly* what we say it is" as not only a real boon for shopper loyalty, but they also see IoT tools as able to help 1) acquire new customers in the first place 2) deliver on fulfillm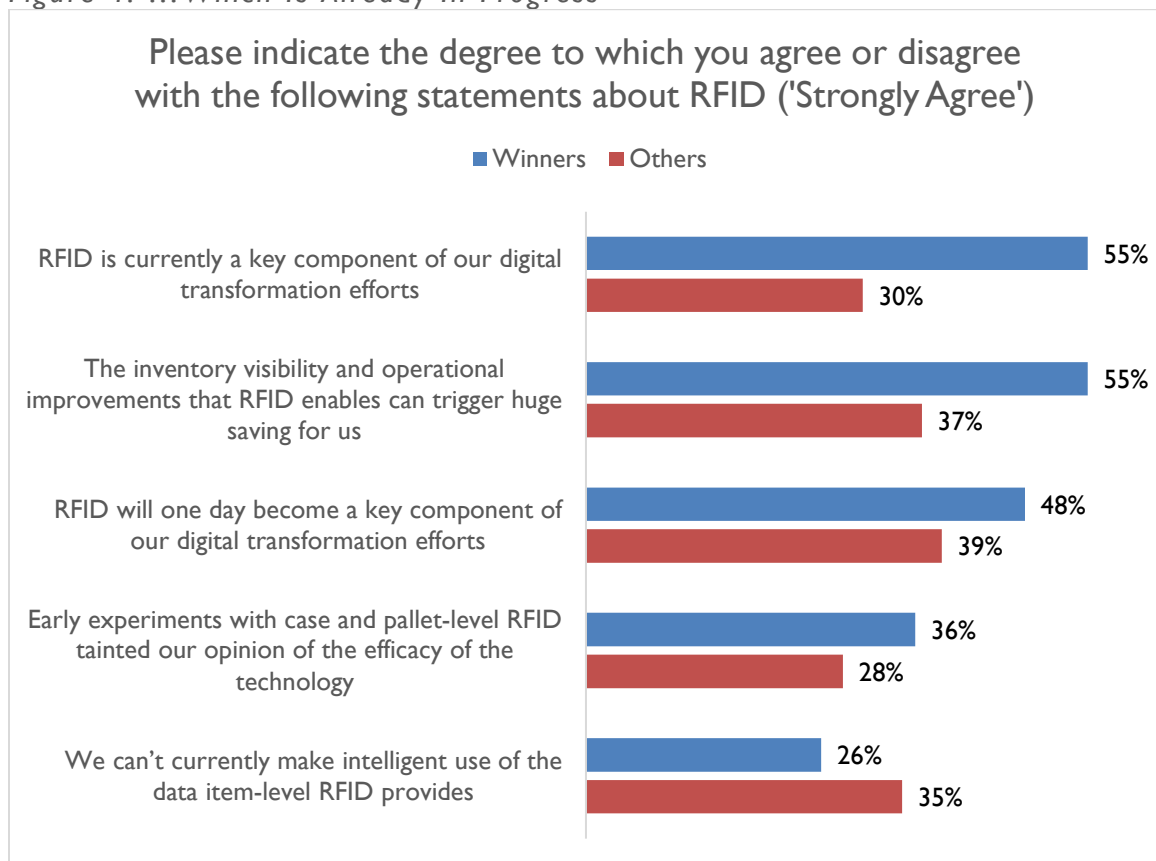ent promises across multiple channels and 3) offer post-sales service in significant numbers (69% for each). This is unseen territory, and it offers a direct line into how much Winners' thinking varies from that of their average and underperforming competitors. They are MUCH more eager to see what the Internet of Things can do – not just for their internal operations – but as a larger part of their brand promise to their shoppers. This is fascinating.

A Work In Progress

Why would Retail Winners have such an elevated view of RFID, in particular? As we see in Figure 4, the answer becomes quite clear: because they have already been using it for longer than their average and underperforming peers.

Figure 4: …Which Is Already In Progress

Please indicate the degree to which you agree or disagree with the following statements about RFID ('Strongly Agree')

■ Winners ■ Others

Statement	Winners	Others
RFID is currently a key component of our digital transformation efforts	55%	30%
The inventory visibility and operational improvements that RFID enables can trigger huge saving for us	55%	37%
RFID will one day become a key component of our digital transformation efforts	48%	39%
Early experiments with case and pallet-level RFID tainted our opinion of the efficacy of the technology	36%	28%
We can't currently make intelligent use of the data item-level RFID provides	26%	35%

Source: RSR Research, April 2022

Winners are more apt to believe in RFID's right-now benefits because more of them have already seen enormous savings in their operational improvements and gained visibility into their inventory. As a result, the past is already prologue for them. They like what they've seen and are driving faster towards an IoT-enabled future.

Methodology

RSR uses its own model, called The BOOT Methodology© to analyze Retail Industry issues. We build this model with our survey instruments. See Appendix A for a full explanation.

In our surveys, we continue to find the kinds of differences in thought processes, actions, and decisions cited above. The BOOT helps us better understand the behavioral and technological differences that drive sustainable sales improvements and successful execution of brand vision.

Survey Respondent Characteristics

RSR conducted an online survey in January 2022 and received answers from 104 qualified retail respondents. Respondent demographics are as follows:

- **2019 Revenue (US$ Equivalent)**

Less than $250 million	2%
$250 million - $499 million	9%
$500 million - $999 million	38%
$1Billion to $5 Billion	38%
Over $5 Billion	14%

- **Products sold:**

Fast moving consumer goods	25%
Apparel, footwear and accessories	18%
Hard goods	16%
General merchandise	33%
Brand manufacturers	8%

- **Headquarters/Retail Presence:**

	HQ	Retail Presence
USA	99%	99%
Canada	0%	38%
Latin America	0%	20%
UK	0%	18%
Europe	0%	24%
Middle East & Africa	0%	8%
Asia/Pacific	1%	12%

- **Year-Over-Year Sales Growth Rates** (assume average growth of 7%):

Worse than average ("Laggards")	6%
Average	38%
Better than average ("Retail Winners")	56%

Business Challenges

What Now?

Now that we have a clear idea of what retailers perceive to be the big picture for the Internet of Things, it's time to uncover the challenges coming at them from both inside their organizations – and from the outside world.

Chief among those challenges is that only a quarter of retailers have a comprehensive strategy in place. For the vast majority, these are piecemeal projects that must ultimately be strung together (Figure 5) in a cohesive way. This is (and will be) no small feat.

Figure 5: Lots Of Work To Be Done

What is your company's current level of experience when it comes to Internet of Things technologies?

■ All Respondents

Category	Percentage
We have a comprehensive strategy in place for managing sensor-based capabilities, and are beginning to implement that strategy	28%
We have multiple, mature sensor-related projects and use them to drive capabilities that differentiate us from our peers	22%
We have successfully implemented at least one sensor-based project, and are actively seeking new projects	20%
We are undergoing education on the opportunities (including some pilot projects)	15%
Different internal organizations are piloting, implementing, or rolling out sensor-related projects, but there is no central management of the capability	11%
We aren't doing anything related to Internet of Things	4%

Source: RSR Research, April 2022

It is encouraging to learn that nearly a quarter of retailers perceive the multiple, tried-and-true sensor-related projects that they've already got going on as having the ability to set them apart from their peers. The mere fact that only 4% of retailers aren't doing anything IoT-related is also a very positive indicator. However, when taken in sum, nearly half of the retailers we surveyed (46%) say they either have just one project underway, something currently in pilot, or are still in the learning phase of what the opportunities may be.

It is important to keep in mind that, for the retail world, at large, at least, these are early days. While some of these technologies have been around for a long time (RFID was discovered during WWII, for example), their use in the modern age has been very limited so far.

However, when we examine the challenges retailers think IoT can help them meet head-on, they clearly believe these are opportunities worth pursuing (Figure 6).

