GS1 Netherlands

The Global Language of Business

White paper

RFID in Fashion, Footwear and Sport

Responding better to customer demand in store and online

RFID in a nutshell

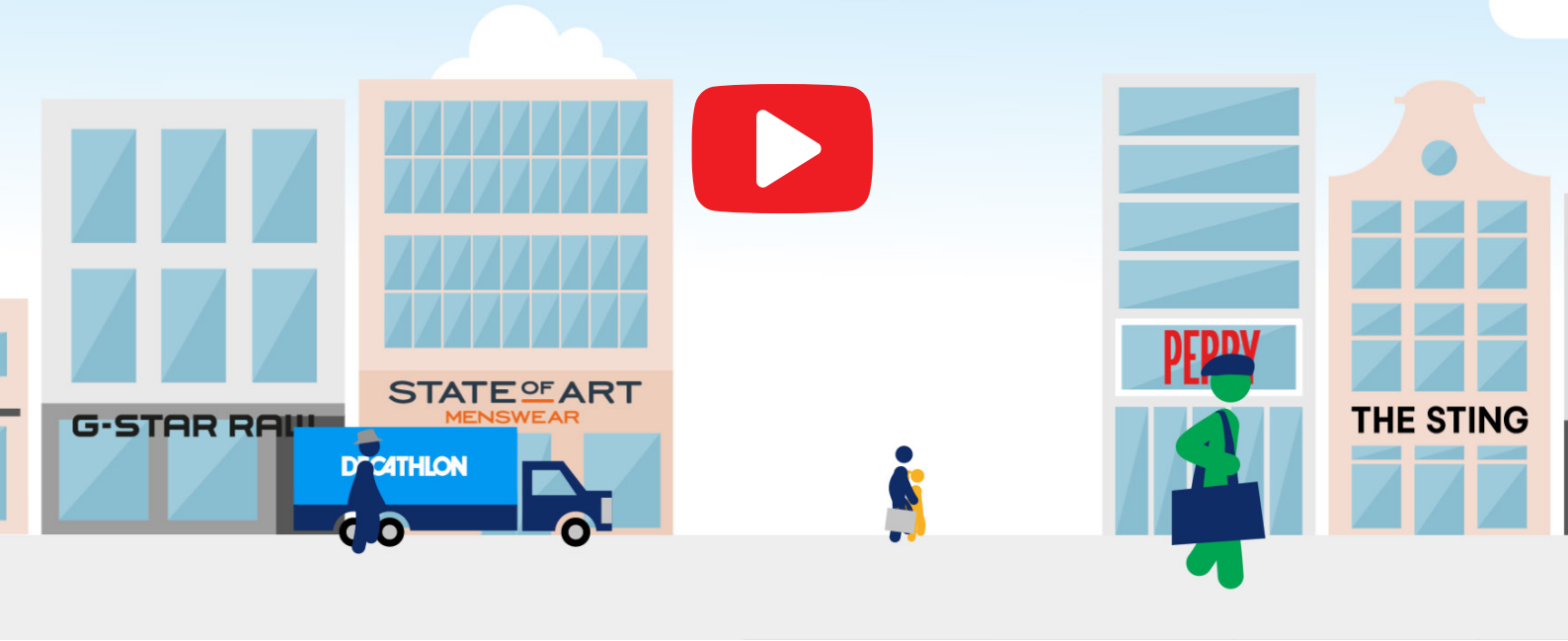
RFID is the right choice if:

- You want to keep track of your stock levels.
- You want to improve product availability in collaboration with your supplier(s).
- You need to identify or count large numbers of items quickly.
- You want to protect your products better against theft.
- You want to find items that you can't see (boxed shoes, stacked T-shirts).
- You want to check goods received quickly and save on labour costs.

This white paper covers the following topics:

- Optimum product availability using RFID.
- The benefits of RFID.
- Possible applications of RFID.
- How does RFID work?
- What does an RFID system comprise?
- How does the GS1 EPC/RFID standard work?
- RFID and privacy.
- Tips for drawing up a business case.

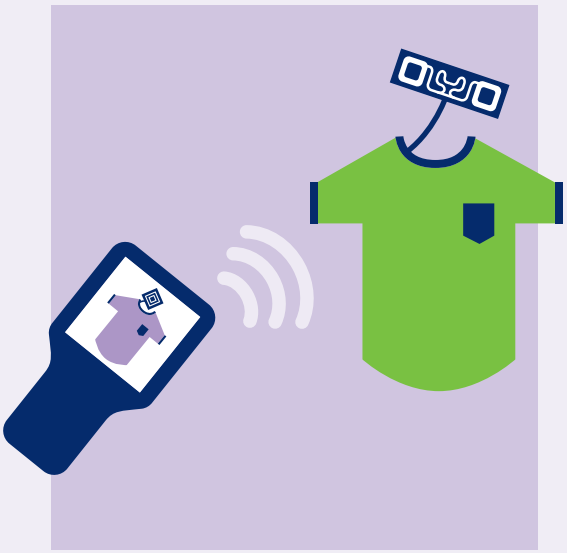
Watch the video and get a picture of who is using RFID.



Optimum product availability using RFID

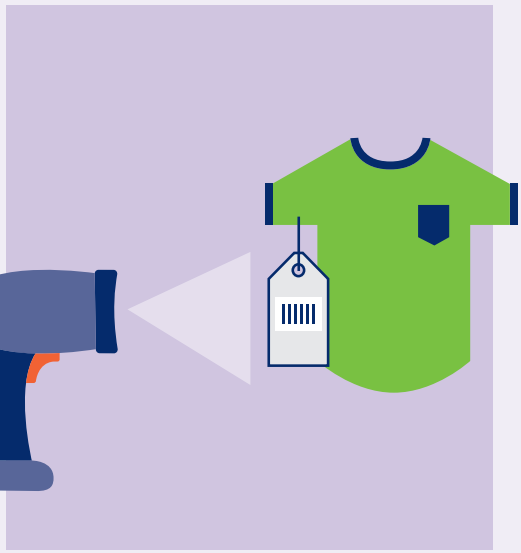
Fashion retailers, whether large or small, can provide optimum service to their customers if they have up-to-date information on their product availability. This requires the physical and online stores to link up seamlessly. RFID is a technology that helps to achieve the best possible customer journey.

Using RFID can help to convert these challenges into opportunities, hence more and more retailers and brands or suppliers are investing in it.



RFID

- Readable in bulk
- Scanning without line of sight
- Each piece unique ID
- Resettable
- Extensive data storage



Barcode

- Piece by piece scannable
- Scan with line of sight
- Article type ID
- One version
- Easy data storage

How does RFID differ from the barcode system?

Trade items are identified based on a unique number, and those numbers can be 'read' using various technologies.

Barcodes and RFID are examples of those technologies. When you scan a product with a barcode it works by reflecting light, whereas RFID uses radio frequencies.

