SURVEY REPORT

How IoT and RFID Are Transforming the Supply Chain Industry

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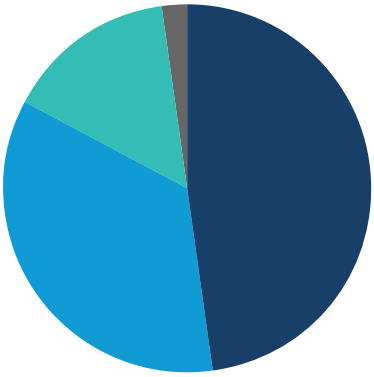
With supply chain challenges continuing to make headlines two years after the start of the COVID-19 pandemic, operations, supply chain and IT professionals are looking for more efficient and accurate ways to track items from the warehouse to the end customer. Internet of Things (IoT) technologies, including RAIN RFID, are highly attractive because they offer better visibility and information sharing capabilities throughout the supply chain.

While many companies are still in the beginning stages of adopting IoT solutions, most understand the positive impact such technologies have had and will continue to have on efforts to alleviate supply chain pressures. However, various challenges may keep them from implementing or growing their IoT technology landscape.

Recently, studioID, Supply Chain Dive's brand studio, and Impinj, a leading RAIN RFID provider and Internet of Things pioneer, surveyed 87 supply chain professionals from different companies within the manufacturing, healthcare, pharma, retail, consumer goods and transportation industries to gain an understanding of where supply chain organizations are in their technology adoption journeys, why they chose to start and what barriers they are facing.

One of the most revealing insights of the survey was that competitive differentiation ranked at the bottom of the list of challenges driving organizations' interest in IoT and RAIN RFID (sometimes referred to as UHF RFID). This response is a potential sign that the technologies have transitioned from a novel, bleeding-edge capability to table stakes for organizations who have realized that the benefits they offer, such as supply chain visibility, are vital to running their businesses effectively and efficiently. Further supporting this idea is the fact that most respondents reported that their organization is planning to adopt or already investing in IoT and/or RFID technology for their supply chains:

Are you planning to adopt IoT for supply chain management?



- 48% Already adopted
- 35% Currently implementing
- 15% Considering
- 2% Don't know/not sure

Are you planning to adopt RFID for supply chain management?

- 36% Already adopted
- 22% Currently implementing
- 22% Considering
- 3% Don't know/not sure
- 17% No plans

How Has the Definition of IoT Evolved?

Previously, the definition of IoT was indeterminate and subject to change depending on whom you asked. While most people understood it had something to do with objects that used sensors to talk to each other, it was difficult to visualize real-world use cases and understand the benefits of the technology.

Fortunately, the definition has gained clarity and concreteness as use cases have multiplied and the technology has developed.

> When I talk IoT with supply chain customers now, they understand it's really things talking to each other to create events and deliver visibility to multiple systems at the same time. They understand the term better, and we don't have to explain it anymore.
>
> **– JEFF HUDSON,** president of Smart Label Solutions, a provider of complete RFID solutions for supply chains

In addition to becoming much clearer and more concrete, the definition has also broadened. In the past, the term "IoT" was often used in reference to a network of connected devices and meant electronics such as cameras, motion sensors or Bluetooth beacons. Today, it can truly be used to describe the Internet of Things. For example, RAIN RFID technology enables companies to connect to individual electronic devices and non-electronic items (e.g., apparel, footwear, automotive parts), the containers housing them, the pallets holding the containers and the equipment used to move everything.

RAIN RFID: A Powerful IoT Technology

With the ability to identify up to 1,000 items per second in a range of a few centimeters to several meters away without direct line-of-sight, RAIN RFID has opened up a world of possibilities for supply chain organizations. Additionally, since they don't need dedicated power, they are battery-free and offer real-time visibility with minimal to no maintenance aside from tag reading devices.

Today, RAIN RFID can be part of a cost-efficient solution that provides a complete picture of an organization's operations. While the overall solution may be expensive, the low cost of individual tags means a business can afford to purchase thousands or billions of tags for tracking thousands or billions of things. This ability to deliver at an enormous scale can be used in time- and cost-saving applications like asset management, shipment verification, pallet build verification and food supply chain management, among many others.

One of its benefits is giving multiple back-end systems the ability to see transactions happening, even if they're not in the same IT environment. For example, a manufacturer creating a product, a freight company transporting the product and the recipient of the product can all use cloud-stored data to see where the product is at all times, despite each having a separate and unique back-end system.

Inventory visibility is another valuable use case for RAIN RFID technology. Having and maintaining real-time visibility helps organizations keep track of which items they have in stock and where, which is an essential piece of the supply chain puzzle.