Figure 6: And The Benefits Are (Potentially) Vast

Please select the TOP THREE (3) business challenges your company faces that drive your interest in the Internet of Things:

■ All Respondents

Challenge	%
Differentiating ourselves from our competition	40%
Pressure to cut our operational costs	40%
Need for more speed and agility in our operations	38%
Consumer price sensitivity, which limits our ability to retain or maintain margins	33%
Consumer dissatisfaction caused by lack of integration and consistency between selling…	27%
Uncertainty about how consumers want to engage with us	26%
Pressure to grow our business faster	24%
Increasing disparity between our technological capabilities and consumers'	23%
Need for automation to compensate for labor shortages	18%
Need for more interaction with consumers outside of the store	17%
Growing levels and costs of inventory	13%

Source: RSR Research, April 2022

In aggregate, four out of ten retailers think IoT is going to help them provide a differentiated experience than that of their competitors. This is a *direct* result of the current climate, whereby product shortages – worldwide - have brought the following truth to bear: the retailer who can accurately stand behind inventory availability is the retailer who will win not just the sale, but also the lasting recollection of the consumer as "the one who could help me solve my problems few others could."
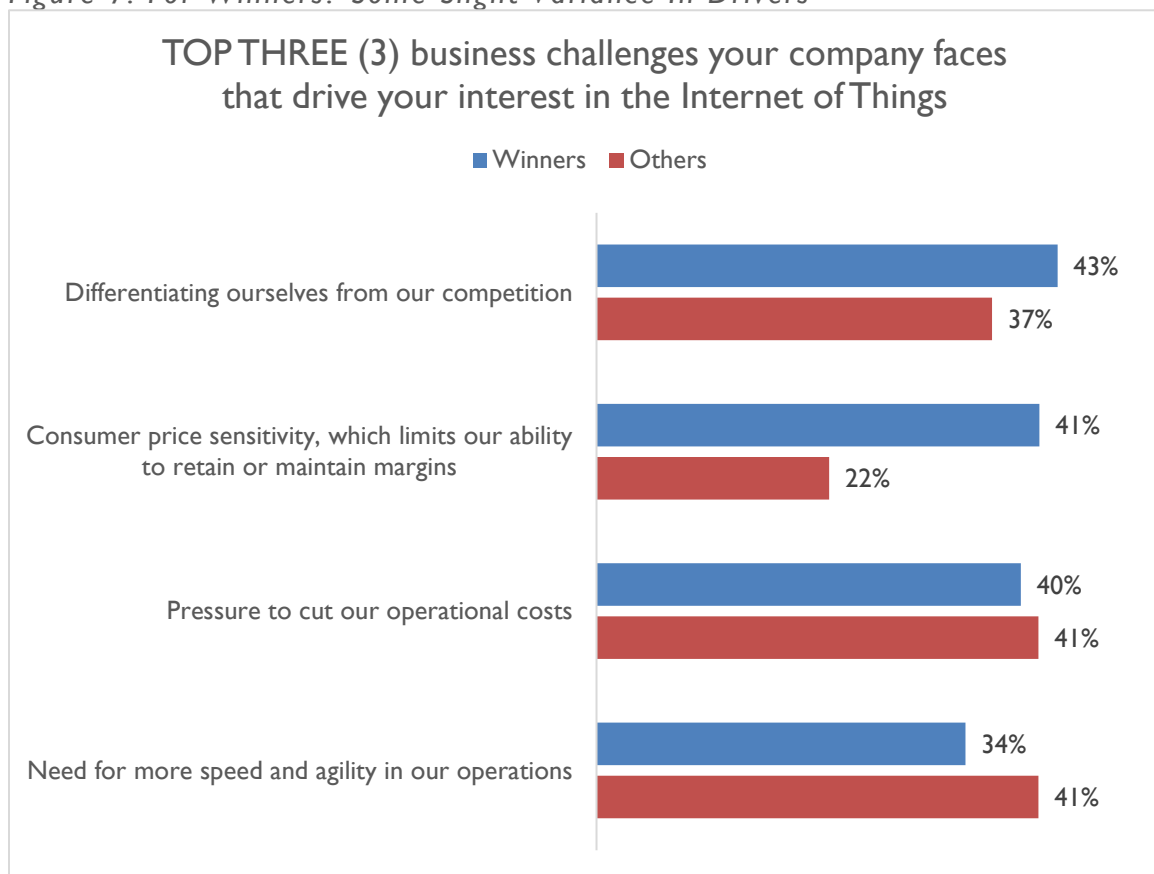
Once-staple products have increasingly become unavailable, and moreover, with little explanation that can satisfy the average shopper. The result (deservingly or not) is anger toward the brand. No shopper likes having their time wasted with a trip to a store for a product that the website said was in stock – only to find the shelf bare. And no one likes placing an online order with a promised delivery date that only keeps getting pushed further and further into the future. Retailers need to know what they have to fulfill their end of the promise, especially once the consumer has trusted them with the "buy."

But retailers don't stop there: they also think these tools afford a real opportunity to drive down operational costs – something we were somewhat surprised (and quite frankly delighted) to see. Whatever lingering effects remain from Walmart's early RFID swing-and-miss mandates seem to have faded quite nicely as the years have rolled on. Retailers, in sum think the sensors, tags, and readers of the future will make them altogether more fit for business. This is excellent news.

Winners' World

Portions of this very same data become even more interesting when viewed by performance (Figure 7, selected differences).

Figure 7: For Winners? Some Slight Variance In Drivers

TOP THREE (3) business challenges your company faces that drive your interest in the Internet of Things

■ Winners ■ Others

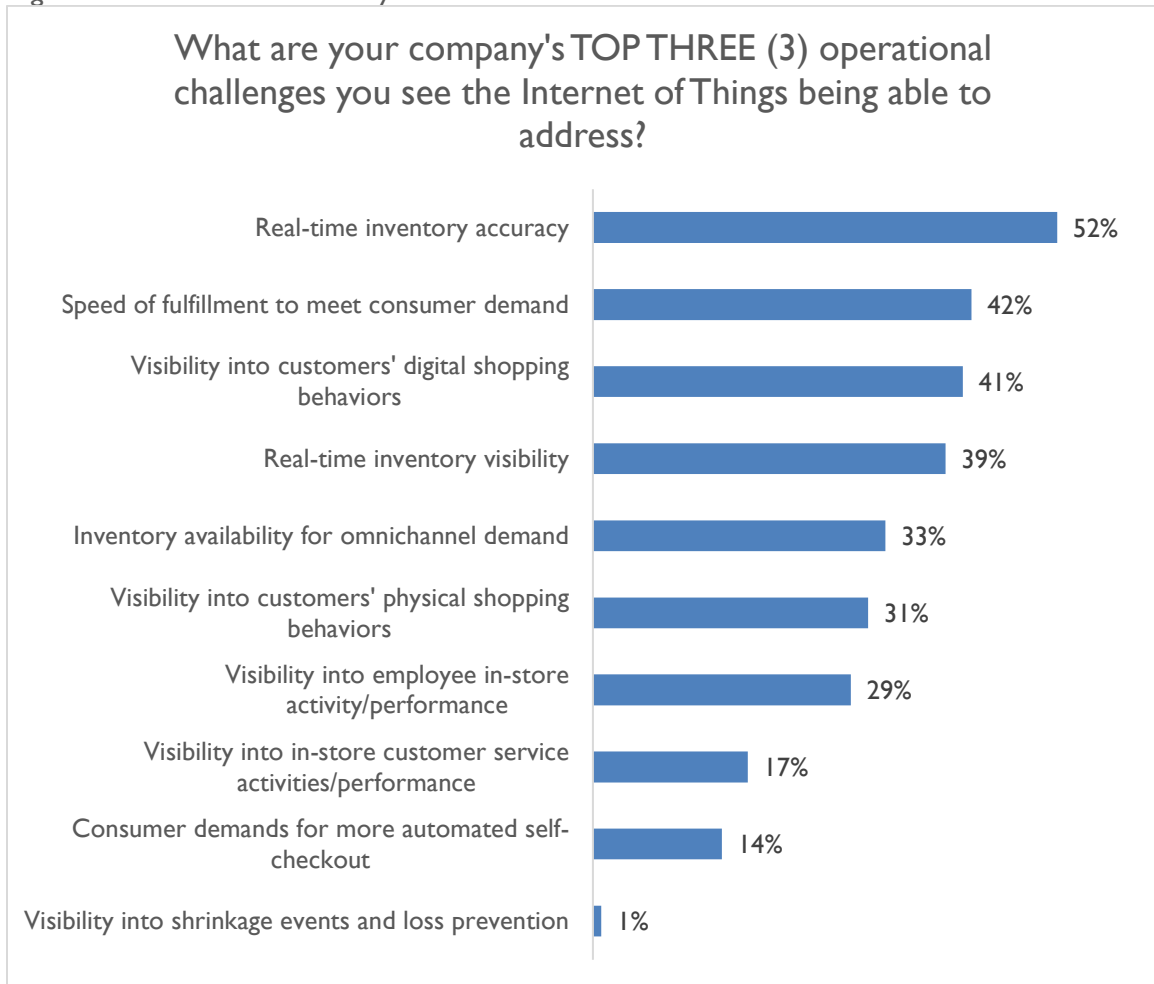|	Winners	Others
Differentiating ourselves from our competition	43%	37%
Consumer price sensitivity, which limits our ability to retain or maintain margins	41%	22%
Pressure to cut our operational costs	40%	41%
Need for more speed and agility in our operations	34%	41%

Source: RSR Research, April 2022

Once again, we see areas of "more" when it comes to Winners. We've already established that they've been using these tools for longer, and as a result, they have slightly more confidence IoT technologies will help them differentiate better, and much more confidence it will help them better react to increases in consumer price sensitivity.

In an era when price inflation appears to be without horizon, Winners see this becoming a more vital issue each growing day.

Stay On Target

Despite all these various opportunities, retailers' imaginations for what IoT can and will help them achieve from an operational standpoint remain squarely transfixed on the supply chain. RFID – and the Internet of Things, as a whole – are a way to get a handle on inventory and fulfillment issues first and foremost. The ability to see into the ways shoppers shop is appealing (both in the physical AND digital worlds), but four of the top five options they choose relate directly to supply chain matters (Figure 8).