Fashion companies opt for RFID in order to:

- Guarantee optimum product availability, respond quickly to customers everywhere and make cross-selling easier.
- Manage omnichannel activities efficiently, e.g. 'click & reserve' for online reservation and 'ship from store', with orders coming via any channel, making the store a distribution hub.
- Save costs: no unnecessary stocks, rapid stock-taking, efficient processes.

The benefits of RFID

Imagine being able to immediately locate everything you've ever misplaced or lost.

By using RFID, retailers save on costs and see increased turnover and customer satisfaction. Brands see increased margins, reduced operating and labour costs, improved productivity and lower numbers of claims and returns. Everyone benefits!

When you think of RFID, you probably picture complex systems, like it's a solution only for a big company. Actually the technology is more accessible, affordable and easy to integrate than you might expect, even on a relatively small scale and for small businesses.

The six main advantages:

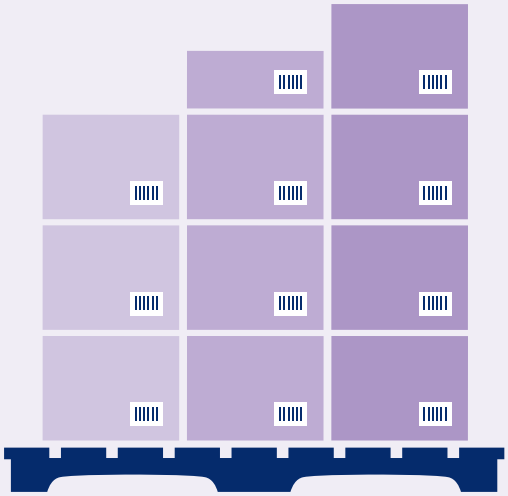
1 Reliable stocks and no more declined orders

No more human errors, but accurate stock levels. Retailers can restock quickly, resulting in not having to decline orders, better in-store availability and higher turnover. That is the main reason for companies to start using RFID. Research shows that in case of an out of stock, approximately 10% of consumers will go on to find the same brand in another store.

Manual counting for keeping stock figures up to date is a thing of the past if all items can be scanned simultaneously.

Only 17% will opt for a different product of the same brand. In other words, 73% will buy another brand that is available.

High lost sales and negative customer and brand experience. Manual stock taking to keep stocks up to date is a thing of the past, if items can be scanned more often and all at once.



Source: Universtity of Parma

Rise in stock reliability
from **60-70%** to **99-100%**

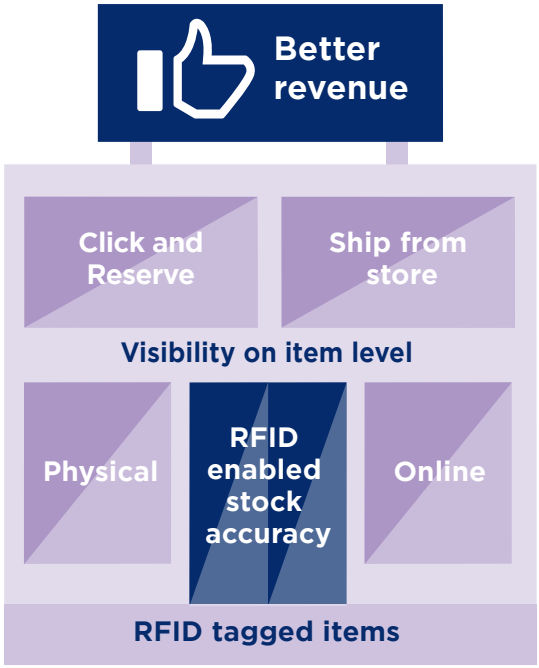
Stock taking takes up to
90% less time

Store staff can keep track of stock throughout the day: what amount is available for online sales, what is in store, what is in the stockroom? VMI (Vendor Managed Inventory) involves the supplier managing its customer's stock, often supplying products based on sales reports. But the correct stock figures are unfortunately not always available for this.

VMI can be used more effectively if the stock figures are reliable thanks to RFID: the supplier can keep better track of the actual availability of its trade items, and the quality of replenishment orders is improved

2 Omnichannel: better availability in store and online

Without an omnichannel strategy nowadays you're behind the times. Everyone wants the total stock to be available in all channels, known as the 'one stock' principle. That calls for high stock reliability and optimum availability. If 100% of the stock on the physical sales floor is available to web stores – without safety margins – full advantage can be taken of concepts such as 'click & reserve' and 'ship from store'.



3 More efficient and reliable logistics processeses

RFID can make processes more efficient and reliable at all points in the supply chain. It provides opportunities not only for automation at distribution centres but also for the optimisation of manual processes.

The costs of outbound and inbound checks at factories, distribution centres and stores are reduced, and performance is vastly improved. Errors can be detected and resolved immediately and at an earlier point in the supply chain. Arguments as to whether items have or have not been delivered become a thing of the past. Suppliers can show what has been shipped in the boxes at single-item level. More efficiency gains can be achieved in stores too. Not only can products be counted at lightning speed (and reliably), items can also be searched for, e-commerce orders picked or stock replenished from the stockroom.

4 Better customer experience in store

Companies regard visual merchandising and improving customer experience in store as new applications. An app can be used to scan garment labels and order the right size, or request assistance in the fitting room. Numerous opportunities are afforded by smart mirrors, which can suggest matching items to customers, for example.

At the checkout, items can be automatically displayed on a screen when they are on the counter. Sales transactions can also be recorded immediately without having to go through a checkout. Or a customer can be given more information about the item: where it was produced, for instance, what material it is made of, and the care instructions. Catwalk videos, other product-related inspiration or personalised offers are possible too: 'This belt goes perfectly with the trousers you're buying'.

Companies see visual merchandising and improving in store customer experience as new applications.

5 Less shrinkage and theft protection

RFID enables you to keep track of when and how items get lost in real time. Products can be traced from the production source to the store, providing an accurate picture of where shrinkage takes. The great advantage is that shrinkage becomes apparent sooner, so that systems can be updated immediately so the stock is correct.

RFID can also be used to safeguard items. If a customer walks out of the store with an unpaid item, exit detectors emit a signal. The detectors are connected to the POS system. Items that have been paid for are assigned a different status from those that have not yet been paid for.

For full supply chain insight you identify products with RFID and determine where product data must become available.