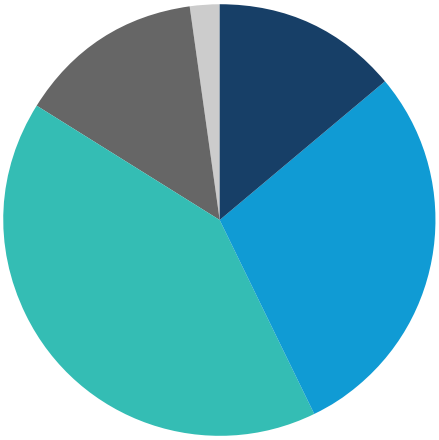
Additionally, being able to track items in transit (e.g., on a conveyor belt, moving onto a loading dock, moving from forklift to truck or truck to forklift, etc.), facilitates the identification of pain points so companies can know where and how to improve their processes and systems. Where is your inventory building up? Where are parts and raw materials getting backed up? Where are you experiencing delays in getting product out of the warehouse and onto a truck? A RAIN RFID solution can provide you with all of this information so you can make the proper improvements.

Who's Planning for IoT Adoption and Why?

Supply chain professionals see IoT and RAIN RFID as integral parts of their businesses, a sentiment supported by the survey results. In fact, 100% of respondents said they were considering adopting one of these solutions or already had.

Which best describes your organization's evaluation of IoT solutions?

When asked which stage of adoption their organization was in — as opposed to whether they were planning to adopt IoT or RFID in the earlier question — nearly all said they were at least in the consideration stage. However, only 14% considered their organization to be at a mature implementation.

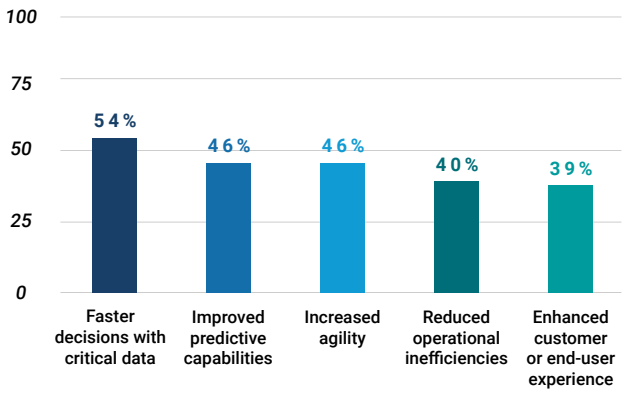


- 14% of supply chain professionals indicated their company was considering adopting an IoT solution
- 29% of supply chain professionals indicated their company was currently adopting an IoT solution
- 41% of supply chain professionals indicated their company implemented an IoT solution
- 14% of supply chain professionals indicated their company had mature implementation of IoT
- 2% of supply chain professionals indicated they did not know or weren't sure of their company's evaluation of IoT solutions

Regarding business resource allocations for IoT investments, operations had the greatest investment, with over 65% of respondent companies aiming digital transformation initiatives at it in the past two years. This trend is not likely to change soon — 60% of all respondents said they expected their company to put the majority of their IoT investments in operations in the next two years.

Which of the following benefits do you anticipate realizing as an investment in IoT solutions?

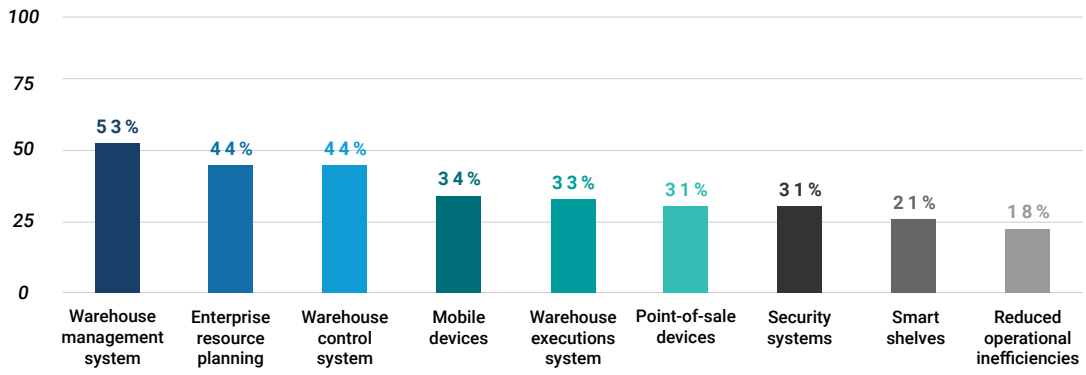
By adopting or expanding IoT, survey respondents anticipated a wide range of benefits. Among all respondents, the top benefits cited were:



The anticipated benefits varied slightly depending on where the respondent's company was in the IoT journey (considering vs. adopting vs. implemented vs. mature implementation). For those still considering IoT, customer and end-user experience took a backseat to increased top-line growth (42%), enhanced forecasting (42%) and reduced labor costs (33%), representing a bigger focus on core business benefits.