Figure 8: Still An Inventory Issue

What are your company's TOP THREE (3) operational challenges you see the Internet of Things being able to address?

Challenge	%
Real-time inventory accuracy	52%
Speed of fulfillment to meet consumer demand	42%
Visibility into customers' digital shopping behaviors	41%
Real-time inventory visibility	39%
Inventory availability for omnichannel demand	33%
Visibility into customers' physical shopping behaviors	31%
Visibility into employee in-store activity/performance	29%
Visibility into in-store customer service activities/performance	17%
Consumer demands for more automated self-checkout	14%
Visibility into shrinkage events and loss prevention	1%

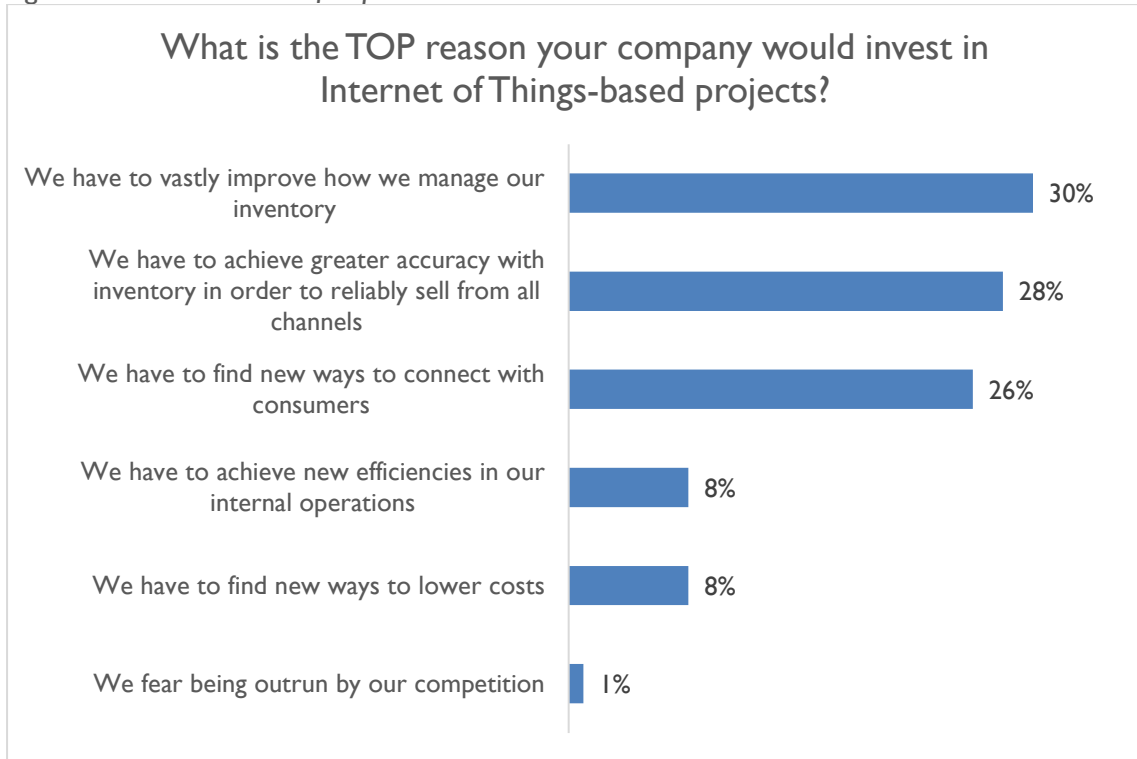*Source: RSR Research, April 2022*

As if we needed more proof of this fact, one must only look to Figure 9 - when we force retailers to pick the *one* reason they'd need to invest in IoT most - to see where they have focused their gaze.

Nearly one in three know their need to manage inventory requires serious overhaul, and another near-third know they simply cannot sell what they cannot reliably see.

What is the TOP reason your company would invest in Internet of Things-based projects?

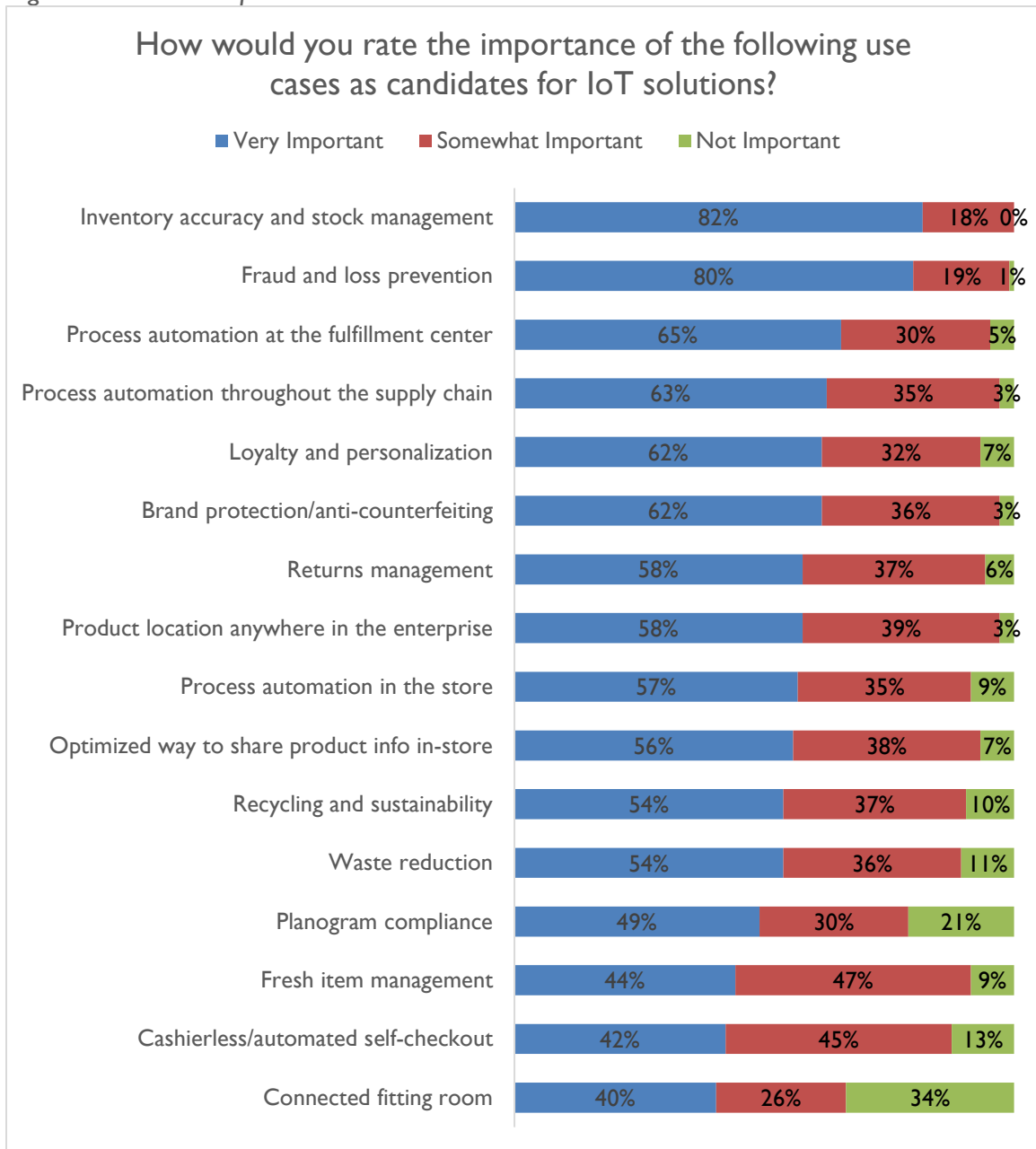| Reason	Percentage
We have to vastly improve how we manage our inventory	30%
We have to achieve greater accuracy with inventory in order to reliably sell from all channels	28%
We have to find new ways to connect with consumers	26%
We have to achieve new efficiencies in our internal operations	8%
We have to find new ways to lower costs	8%
We fear being outrun by our competition	1%

Source: RSR Research, April 2022

Let's now dig deeper into the specific Opportunities that resonate most with their needs.

Opportunities

High Value Targets

We've already seen that retailers hold high regard for the fact that Internet of Things technologies will aid in their supply chain matters. But which use cases hold the most promise? The value ascribed in the "very important" list is impressive (Figure 10).

Figure 10: The Importance Is Undeniable

How would you rate the importance of the following use cases as candidates for IoT solutions?