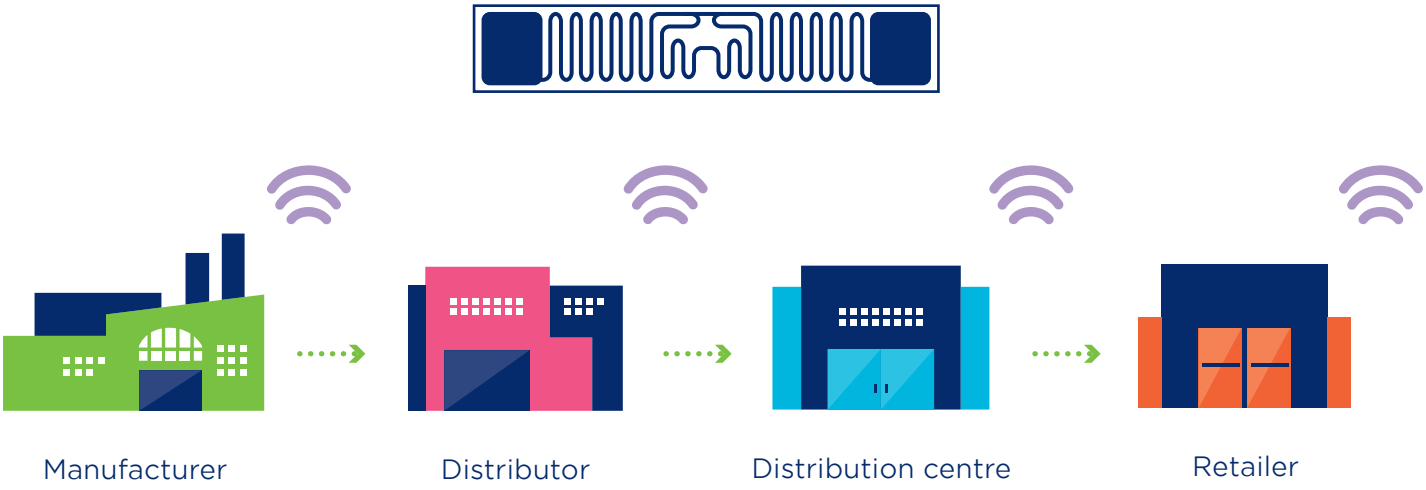
6 Information on the supply chain: origin, traceability and circularity

Information and transparency are catchwords that are increasingly being heard. Accurate stock ensures that you can reduce garment surpluses in the supply chain, for instance, making it more sustainable. You can identify products using RFID and then decide at what points in the supply chain product information should be available – for example to enable you to trace products from their source and determine the origin of items.

Good management of data flows is important for a circular fashion industry too, and above all the information needs to be dynamic, available and reliable. It is important to know the composition of products: what fibres and dyes does a garment contain? For the product to be recycled it is important to know what dyeing process was used as well. All this information can be brought together in a product passport, which you then link up with the RFID tag and keep up to date, at least as long as the product is in use.

Possible applications of RFID

RFID has many applications, and the technology is not standing still. The possibilities depend on where in the supply chain the item is tagged. A large part of the supply chain can benefit if items are tagged at the earliest possible point.



What application do you want to use in the supply chain?

Cotton manufacturer

- Traceability

Factory

- Tagging products
- Checking shipments
- Recycling and re-use
- Authenticity

Consumers

- More enjoyable shopping (RFID mirror)
- Convenience: assistance in the fitting room
- Stock visibility
- Social media with garments

Distribution

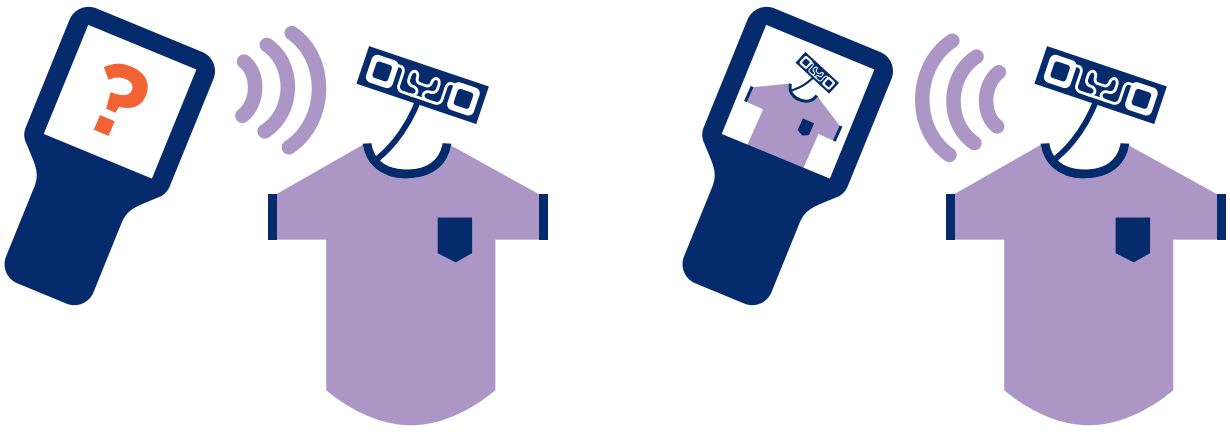
- Checking goods received
- Cycle count
- Picking
- Checking outbound goods
- Grey market protection

Stores

- Checking goods received
- Stock taking
- Replenishing sales floor from stockroom
- Interaction with customers
- Point of Sale
- Anti-theft
- Return process

How does RFID work?

By tagging products with a chip containing the item code and serial number you can identify them anywhere and at any time by scanning them. The scanner reads the code using radio signals. The tag contains an ID number that is unique to that particular item.



The scanner (reader) emits a signal and the chip ‘answers’

The tag is the key to other information such as the garment’s location, condition and status, which is stored in an external database.

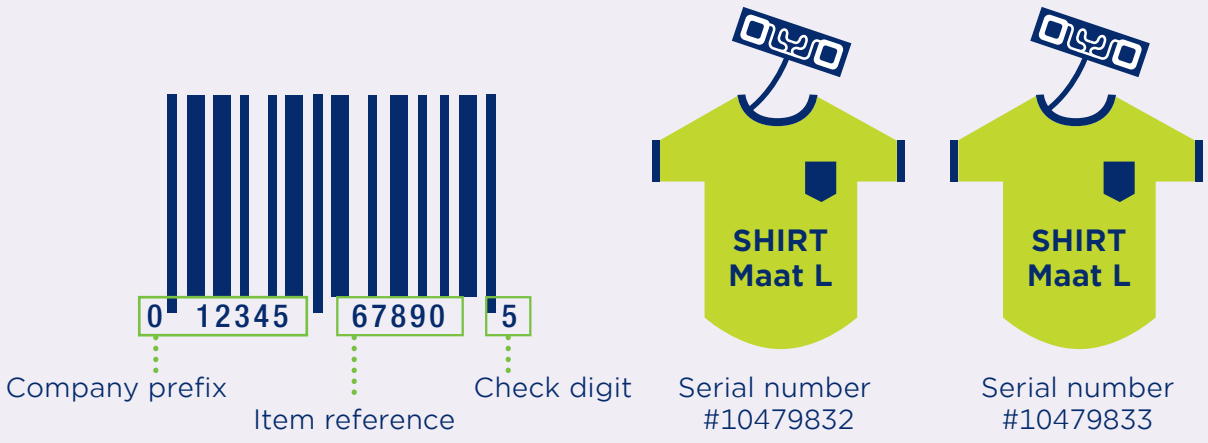
What can RFID do?