On the other hand, enhanced customer experience topped the list at 58% among respondents who indicated mature implementation. This group focused more on business enhancements like faster decision-making (50%) and improved risk management (42%).

Upon adopting or expanding RFID specifically, respondents also indicated to which existing solutions they would look for integration. The results among all survey respondents were spread across a range of technologies, suggesting that RFID and IoT in general are relevant and beneficial to various company operations and use cases.



> The more advanced organizations not only understand the importance of IoT and RAIN RFID, they understand how much more valuable that data can become when woven into all the other data they have about their business instead of treating it as a siloed, standalone data source.
>
> – **SANDY MURTI,** vice president, global partner development at Impinj

What's Driving Interest in IoT & RAIN RFID?

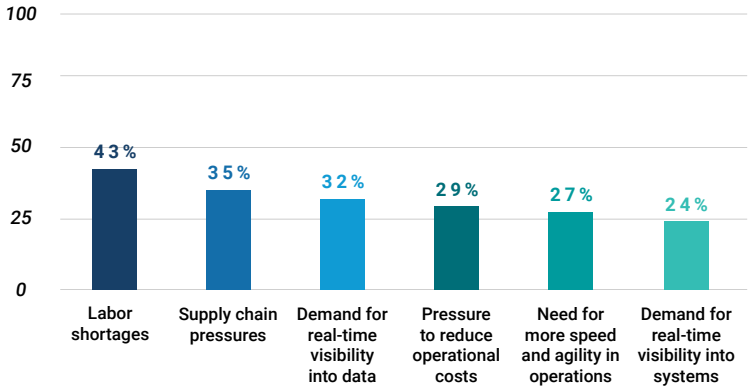
The last two years have uncovered new or worsening business challenges that are pushing many organizations toward IoT and RAIN RFID solutions. Prior to the pandemic, employees in warehouses often used barcode scanners to manually scan items as they came through various choke points (e.g., moving from conveyor to warehouse to dock, etc.). However, the recent labor shortages have caused massive slowdowns and other issues at those points.

In many organizations, the desire for operational efficiency is a primary driver of supply chain transformation initiatives, while the need for speed and agility in operations is a primary driver for investing in IoT. These sentiments are shared by a significant portion of all survey respondents (31% and 29%, respectively). By investing in such solutions, organizations can streamline certain operations so fewer employees can perform the same or a higher amount of work. For example, integrating a RAIN RFID solution allows items to be automatically read as they pass through transition points, eliminating the need for workers to use a handheld device to scan items one by one.

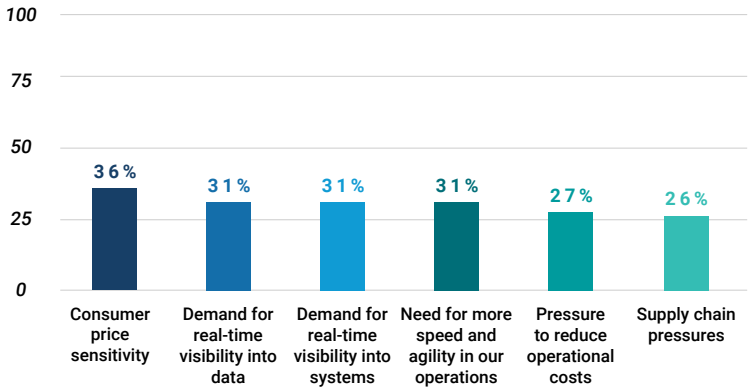
> Some companies are seeing up to 25% efficiency gains just by eliminating the barcode scan on each pallet before picking it up to load on the truck.
>
> –**JEFF HUDSON,** president of Smart Label Solutions

Besides the need for speed and agility in operations, many other business challenges are driving interest in IoT. At the top of the list for all respondents is demand for real-time visibility into data (32%). However, while it remained near the top for respondents regardless of where their company was on their IoT journey, other challenges ranked above it.

For respondents with companies considering or currently adopting IoT, the top challenges driving interest were:



For respondents with companies that have implemented IoT, the top challenges driving interest were:



RAIN RFID rests in the sweet spot for many of the biggest challenges participants listed above — especially real-time visibility, speed and agility and supply chain pressures. Since RAIN RFID is an always-on technology, it provides a steady stream of data. This design allows organizations to make better and more timely decisions about their supply chain operations.