■ Very Important   ■ Somewhat Important   ■ Not Important

Use Case	Very Important	Somewhat Important	Not Important
Inventory accuracy and stock management	82%	18%	0%
Fraud and loss prevention	80%	19%	1%
Process automation at the fulfillment center	65%	30%	5%
Process automation throughout the supply chain	63%	35%	3%
Loyalty and personalization	62%	32%	7%
Brand protection/anti-counterfeiting	62%	36%	3%
Returns management	58%	37%	6%
Product location anywhere in the enterprise	58%	39%	3%
Process automation in the store	57%	35%	9%
Optimized way to share product info in-store	56%	38%	7%
Recycling and sustainability	54%	37%	10%
Waste reduction	54%	36%	11%
Planogram compliance	49%	30%	21%
Fresh item management	44%	47%	9%
Cashierless/automated self-checkout	42%	45%	13%
Connected fitting room	40%	26%	34%

Source: RSR Research, April 2022

It is worth noting that 11 of the 16 use cases we offered up to retailers to evaluate, the percentage

citing "not important" was in single digits. Several of these received infinitesimal pushback (1% see no potential in fraud and loss prevention, 3% for SC automation, etc.), and ZERO retailers – a number we never see in any of our research – say these technologies aren't important to inventory accuracy and stock management. This is unheard-of data, and signals a new era for signaling tech.

What this tells us is that once retailers have tackled their inventory issues, other use cases can then add value to that initial investment. Quite simply, retailers know they have to address their inventory woes first. But once that challenge is met, they are already eyeing the next use cases that will leverage the investments they've made in IoT systems.

Supply Chain And Beyond

Considering all we've seen so far, it comes as little shock that even at the organizational level, retailers' top-identified opportunities extend to the supply chain. It is important to note, however, that this is not the only area that holds retailers' interest. In their minds' eye, Store Ops stands to benefit enormously from one version of the truth. Merchandising decisions will become easier to make - and smarter. The entire enterprise stands to gain (Figure 11).

Figure 11: 'The Supply Chain' Is Everywhere

Organizationally, please rank the opportunity for impact from deploying Internet of Things solutions:

- Lot of Value
- Some Value
- Little to No Value

	Lot of Value	Some Value	Little to No Value
Supply Chain	79%	20%	1%
Asset Management	62%	36%	3%
Merchandising	60%	34%	7%
Store Operations	60%	31%	10%
Loss Prevention	59%	33%	9%
Marketing	54%	35%	12%

Source: RSR Research, April 2022

Figure 12 shows Winners' stance on the data we've just seen, above, and as is to be expected, the best performers are even more enthusiastic. All of the retailers we surveyed see the supply chain

implications, but as it extends to other functions of the business (marketing, in particular) Winners just "get it" more.

Organizationally, please rank the opportunity for impact from deploying Internet of Things solutions ('A Lot Of Value')

■ Winners ■ Others

	Winners	Others
Supply Chain	83%	74%
Merchandising	74%	41%
Loss Prevention	67%	48%
Marketing	67%	37%
Store Operations	67%	50%
Asset Management	66%	57%

Source: RSR Research, April 2022

While all the differences above are worth noting, the fact that 2 out of 3 Retail Winners think that marketing functions stand for serious improvement from new sensor-based projects that is fascinating. We'll see more about the details surrounding this data in the Technology Enablers section of this report, but it is worth noting here: one 1 out of 3 non-winners is looking around the corner enough to think about how these technologies can help them market better to and communicate better consumers in all new ways – and as we'll see later – all via the mobile phones that consumers have made a virtual extension of themselves.

Now let's see what stands in their way.

Organizational Inhibitors

Committing To Digital Transformation

The promise of the Internet of Things (IoT) is that it will make it possible for a business to *see* physical things – people, processes, and assets – and that will in turn trigger fundamental changes in how an organization operates. Realtime visibility is fundamental to what business strategists call a *Digital Transformation* strategy; any physical "thing" that has a digital equivalent can be observed in real time to determine its status and analyzed. Ultimately, that makes it possible for companies to break down operational silos and optimize operational workflows, to be able to respond very quickly and efficiently to market realities on both the supply and demand sides of the business in ways that lower costs, increases revenue, and improves cash flows.
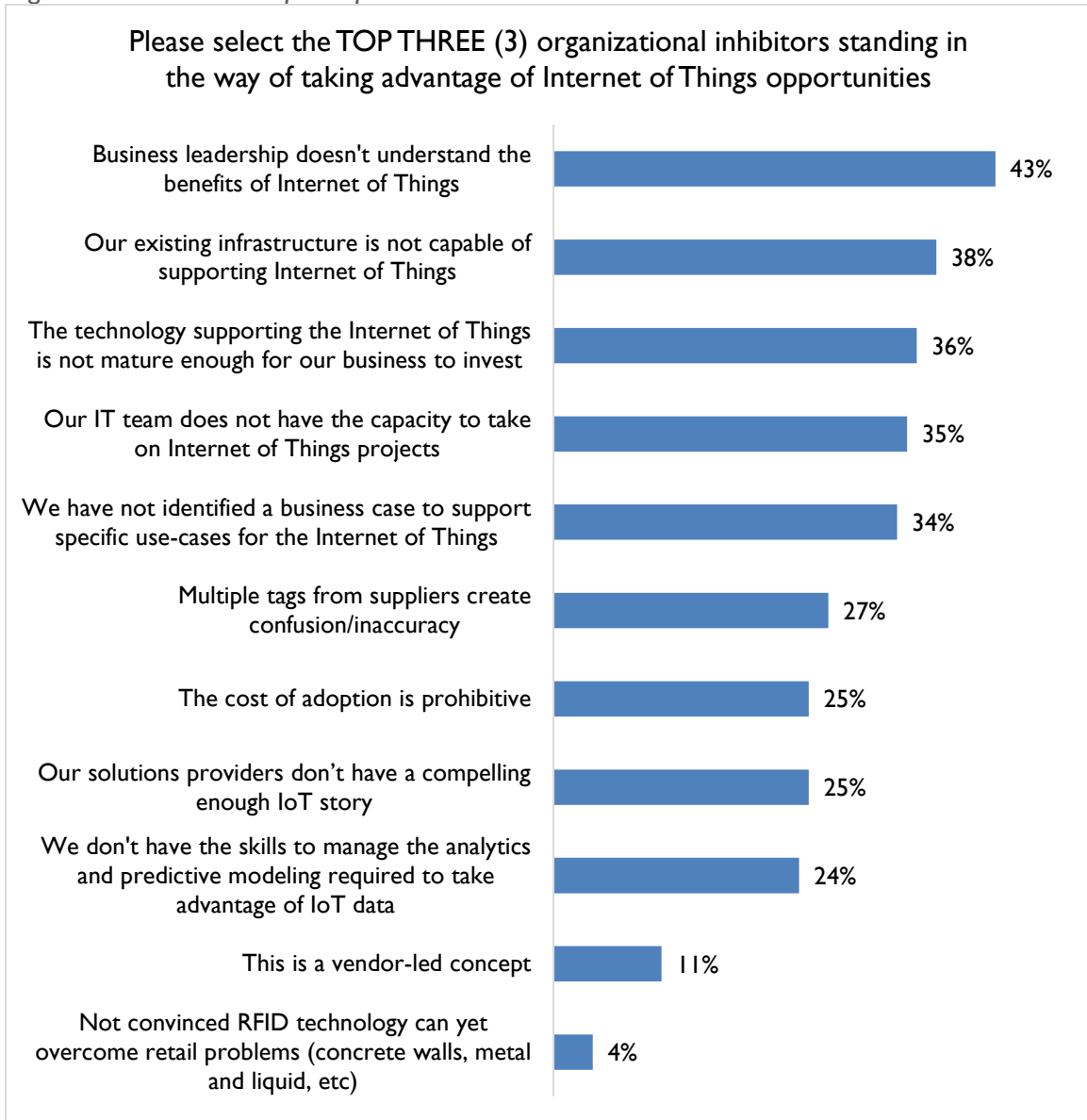
That's the theory. But while the possibilities created by IoT technologies are enormous, retailers tend to be pragmatic and don't like to get too far ahead of themselves (in fact, RSR has built its research model around the 12-24 month timeframe that most retail decision makers operate in). Retailers don't necessarily think of IoT - and to some extent the AI/ML analytics that can help them to make sense of all the data that IoT can generate - as part of an overall transformation strategy. Rather, those things are perceived as new weapons in the arsenal to address very specific problems.

That is why (as we saw in the **Opportunities** section of this report) that the overwhelming majority of over-performing Retail Winners see IoT -and RFID in particular - as a tool to address *inventory visibility/accuracy* and *loss prevention* in particular.

But IoT isn't just another point solution – to get the full measure of the benefits that the technologies can offer, retail leaders must think beyond the transactional mindset that is so systemic to the operational model. That turns out to be the single greatest internal roadblock to IoT adoption: retailers across performance groups and verticals agree that that "*Business leadership doesn't understand the benefits of Internet of Things*" (Figure 13).

Interestingly, the sole exception to that point of view comes from Fashion retailers – only 30% of those respondents (compared to 43% overall) are concerned about support from the company's leadership. Undoubtedly, that is because fashion retailers such as **Nike** and **Macy's** have led the industry in item-level RFID tagging for several years, and in 2020 retail giant **Walmart** began tagging apparel items.