- Identify each individual item uniquely. The chip can be read from nearby (e.g. at the checkout) or at a distance (e.g. stock in the stockroom), and a line of sight is not needed to scan and identify items.
- Multiple items can be read and identified at the same time.
- The 'status' of items in transit or storage can be recorded more often and at more points throughout the supply chain.
- The memory in an RFID tag can be edited: for example it can be locked permanently and/or temporarily secured, it can be overwritten or status information can be added (e.g. return history, origin, B-stock).

RFID starts with an sGTIN

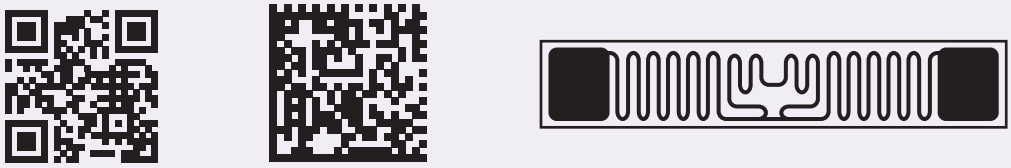
The familiar traditional barcode identifies an 'item-colour-size' combination, for example green T-shirt in size L. All green T-shirts in size L have the same barcode (GTIN or EAN), known as the 'stock keeping unit' (SKU). RFID starts with that GTIN identification and adds a serial number to produce a sGTIN.

Using RFID, then, you can easily make each individual item unique, as each individual T-shirt in size L will have a different serial number.



Brands should follow the identification standard to avoid duplicate numbers, otherwise items will not be unique and interchangeable between brand and retailer.

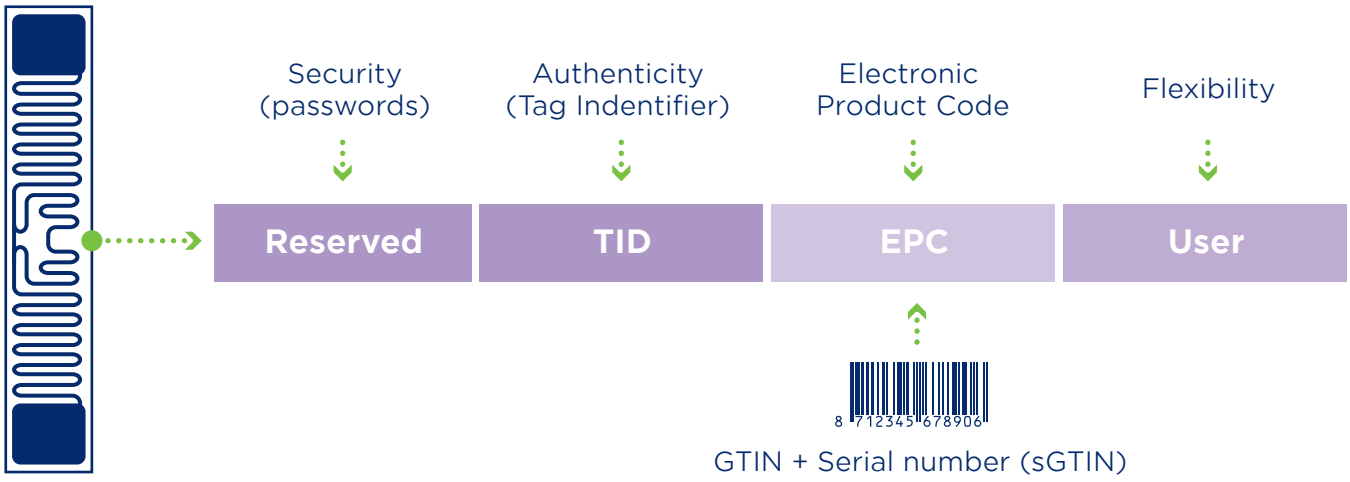
The chip functions as a 'data carrier' just like a barcode or QR code.
The sGTIN can be read from either a 2D barcode or a chip.



QR code | GS1 DataMatrix | RFID

The sGTIN is stored in the EPC section of the RFID chip. Special printers are used to encode the sGTIN in the EPC memory. This is usually done by specialist companies that have printing facilities in the manufacturing countries, which can also manage the serial numbers. Or you can print and encode sGTINs on a tag yourself. A good RFID printer will check whether the printed barcode corresponds to the programmed chip.

The RFID chip comprises four parts:



1. Space for securing the chip with a password.
2. A 'Tag Identifier' (TID), a unique number traceable to the chip manufacturer.
3. The EPC section containing the sGTIN.
4. Free memory where additional information can be stored.

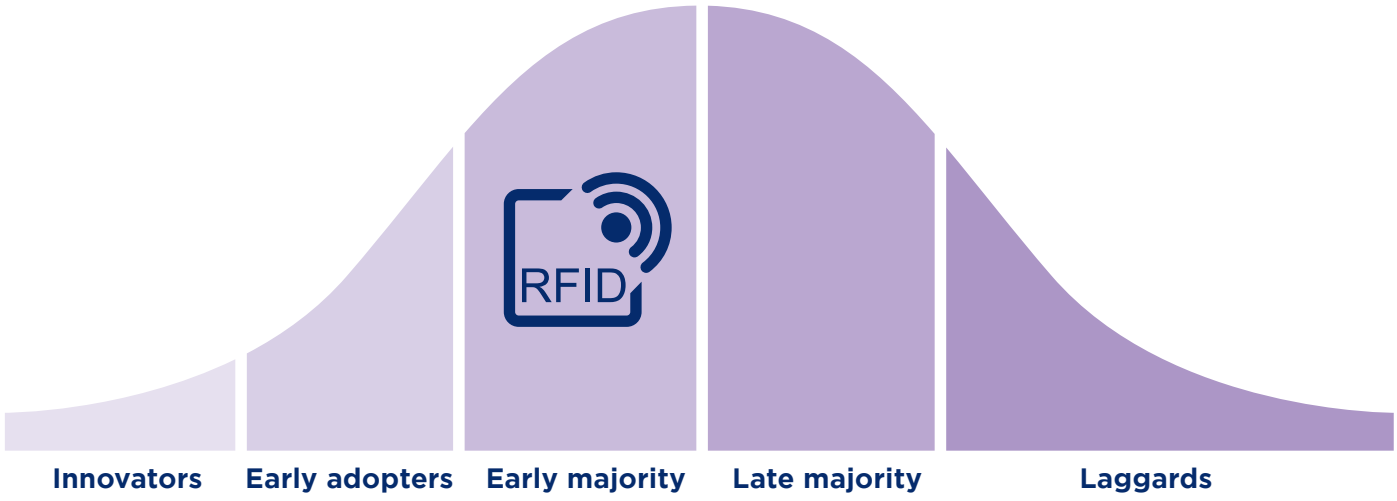
RFID is a tried and tested technology

RFID has been around for some time now. It is a technology that promises just-in-time retail supply chains and constitutes a giant leap forwards in the area of customer service and loss prevention.