There's nothing worse than giving a customer inventory information that's a day or a week old and then having to contact them to say their order will be delayed because it's out of stock. With RAIN RFID, organizations have access to real-time information with 99% order accuracy and 95% inventory accuracy, so they can more confidently tell customers whether an item is available.

What's Stopping the Adoption of IoT & RAIN RFID?

Despite the many benefits of IoT and RAIN RFID technology, some supply chain organizations still have reservations about adopting such solutions. This hesitation is likely due in part to the internal and technical barriers professionals face in integrating the technology into their organization's systems and processes.

INTERNAL BARRIERS TO ADOPTING IOT / RAIN RFID

The internal barriers indicated by all respondents were:

30%

The IT function does not have the capacity to take on IoT projects

30%

Existing infrastructure is not capable of supporting IoT

29%

Our solutions providers don't have a compelling enough IoT story

29%

The capital outlay to fully take advantage of IoT is too high

26%

The technology supporting the IoT is not mature enough for our business to invest

23%

Don't have the skills to manage the analytics and predictive modeling required to take advantage of IoT data

23%

Business leaders don't understand the benefits of IoT

13%

Have not identified a business case to support specific use-cases for the IoT

Among respondents from companies in the considering or adopting stage and the implemented or mature implementation stage, an insufficiently compelling IoT story and a lacking IT function or infrastructure ranked at the top.

These results highlight a greater need for solutions providers to educate supply chain customers about how IoT and RAIN RFID can help them solve their greatest business challenges.

In the past, organizations perceived such technologies as requiring significant internal resources to maintain. But RAIN RFID is scalable and repeatable, so it doesn't need as many resources to get it up and running. In some cases, you don't even have to get IT involved — the hardware installs easily and uses a similar labeling process as barcode labels. Then, the data flows out of the building via an IoT event to cloud software outside the network. So, you can have a completely implemented supply chain visibility system without getting into IT infrastructure.

Additionally, since the system can run on a software-as-a-service model, you also don't have to maintain servers or worry about backups. This significantly reduces your time-to-value metric.

> We're seeing all of our use cases being deployed and paid for in an ROI of less than 12 months.
>
> – JEFF HUDSON, president of Smart Label Solutions

TECHNICAL BARRIERS TO ADOPTING IOT / RAIN RFID

Regarding technical barriers, dealing with so much data from so many different sources in real-time was at the top of mind for all respondents (34%). However, this statistic is likely due to more of a perception problem than actual reality. Some of the data is already being collected through manual means, and automating its collection is easier, not harder. You don't have to rip and replace your ERP system since RAIN RFID can coexist with or complement your existing business applications.

> Once organizations really dive into the type of data RAIN RFID systems can generate, more often than not, they realize there are already places within their existing IT applications where that data can live. It's less a case of a fundamental gap in IT capability, and more a gap in understanding what the data from RFID is.
>
> – **SANDY MURTI,** vice president, global partner development at Impinj

Additionally, with a good solution provider, the data you receive from your RAIN RFID system will integrate with — and look the same as — the systems you're already using in your business operations.

Other top technical concerns for participants were combining IoT data with existing capabilities like predictive analytics (32%) and connecting early-stage IoT technologies to existing infrastructure (32%). These concerns are also easy to assuage since tag read events can deliver data in the same way as the barcode scan or other previously used collection methods. The data is presented in a way you're used to seeing, so you can still get your work done as usual.

Companies like Impinj, who use power-over-ethernet (PoE) connectivity in their devices, make it even simpler to adopt IoT solutions. IT infrastructure professionals are likely already accustomed to security cameras and other devices that use PoE. Thus, when using PoE-connected RFID devices, IT just needs the IP address to add the devices to the network.

Recommendations for IoT Implementation

IoT and RAID RFID have many applications, and, by investing in them, organizations can bring ROI to a wide range of business challenges. However, an important thing to remember about adopting these technologies is that it's a journey with no set path. No organization has implemented every technology at once or realized all of the value investment in them can offer to different business operations in one go, but that's not a reason for your organization to not start at all.

To ensure successful adoption of these technologies in your organization, look at the high-value business cases you want to address, determine the level of effort required for each and focus on one at a time. Once you've demonstrated ROI in a use case, you can expand to others until you've progressively reaped the benefits of IoT throughout your business. This gradual approach enables you to better adapt to the technology and make it work in your business environment to help solve your biggest supply chain challenges.

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Impinj 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.

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