Figure 13: Leadership Required

Please select the TOP THREE (3) organizational inhibitors standing in the way of taking advantage of Internet of Things opportunities

Business leadership doesn't understand the benefits of Internet of Things	43%
Our existing infrastructure is not capable of supporting Internet of Things	38%
The technology supporting the Internet of Things is not mature enough for our business to invest	36%
Our IT team does not have the capacity to take on Internet of Things projects	35%
We have not identified a business case to support specific use-cases for the Internet of Things	34%
Multiple tags from suppliers create confusion/inaccuracy	27%
The cost of adoption is prohibitive	25%
Our solutions providers don't have a compelling enough IoT story	25%
We don't have the skills to manage the analytics and predictive modeling required to take advantage of IoT data	24%
This is a vendor-led concept	11%
Not convinced RFID technology can yet overcome retail problems (concrete walls, metal and liquid, etc)	4%

Source: RSR Research, April 2022

Right behind the leadership challenge are three technological inhibitors: (1) the existing infrastructure, (2) concerns about the maturity of IoT technologies, and (3) lack of expertise among the IT team. A similar number of Winners and others generally agree that these are big internal issues, although more Winners worry about finding the right set of use cases to justify the investment (38% Winners vs. 28% Others), while more average and under-performers express a concern about the maturity of IoT technology itself (33% Winners vs. 39% Others).
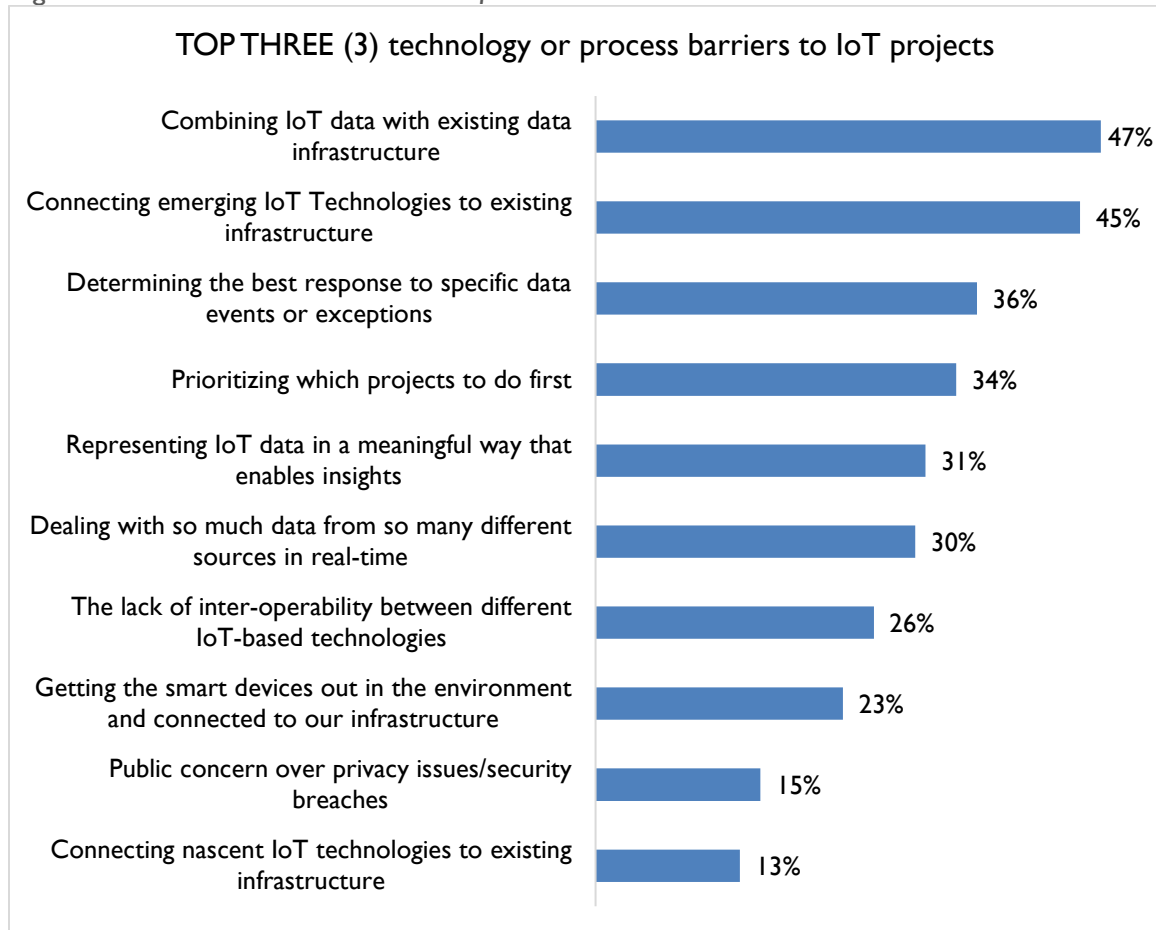
Data From People, Processes, And Things

As we've already noted, retailers worry about if and how their existing technology portfolios will be able to absorb IoT-generated data. This isn't new, it's just new to retail. Other industries (e.g., energy, finance, manufacturing) have already learned how to use IoT-generated data. In 2014, an

IBM-sponsored essay [1] entitled "**Big Data-Why Transaction Data is Mission Critical To Succeed**" summarized it this way: *"...the arrival of sensor networks has had ... <an> impact on **non-transactional big data** generation rates... as more and more smart products are manufactured, the Internet of Things (IoT) comes alive resulting in a tsunami of data...."*.

Now, this presents a big technical challenge for retailers, whose systems are invariably built to process transactional data, not non-transactional signals from people, processes, and things. Not surprisingly then, the top technology barriers are related to connecting IoT devices to the existing infrastructure and handling the "tsunami of data" that results (Figure 14).

Figure 14: IoT And A Tsunami Of Data

TOP THREE (3) technology or process barriers to IoT projects

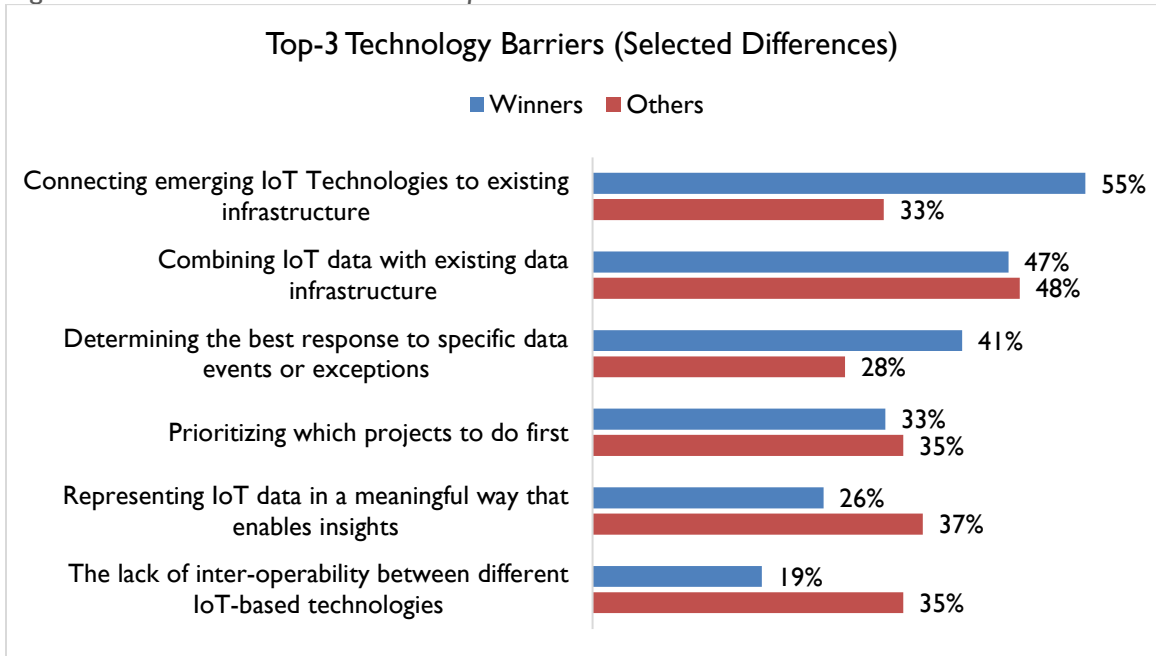| Barrier	%
Combining IoT data with existing data infrastructure	47%
Connecting emerging IoT Technologies to existing infrastructure	45%
Determining the best response to specific data events or exceptions	36%
Prioritizing which projects to do first	34%
Representing IoT data in a meaningful way that enables insights	31%
Dealing with so much data from so many different sources in real-time	30%
The lack of inter-operability between different IoT-based technologies	26%
Getting the smart devices out in the environment and connected to our infrastructure	23%
Public concern over privacy issues/security breaches	15%
Connecting nascent IoT technologies to existing infrastructure	13%

Source: RSR Research, April 2022

Looking inside these results, there are some interesting differences between Retail Winners and all others that highlight where retailers are on the adoption curve (Figure 15).