Before 2006 the focus was mainly on the technology: 'Does it actually work?'. Pilots were often designed to answer that question. Then there was uncertainty as to whether RFID was affordable and sufficiently reliable.

The business case was not so easy to establish yet, and pilots did not automatically result in the system being rolled out. That has changed, as the costs have gone down and the need has become clearer, especially with the advent of omnichannel concepts. In the last few years the focus has mainly been on 'How would it work for me?' and 'What are the benefits?'. Adoption was somewhat slower than the hype suggested, but great interest is now being shown in RFID.

The technology and its reliability are now adequately proven, and according to recent research by the University of Parma, worldwide use is now at the early majority stage of the technology adoption curve. The pioneering stage is therefore behind us, and RFID is being used on a large scale and beginning to mature.

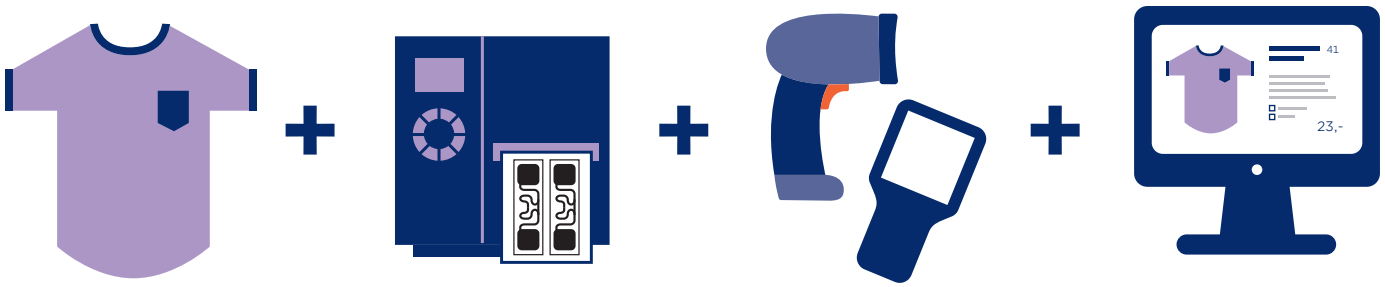


Before 2006	2006 - 2010	2010 - 2020	From 2020
• What is the technology, and how does it work? • Companies involved as innovators.	• Does the technology work reliably?	• What is the business case? • Companies involved as early adopters.	• Companies involved as the early majority.

What does an RFID system comprise?

A typical RFID system comprises four parts:

1. The item that you want to identify using a tag.
2. A printer to encode the RFID tag.
3. A scanner (reader) to read the label.
4. Software to store and process the scanned information.

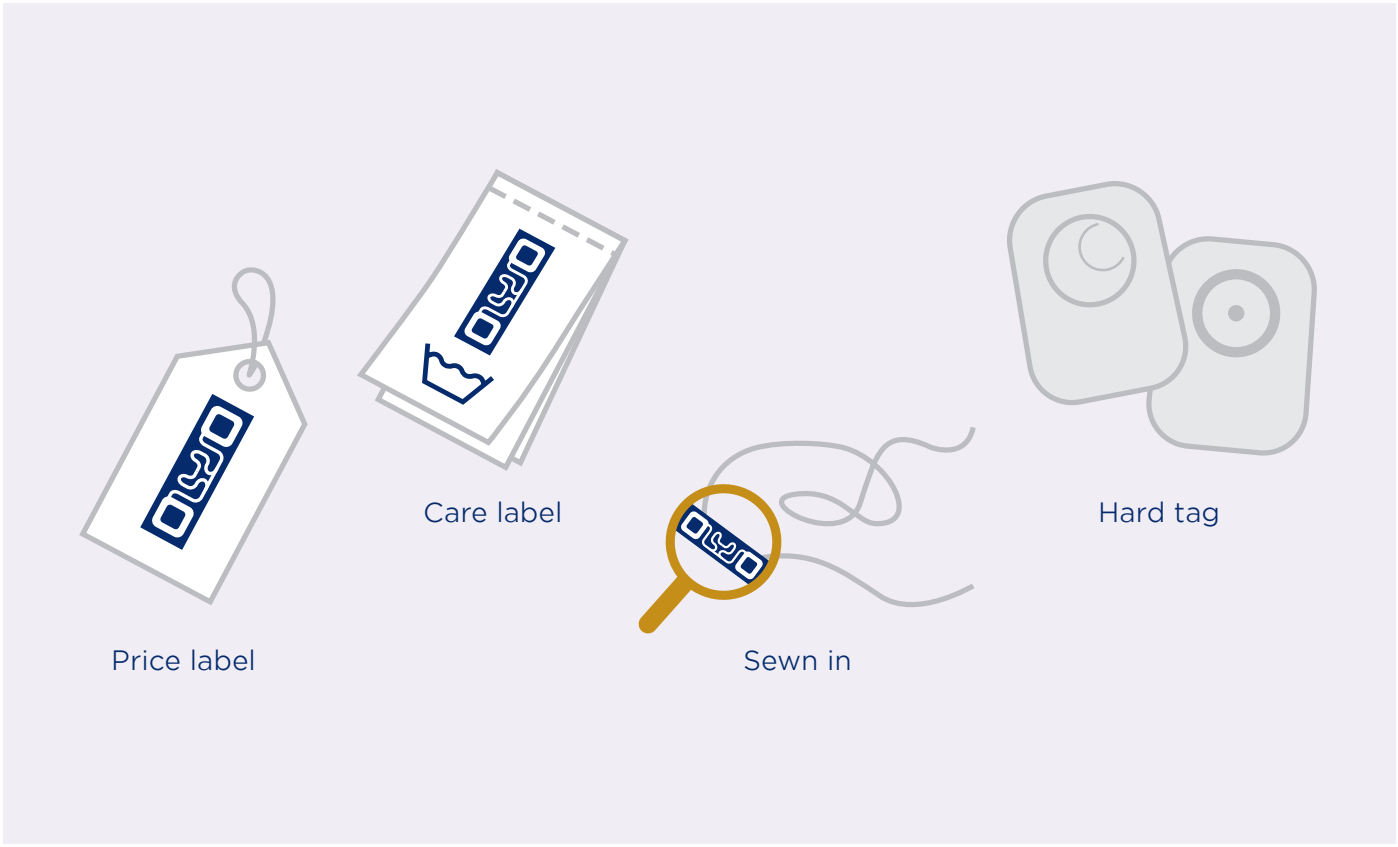


Item RFID printer Reader/scanner Software

Types of tags

There are active tags (battery-powered) and passive tags (with no battery). The latter are mainly used in fashion. Active chips are more expensive; they are used to identify hospital beds or other assets for example. A label comprises an 'inlay' (the chip and the antenna) and an 'encasement'. The encasement can take various forms: it could be a sticker on a price label, incorporated in the care label, a hard tag or plastified to enable it to be washed multiple times. Nowadays it can be even incorporated in a thread.

Opt for good-quality tags, for example from a reliable brand: 'Don't be penny wise and pound foolish'. Some materials, such as metal, lurex and materials containing moisture, do not go together well with RFID tags, as they affect readability and performance.



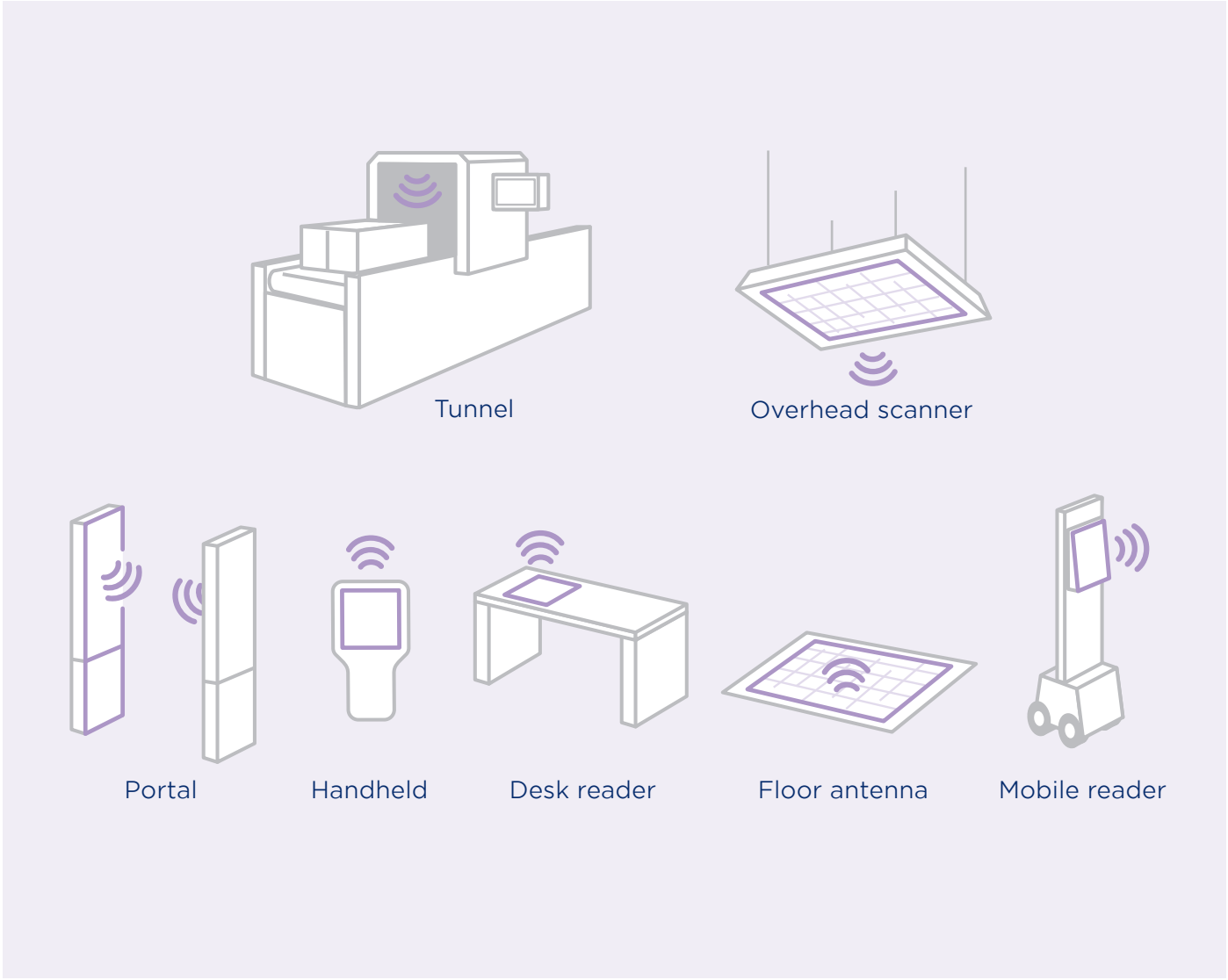
Types of printers

You can print labels yourself using various types of RFID printers, from simple desktop models to robust industrial types. Your choice will depend on the location and the volume required. These printers not only print the product information on a label, but also program it on the tag. Most printers also have a check function to ensure that the printed information corresponds to the programmed information.

If you have a large volume and many factories, you can outsource printing. Various label manufacturers have facilities in most manufacturing countries, and they can assign and manage serial numbers.

Types of readers

Various readers are available that can read tags for various purposes, both fixed and mobile.



Software

Special software is needed for an RFID system to function best. Every time a tag is read, information needs to be recorded, and the amount of data is large, as everything is recorded under a unique serial number (sGTIN). Tags are read often, for example as part of weekly stock taking, and for that purpose you need a database capable of storing that amount of data. This will usually be a different system from the ERP system, as the GTIN level (SKU) is not sufficient.

Each time a tag is read, a large amount of data must be stored.

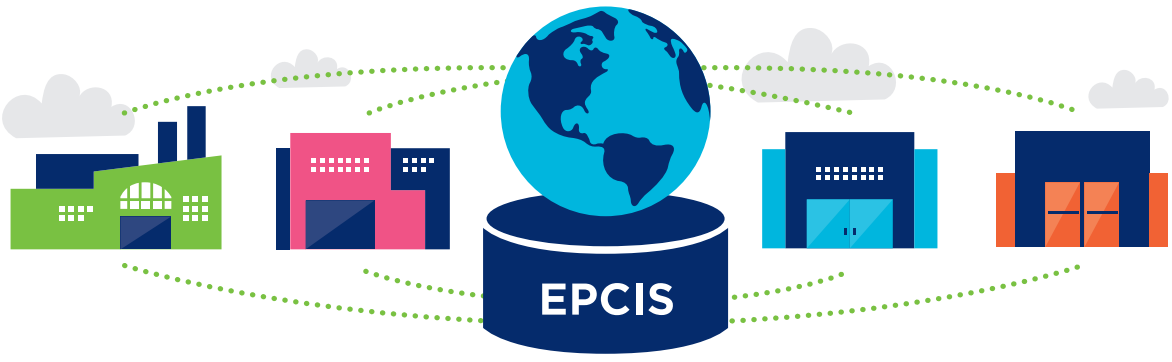
As well as data storage, intelligence is needed to convert data into useful management information. For example to compare scanned information with the expected quantities, or to generate a suggestion on what items should be transferred from the stockroom to the sales floor.

How does the GS1 EPC/RFID standard work?

Collaboration is a lot more efficient when everyone speaks the same language, and that can be achieved using a standard. GS1 has a worldwide standard for RFID in the form of the EPC (Electronic Product Code), which ensures that product tags can be used by multiple organisations to exchange information and for improved supply chain transparency. Standards are vital in a multi-brand environment and when working with e-commerce platforms.