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[1] Ferguson, Mike. "Big Data-Why Transaction Data is Mission Critical To Success." *England: Intelligent Business Strategies* (2014).
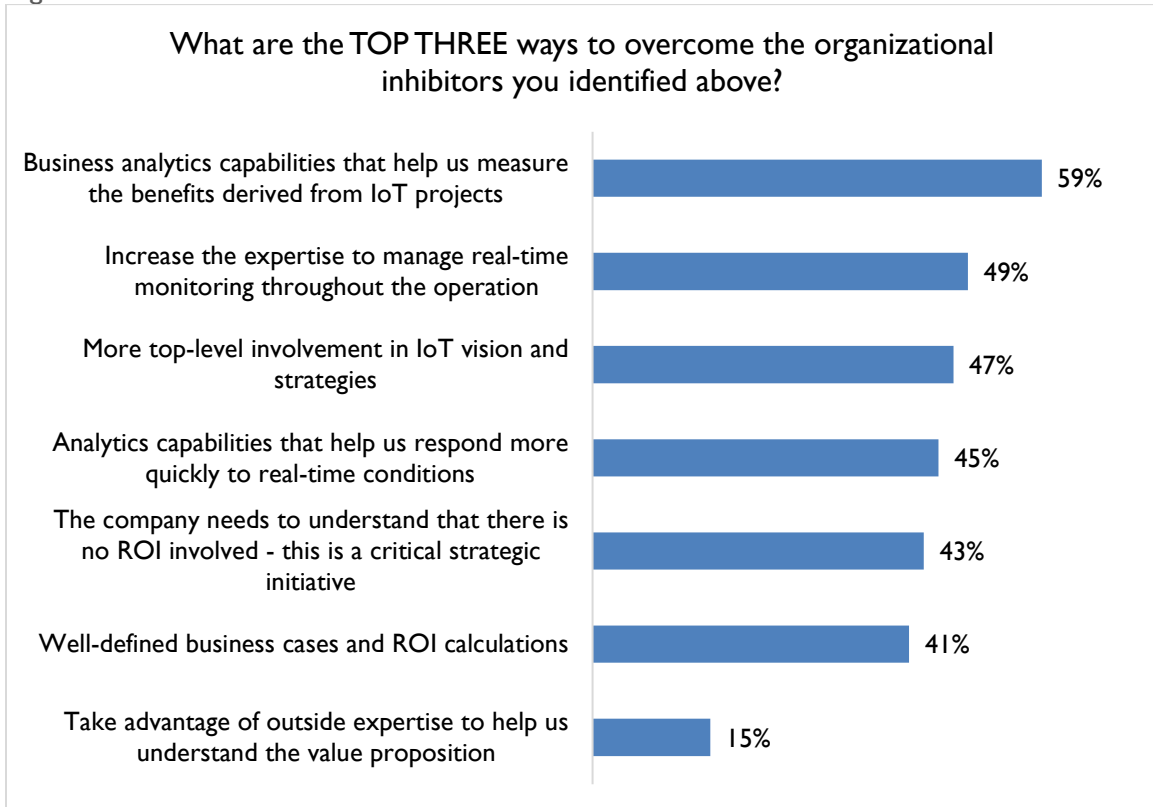
Top-3 Technology Barriers (Selected Differences)

■ Winners   ■ Others

Barrier	Winners	Others
Connecting emerging IoT Technologies to existing infrastructure	55%	33%
Combining IoT data with existing data infrastructure	47%	48%
Determining the best response to specific data events or exceptions	41%	28%
Prioritizing which projects to do first	33%	35%
Representing IoT data in a meaningful way that enables insights	26%	37%
The lack of inter-operability between different IoT-based technologies	19%	35%

Source: RSR Research, April 2022

While retailers across performance groups agree that (1) integrating IoT data with existing databases and processes is a problem, and (2) that they need to prioritize what to focus on, more Winners are dealing with implementation challenges like IoT connectivity and process issues related to specific data events or exceptions. These differences indicate that over-performers are further along in the adoption of the technologies (as we will discuss further in the **Technology Enablers** section of this report).

One Step At A Time

When it comes to getting past internal roadblocks to adoption, retailers are focused squarely on letting results from pilot projects guide them forward – this is a phased approach, i.e., conducting projects that demonstrate value and expanding the reach of IoT "one step at a time" (Figure 16).

What are the TOP THREE ways to overcome the organizational inhibitors you identified above?

Business analytics capabilities that help us measure the benefits derived from IoT projects — **59%**

Increase the expertise to manage real-time monitoring throughout the operation — **49%**

More top-level involvement in IoT vision and strategies — **47%**

Analytics capabilities that help us respond more quickly to real-time conditions — **45%**

The company needs to understand that there is no ROI involved - this is a critical strategic initiative — **43%**

Well-defined business cases and ROI calculations — **41%**

Take advantage of outside expertise to help us understand the value proposition — **15%**

Source: RSR Research, April 2022

Looking inside these results, we can see that this approach is favored by over-performers in general (69% Winners vs. 46% Others), and FMCG and Fashion retailers in particular (73% and 74% respectively). This is a fascinating difference; FMCG retailers have big assortments of extremely fast moving products, while fashion merchants have much smaller and relatively slow moving assortments. Because of the differences between those retail verticals, the use-cases that drive IoT adoption are likely to be much different.

Regardless of these differences, retailers seem committed to letting project outcomes convince a skeptical leadership team and prioritize the next use-cases to target. There isn't a grand strategy at work here, no digital transformation project. Pay-as-you-go seems to be the rule.

But there is one exception to retailers' pay-as-you-go approach; fully one-half of average and under-performers want to convince the leadership that there is "no ROI involved" (50%). In other words, for them, this is about remaining competitive. But most Winners don't buy into that at all - they want results to drive priority initiatives, and there must be a demonstrable ROI for their efforts.

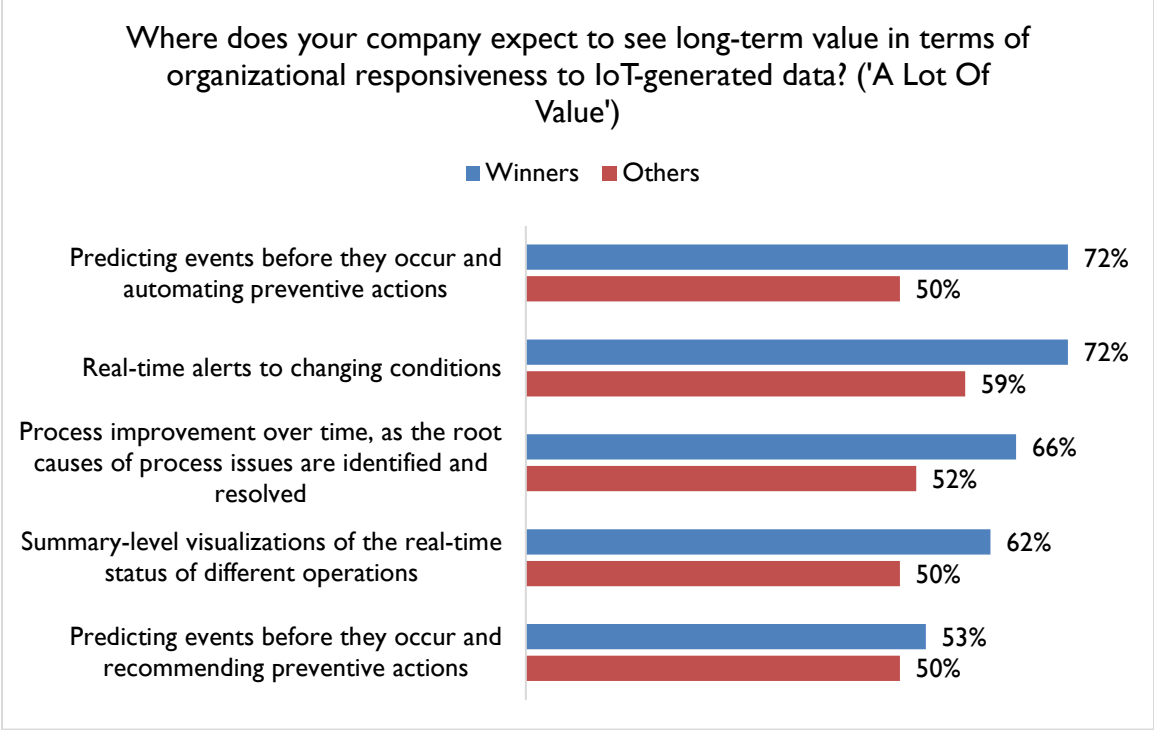Now let's dig into more of retailers' overall technology plans.

Technology Enablers

The Long View

In the **Opportunities** section of this report, we learned that *inventory visibility and accuracy* are top objectives for IoT technologies (and RFID in particular). Real time and accurate visibility is an enabler for several other important use cases that retailers also identify as valuable: *product authentication, loss prevention, omnichannel fulfillment*, and *store and warehouse process automation* (just to name a few). We also learned in the **Organizational Inhibitors** section that retailers are focused on specific use cases for IoT adoption rather than embarking on a company-wide *digital transformation* strategy.