1. GS1 EPC/RFID standards enable organisations to use one another's labels.

2. The more organisations use the standards, the lower the development costs are. It becomes easier and cheaper to communicate using interfaces.

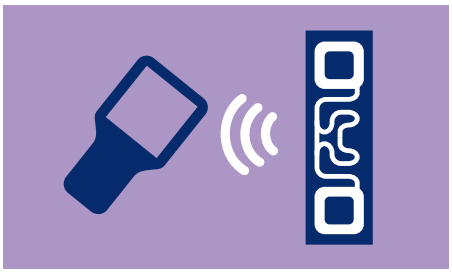


The standards relate to three elements, namely tags, hardware and software:

1 **Identification using the sGTIN (item code plus serial number) on the RFID tag**
The data and memory structure for RFID tags is derived from the GS1 identification system that is in common use. It comprises the GTIN identification number – also known as an EAN – plus a serial number and some reading instructions.

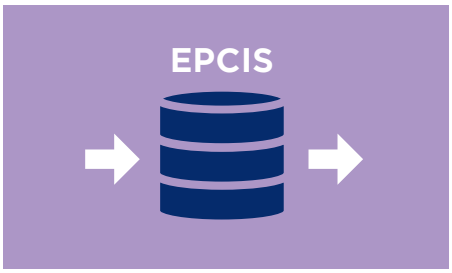
How the data is stored on an RFID tag.

2 **EPC Gen2 (RAIN) interface for tags and hardware**
The EPC standard provides a blueprint for the way tags and readers talk to each other, so that any EPC-compliant combination will work anywhere in the world.



How an RFID reader talks to the tag.

3 **EPCIS databases for data interchange**
EPCIS events provide a detailed picture of a business process. EPCIS is able to show in a standardised manner to what physical objects the message relates, when and where the 'event' took place, and where in the process.



How information is stored and shared.

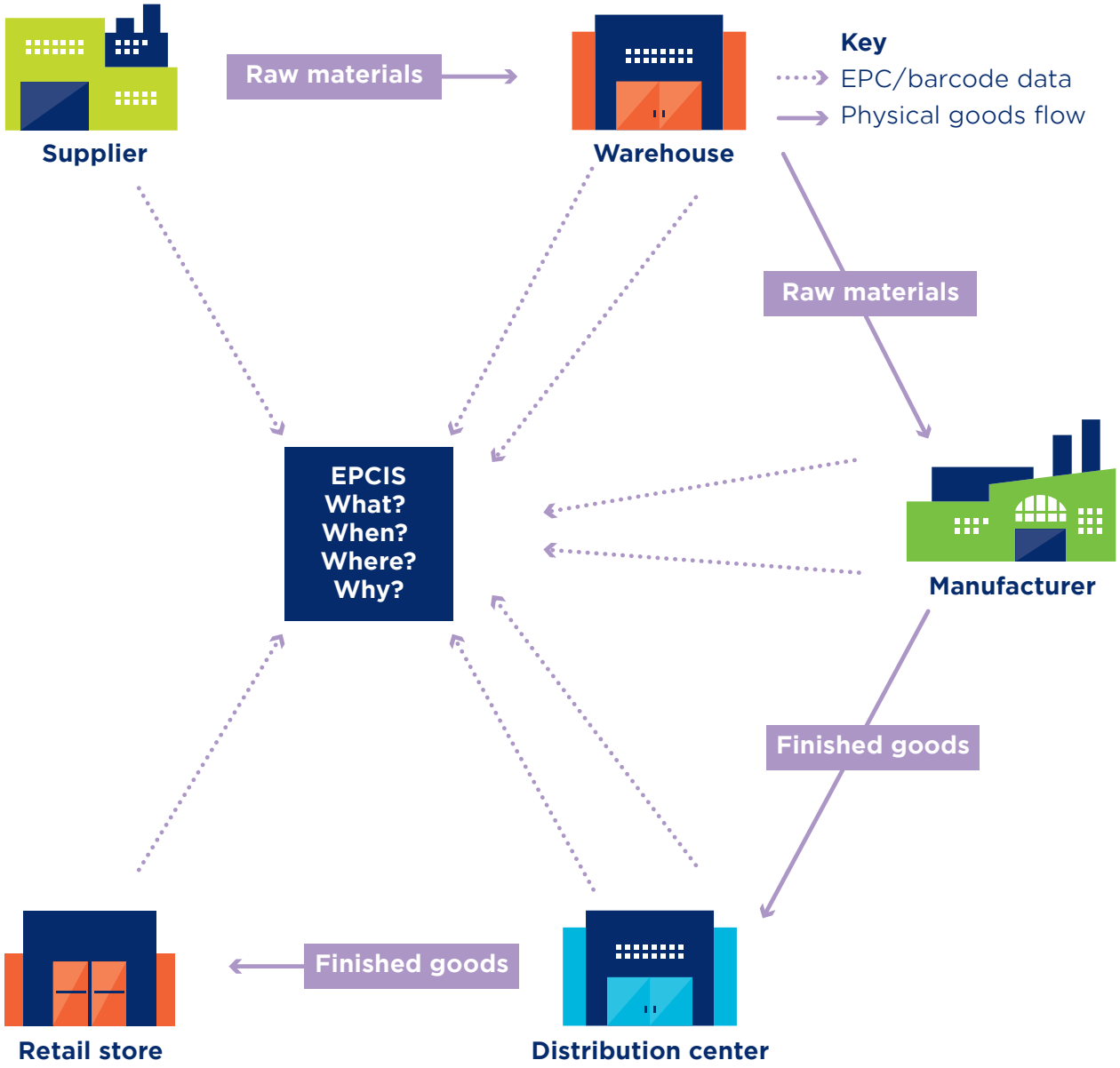
The EPC/RFID standards can be found on the international GS1 sites www.gs1.org/standards/epc-rfid and www.gs1.org/standards/epcis.

Scanning creates large amounts of data: EPCIS

Scanning tags generates large amounts of data, which is stored in a database. If the database complies with the EPCIS standard, data can be stored uniformly and shared between all the supply chain parties.

Each scan is referred to as an 'event' and comprises:

- **What:** what product has been scanned at sGTIN level.
- **When:** when the scan took place.
- **Where:** e.g. factory, distribution centre or store.
- **Why:** the business process, e.g. receiving, stock taking or sale.



RFID and privacy

When it comes to RFID and privacy, transparency is particularly important: both ‘What happens to the data?’ and ‘Why is it needed?’. Study the General Data Protection Regulation (GDPR) carefully.

Protect consumer privacy

RFID can improve the shopping experience, but its use does involve privacy issues. Consumers are more accepting now, because they like to enjoy the benefits, but at the same time privacy is one of their main concerns: ‘What are these companies doing with the information about me?’.