Notwithstanding that sharp focus on current tactical challenges, retailers certainly aren't ignoring an overarching strategy to make all their operational processes more proactive, agile, and efficient. A key to that is having the ability to implement a *virtuous cycle of improvement*: to receive real time exception alerts from operational processes, to respond to them, and to learn from the experiences to better anticipate future conditions and responses. Although one-half or more of all the retailers who responded to our survey see this as the long-term value of IoT enablement, over-performing Retail Winners are far more bullish about it (Figure 17).

Figure 17: Enabling An Agile Response To Real Time Conditions

Where does your company expect to see long-term value in terms of organizational responsiveness to IoT-generated data? ('A Lot Of Value')

■ Winners ■ Others

	Winners	Others
Predicting events before they occur and automating preventive actions	72%	50%
Real-time alerts to changing conditions	72%	59%
Process improvement over time, as the root causes of process issues are identified and resolved	66%	52%
Summary-level visualizations of the real-time status of different operations	62%	50%
Predicting events before they occur and recommending preventive actions	53%	50%

Source: RSR Research, April 2022

Over-performers are more interested in using predictive models to automate preventive actions than they are to recommend preventive actions. Obviously, more Winners than average and under-performers are confident in the analytical engines that use data generated by IoT.
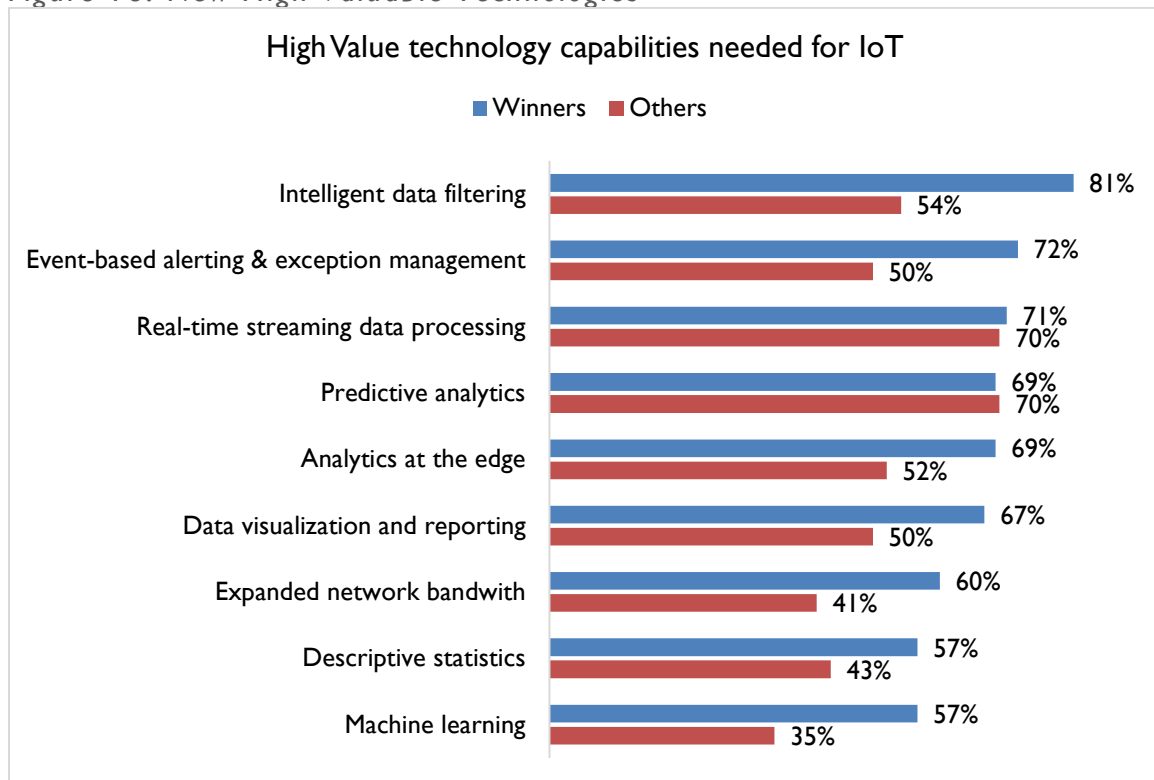
We get a more nuanced understanding of these results by looking at what is most valuable by retail vertical. An automated preventive action capability is particularly valuable to **GM** (general

merchandise) retailers as opposed to getting recommendations (76% vs. 62%). On the other hand, **Hardgoods** retailers like it the other way around - they prefer to get recommendations over automated preventive actions (76% vs. 47%). **FMCG**'ers clearly want to know what's going on in their fast-moving operations in time to take corrective actions as necessary: they are most interested in getting real-time alerts to changing conditions (73%), and to a lesser extent, enabling summary-level visualizations of operational processes (65%).

How?

Retailers know that automating or recommending operational decision making, or simply being able to visualize operational processes, will require new technologies (Figure 18).

Figure 18: New High-Valuable Technologies

High Value technology capabilities needed for IoT

Winners | Others

Technology	Winners	Others
Intelligent data filtering	81%	54%
Event-based alerting & exception management	72%	50%
Real-time streaming data processing	71%	70%
Predictive analytics	69%	70%
Analytics at the edge	69%	52%
Data visualization and reporting	67%	50%
Expanded network bandwith	60%	41%
Descriptive statistics	57%	43%
Machine learning	57%	35%

Source: RSR Research, April 2022

While retailers generally understand that they need to be able to process *real time streaming data* and use *predictive analytics* to be able to take advantage of IoT data, more Winners place a high value on *intelligent data filtering* to help them handle the incoming tsunami of IoT data. Over-performers more clearly understand that IoT devices create a lot of data, far more than needs to be passed on to operational systems. But incongruously, more Winners than average and under-performers are focused on *exception-based alerting*. What can be gleaned from these findings is that Winners have a clearer understanding that managing process <u>exceptions</u> is more important than managing <u>everything</u>.

IoT adoption is a work-in-progress across the retail industry, but when we asked retailers how far they are on the adoption curve, Retail Winners clearly are being more aggressive (Figure 19). In each category of technology that we asked about, far more Winners are using and satisfied with the technologies than lesser performing retailers.

What is your company's current status with the following technologies? ('Using/Satisfied')

■ Winners   ■ Others

Technology	Winners	Others
Event-based alerting & exception management	62%	24%
Predictive analytics	59%	28%
Intelligent data filtering	57%	35%
Expanded network bandwith	55%	26%
Descriptive statistics	55%	28%
Data visualization and reporting	53%	37%
Real-time streaming data processing	53%	46%
Machine learning	45%	26%
Analytics at the edge	43%	26%

Source: RSR Research, April 2022

As we mentioned above, Winners want to focus on exceptional conditions, whereas average and under-performers don't make seem to the distinction between exceptional conditions and all conditions. We worry that non-Winners will be overwhelmed with IoT data if they don't adopt a similar focus on "managing by exception".

What?

Retailers tell us that many addressable use cases for IoT are in fact being addressed to some extent (Figure 20). But to make sense of these responses, we need to explain what retailers think IoT is.

The original notion of the Internet of Things is of physical things that can *send and receive* data via *the Internet without human interaction*. A smart phone is an IoT device; so is an RFID chip. But retailers also tend to include symbologies (barcodes and QR codes) that can identify a thing to the network.

Some may argue that barcodes and QR codes don't fit the definition, since they can't receive information and may require human intervention to be scanned. But retailers include them when thinking about capabilities like self-checkout and sharing expanded product information at the shelf edge. Understanding that helps us to interpret which use-cases retailers identify.

What's the status of the following IoT-enabled capabilities at your company? ('Using/Satisfied')

Capability	Percent
Inventory accuracy and stock management	53%
Cashierless/automated self-checkout	46%
Loyalty and personalization	42%
Brand protection/anti-counterfeiting	41%
Fresh item management	40%
Returns management	40%
Process automation at the fulfillment center	39%
Fraud and loss prevention	39%
Optimized way to share product info in store	38%
Process automation throughout the supply chain	37%
Planogram compliance	37%
Process automation in the store	36%
Recycling and sustainability	36%
Product location anywhere in the enterprise	34%
Waste reduction	32%
Connected fitting room	26%

Source: RSR Research, April 2022

Over 50% of all retailers report their satisfaction with what they've implemented to address inventory accuracy and stock management. As should be expected, far more Retail Winners than others report success (62% vs. 41%). But when we look at the top "implemented/satisfied" choices by vertical, some interesting details emerge:

	FMCG	GM	Fashion, Specialty, Brand	Hardgoods
Recycling and sustainability			48%	
Inventory accuracy and stock management	62%	56%		59%

Source: RSR Research, March 2022

Surprisingly, **Fashion, Specialty, and Brand** merchants claim that their top "using/satisfied" use case is *recycling and sustainability*, not stock management. That stands in contrast to the many success stories about how fashion and specialty retailers like **H&M, Zara, Nike, Uniqlo, Adidas, Levi's, Ralph Lauren, Tommy Hilfiger**, and others, use RFID.