Consumers need to be able to choose whether to share data in exchange for added value, so you should always inform them that there are RFID tags in your store by displaying the RFID logo. Your customers need to be able to remove or deactivate RFID tags easily. The statutory requirements still apply when tags are deactivated or removed:

The customer must be able to choose whether he wants to share data in exchange for added value.

customers need to be able to return the product, for instance, even if the tag has been removed.

RFID is increasingly being incorporated in garments, which helps not only with returns but also with authentication, care and re-use or recycling. On the other hand, EPC tags are increasingly better equipped to safeguard privacy (e.g. by restricting the reading distance, hiding memory or being secured with a password).

Privacy Impact Assessment

The European Commission wants companies to conduct a PIA (Privacy Impact Assessment) to examine customer privacy issues before introducing new RFID applications. To ascertain whether you need to conduct or arrange a PIA, you should answer the following questions:

1. Does the RFID application process personal information?
2. Does the application link RFID data to personal data?
3. Do the RFID tags contain personal information?
4. Do the RFID tags remain in the garment so that they are worn by a person?

If the answer to all those questions is 'No', you do not need to do the PIA.

TIP: A PIA is not required if the tags are removed at the checkout before the consumer takes the garment home.

Use the GS1 Privacy Impact Assessment tool

You may want to improve customer experience by using RFID, in which case you will be using personal data: for example if you link a product's RFID chip to a customer in a CRM system to make returning easier, simplify reordering the product or offer personalised benefits.

GS1 has developed a tool that enables you to do the following:

- Conduct a rapid detailed assessment of the privacy risks of any new EPC/RFID implementation in your company.
- Identify the privacy checks that need to be incorporated in an early stage of the specification or development process.
- Comply with the European Commission's RFID recommendation on privacy and data protection, including the EPC privacy guidelines.

Find the tool at https://www.gs1.org/pia

Tips for drawing up an RFID business case

Decide what problem you want to solve and draw up a business case. That will help you to make the right decisions. The GS1 RFID Expert Group – containing companies in the fashion and sports sectors – can give you tips on how to draw up a business case.

Tip 1: Learning by doing
Introducing RFID is not the end of the process; it's merely the beginning! It involves 'learning by doing'. Keep it simple, start small and gradually expand.

Tip 2: Ensure that there is support from management
Generating support internally is important if a project is to be successful. Obtain approval and support from management: you will need that to enable you to access the necessary resources.

Tip 3: Take advantage of other companies' experience
Many companies have gone ahead of you. Learn from their experience, ask for tips, and seek inspiration on all the various applications, as they are developing at a rapid rate.

Tip 4: First define the problem you want to solve using RFID
Don't become fixated on the technology and the required resources. First and foremost, you need to find out what you can achieve using RFID. Only then look at the resources.

Tip 5: Use the GS1 standard
Companies can collaborate more effectively and efficiently by using standards. Standards facilitate data interchange and upscaling the use of RFID for other applications and with other organisations. The GS1 standard comprises the sGTIN for defining the information, the EPC UHF Gen 2 (RAIN) interface for tags and hardware, and EPCIS for exchanging information.

Tip 6: Tag at the source
The best solution for the entire supply chain is for the manufacturer to tag and encode in the manufacturing country, known as 'source tagging'. That is cheaper and at the same time provides more opportunities throughout the chain. As the retailer you can ask your suppliers to do this.

Tip 7: Use the ROI calculator to ascertain the costs and benefits
The RFID ROI-calculator is a handy free tool that provides an indication of the cost and potential benefits of RFID. The output is based on certain general assumptions and your particular input. The result gives you an idea of when your investment is likely to repay itself and helps you to come up with a vision and decide whether to run a pilot. The cost and potential benefits will depend on the problem you want to solve. Broadly speaking, there are three cost items: the tags, the readers and the required software. There are also benefits: higher turnover due to better product availability, time savings and performance improvements.

The RFID ROI calculator provides an idea if your investment pays for itself. It helps to create a vision and to decide on a possible pilot project.

Tip 8: Define a testing path and KPIs
What do you want to use RFID for? And where? On part of your collection or everything at once? At your distribution centre or in one or multiple stores? A small pilot will show you whether using RFID will produce a sales uplift or an improvement in efficiency. Define clear KPIs that can show the relationship between using RFID and the indicators that you want to improve.

How companies benefit from RFID in real life

Smit Fashion

RFID helps keeping your stock up to date

'We now use RFID for stock taking in our stores. Everything is counted every fortnight, in every store. That's done very quickly. In our large store, it's done within forty minutes.'

Decathlon

With RFID you gain speed, efficiency and insight

'At production stage, we can already indicate which data we would like to have included in the RFID tag. Each tag has a unique code with which the quantities can be quickly determined at dispatch and receipt'.

'Particularly with the self-scanning checkout we have positively surprised customers: checkout is now three to four times faster.'

America Today

RFID basic requirement for omnichannel performance

'If we provide each individual item with an RFID tag, it is easy to see where items are located, which of course has enormous benefits for omni-channel activities.'

'RFID allows us quick stock taking. Our stock accuracy rose to 98% and we immediately saw turnover growth.'

bonprix

With RFID you can offer a unique shopping experience

'A customer can scan a garment and add it to her digital shopping basket. With RFID the stock is checked, the item is reserved and an employee delivers the ordered dress to one of the fitting rooms.'

'The items that the customer actually wants can be taken immediately. RFID readers register which items remain in the fitting room. The app is used to request payment.'

Wolkyshop

RFID perfect for stock accuracy

'Without RFID, stock accuracy in stores is only around 69%. One in three items you think you have in stock is incorrect. It's either not there or it's more than you thought. That results in out-of-stocks and therefore disappointed customers'.

sitchd

RFID is foundation for a transparent chain

'Consumers will ask more and more questions about the materials used and how they are incorporated into our products. Once source tagging has become common, each individual product can be monitored closely'.

'When RFID is used with VMI, we can help our smaller customers and guarantee optimal product availability.

Perry

Roll out RFID: where in the chain to tag products?

'The most efficient way of doing this is of course at the beginning of the chain in the factory rather than at the very end. At the beginning of the chain, larger volumes are involved, which enables manufacturers to invest in machines'.

'The earlier in the chain the products are tagged, the greater the part of the chain that benefits. This creates more value for all parties'.

Only for men

Support for suppliers needed for RFID

'A number of retailers are waiting for manufacturers, who in turn are waiting for action on the retailers' side. By now starting tagging clothes with RFID in a number of our stores, we hope to set something in motion'.

GS1 Netherlands

Starting out with RFID

- Collect information. GS1 can help.
- Talk to your customers or suppliers, solution providers and friendly competitors that have already started.
- Draw up the business case, but don't go crazy.
- Select potential suppliers. Consider not only the cost but also culture, collaboration and growth opportunities.
- Start implementing the system. Start small and simple, gain experience and learn, and expand gradually.

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About GS1

We are an independent, not-for-profit organisation that develops and manages international standards for the identification, capturing and sharing of data.