What's Next?

Earlier, we learned what retailers value most in terms of organizational responsiveness to IoT-generated data (Figure 17). And Figure 20 highlights the percentage of retailers that have successfully addressed use cases for IoT. Given that retailers are in the early stages of IoT adoption, the question now is, are their go-forward priorities now? Not surprisingly, the answer depends on which retail vertical we're looking at (Figure 21).

Figure 21: Different Challenges/Different Opportunities

Top Three Near-Term Investments Plans By Retail Vertical ('Using/Planning To Change' & 'Budgeted Project')	
	FMCG
Recycling and sustainability	62%
Process automation at the fulfillment center	58%
Process automation throughout the supply chain	58%
	GM
Product location anywhere in the enterprise	47%
Recycling and sustainability	47%
Optimized way to share product info in store	47%
	Fashion, Brand, Specialty
Optimized way to share product info in store	59%
Connected fitting room	59%
Process automation at the fulfillment center	59%
Product location anywhere in the enterprise	59%
	Hardgoods
Process automation in the store	59%
Waste reduction	59%
Recycling and sustainability	53%
Process automation throughout the supply chain	53%

Source: RSR Research, April 2022

In RSR's inaugural report of the state of IoT in Retail in 2015[2], we pointed out that:

"Retailers report they are doing projects, working their way up the learning curve. But it seems like the more they learn, the more they discover what they don't know. One conclusion to draw from this: the learning curve for IoT is vast and steep, and retailers – most especially Retail Winners – believe they have only progressed along the slight incline at the start of the curve."

In the seven years since that report, retailers have learned a lot. Over 50% have addressed *inventory visibility & accuracy* (the use case that transcends all others), and have moved on to

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[2] **The Internet Of Things In Retail: Great Expectations**, RSR Benchmark Report, August 2015

prioritize investments that make sense for the verticals they operate in. Certain opportunities span the industry: optimizing customer order fulfillment, recycling and sustainability, improving supply chain agility. Other opportunities are particular to one vertical only (e.g., the connected fitting room).

The fact that for each of the priority use cases noted in Figure 21, from close to one-half to as many as two-thirds of the retailers we asked have plans to invest in IoT solutions in the next 12-18 months. Retailers have moved far beyond the proof of concept projects of seven years ago.

From all that we have learned, in the next section we will outline our BOOTSTRAP recommendations for retailers to consider in their own digital transformation projects.

BOOTstrap Recommendations

The Digital Transformation is Happening Now

The Internet Of Things is conceptually straightforward: anything physical - people, assets, or items - has a digital equivalent that can be observed in real time. This makes it possible for companies to analyze processes, break down operational silos, optimize workflows, and respond quickly and efficiently to market realities on both the supply and demand sides of the business in ways that lower costs, increases revenue, and improves cash flows.

Other industries, such as energy, airlines, and manufacturing, have already learned how to use data generated data by IoT to transform their businesses. Now it's the retail industry's turn. The marketplace that retailers operate in has both sped up remarkably and has been more disrupted in the past several years, and old-fashioned transactional data (product orders and invoices, inventory ins-and-outs, sales, etc.) are insufficient for operators who need to respond very quickly to changes in either supply or demand.

Survey respondents identify several high priority use cases that IoT in general and RFID specifically can help retailers to address, but as is often the case, over-performing Retail Winners are leading the way. From examining Winners' progress, we offer the following recommendations for all retailers:

Address Executive Concerns

The top inhibitor to progress is that "*business leadership doesn't understand the benefits of the Internet of Things*". That's a to-do that must be addressed by proponents of the new technologies. IoT proponents may not need to convince Retail Winners that IoT is important, but average and under-performers need help to arrive at a prioritized list of use-cases in the context of an overall plan. Technology providers need to help, by offering case studies that explain why and how successful companies have realized new operational efficiencies and market successes by deploying IoT.

Implement IoT Technologies Like RFID to Enable Real-time Inventory Visibility and Accuracy

Retailers must finally make inventory visibility across the enterprise real. Companies have been trying to enable real time inventory visibility and accuracy time for more than a decade, to be able to make inventory available to omnichannel shoppers no matter where it is in the enterprise. But real-time and accurate inventory visibility goes far beyond helping consumers make their shopping decisions. Here's a partial list of other processes that would benefit:

- Omnichannel order fulfillment
- Inventory efficiency
- Improved fraud/loss prevention
- A quick response to supply chain exceptions
- Process automation
- Returns handling
- Product authentication
- Post sales service and support (for example, warranty handling)

Create A Digital Transformation Roadmap

Because inventory visibility is so important, retailers tend to use the terms "IoT" and "RFID" synonymously. But RFID is a subset of IoT – there are other opportunities available to retailers from other IoT devices, such as consumer mobile devices, instore beacons, shelf edge technologies, environmental control systems, etc. A digital transformation roadmap should include use cases that identify how those technologies can be used drive new operational efficiencies and customer-facing capabilities.

Analyze Everything – But Manage By Exception

IoT creates a lot of non-transactional data – sometimes described as a *tsunami* of new data. Even a few years ago, processing that data with traditional data storage, access, and analysis tools was a heavy lift for technologists. But new data tools, particularly artificial intelligence (AI) and machine learning (ML), make it possible for retailers to observe and measure the effect of their efforts in real time and to alert operators when exceptions occur. This implies *intentional* process design – a critical component of digital transformation planning.

Appendix A: The BOOT Methodology[©]

The BOOT Methodology[©] is designed to reveal and prioritize the following:

- **B**usiness Challenges – Retailers of all shapes and sizes face significant **external** challenges. These issues provide a business context for the subject being discussed and drive decision-making across the enterprise.
- **O**pportunities – Every challenge brings with it a set of opportunities, or ways to change and overcome that challenge. **The ways retailers turn business challenges into opportunities often define the difference between Winners and "also-rans."** Within the BOOT, we can also identify opportunities missed – and describe leading edge models we believe drive success.
- **O**rganizational Inhibitors – Even as enterprises find opportunities to overcome their external challenges, they may find **internal** organizational inhibitors that keep them from executing on their vision. Opportunities can be found to overcome these inhibitors as well. Winning Retailers understand their organizational inhibitors and find creative, effective ways to overcome them.
- **T**echnology Enablers – If a company can overcome its organizational inhibitors, it can use technology as an enabler to take advantage of the opportunities it identifies. Retail Winners are most adept at judiciously and effectively using these enablers, often far earlier than their peers.

A graphical depiction of the BOOT Methodology[©] follows:
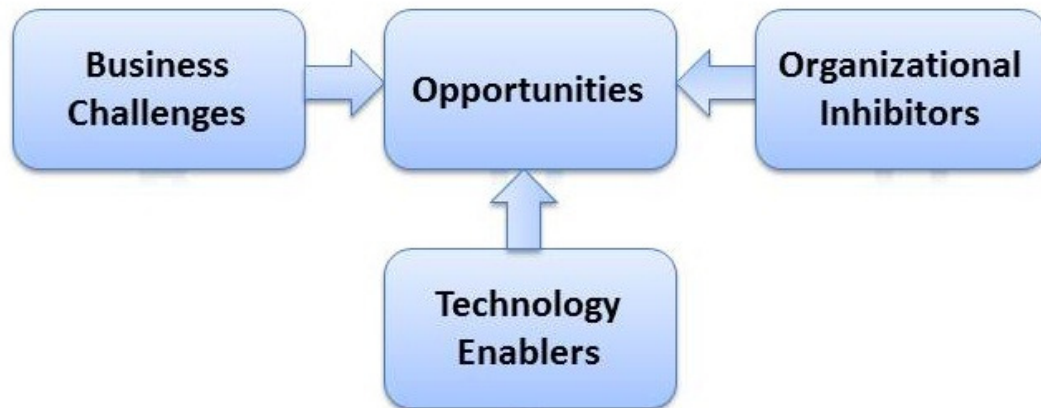
Appendix B: About Our Sponsor

Impinj (NASDAQ: PI) helps businesses and people analyze, optimize, and innovate by wirelessly connecting billions of everyday *things*—such as apparel, automobile parts, luggage, and shipments—to the Internet. The Impinj platform uses RAIN RFID to deliver timely data about these everyday *things* to business and consumer applications, enabling a boundless Internet of Things.

Appendix C: About RSR Research

Retail Systems Research ("RSR") is the only research company run by retailers for the retail industry. RSR provides insight into business and technology challenges facing the extended retail industry, providing thought leadership and advice on navigating these challenges for specific companies and the industry at large. We do this by:

- **Identifying information** that helps retailers and their trading partners to build more efficient and profitable businesses;

- **Identifying industry issues** that solutions providers must address to be relevant in the extended retail industry;

- **Providing insight and analysis** about a broad spectrum of issues and trends in the Extended Retail Industry.