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Chapter 10

Global Standards for Supply Chain Management in Consumer Packaged Goods Industry

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Additional information is available at the end of the chapter

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1. Introduction

The Global Standards Management Process (GSMP) is the global process established initially by Global Commerce Initiative (GCI) and continued by GS1 for the development and maintenance of global standards and implementation guidelines, which are part of the GS1 System.

The Global Standards (GS) is a comprehensive set of methods and rules allowing the user community and affected industry groups to submit and influence the creation and maintenance of globally agreed standards and guidelines. Since the needs of the community as a whole and the vertical industry groups are constantly changing, the GSMP structure needs to reflect changes to allow maximum process efficiency.

The Efficient Consumer Response (ECR) movement, Voluntary Interindustry Commerce Standards (VICS) and other industry associations have developed Global Standards and Best Practices for CPG (FMCG) industry based on collaboration. These include for example Category Management and Collaborative, Planning, Forecasting and Replenishment (CPFR). To date the industry has struggled to implement these processes widely. A standards based foundation brings: Scalability (expansion from a pilot to an enterprise-wide solution); Portability (roll-out across internal divisions and regions); Affordability (increase in scale without proportional increase in cost) to these processes. [1]

Emerging technology brings new e-business and e-service opportunities to the marketplace. e-Procurement, e-auctions and e-communication over the internet through XML will all be more efficient if developed on a common standards based platform. If international manufacturers, retailers and solution providers (including exchanges) are forced to support a myriad of local 'standards' then the incremental cost incurred will impact the entire supply chain, including national players.

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The Global Commerce Initiative established the Global Upstream Supply Initiative (GUSI) in order to provide a standard framework for consumer goods manufacturers and their suppliers of ingredients, raw materials and packaging to better integrate across a number of supply chain processes.

Without Internal Data Alignment, for example, Global Data Synchronization (GDS) will definitely not improve business performance and will, in fact, magnify the negative impact of poor quality data. What's more, collaborative initiatives such as those included in Efficient Consumer Response (ECR) and Collaborative Planning, Forecasting and Replenishment (CPFR) will not be economically deployable on a wide scale without the consistently accurate and available information that will result from an Internal Data Alignment program.

GDS is based on a global network of data pools, or electronic catalogues, which are all inter-operable and compliant with the same business requirements and standards. Interoperability means that a manufacturer can publish a product and partner data on one single Data Pool without having to worry about the fact that customers may select different Data Pools to access the data.

The need for an internal organization

The success of Global Standards, and therefore the realization of the benefits, will come through achievement of critical mass. Widespread adoption, though, does not mean that companies cannot gain competitive advantage through optimal implementation of standards. Leading companies that strive for this position have aligned relevant internal functions and processes with the external standards development and management environment and are building standards implementation into their internal business processes.

It is clear that standards development requires business involvement. Industry representation is critical. Leading businesses understand this and engage with the standards process.

In addition to working with the GS1 - GSMP and with GCI, most major manufacturers and retailers engage with trade associations such as Association Internationalle de Marque (AIM), CIES – The Food Business Forum, Food Marketing Institute (FMI) and Grocery Manufacturers Association (GMA), and with associations such as the regional and national ECR and GS1 organizations. Most companies do not co-ordinate their activity across these bodies allowing regional or national managers to engage with a regional or local perspective rather than a global perspective.

Lack of alignment of these activities in a global company results in inefficient use of resources, duplication of activity and confusion within and outside the organization.

Companies that have coordinated across these activities report increased efficiency (a reduction in the resource applied against these activities) but coupled with a significant increase in effectiveness. Less people doing a better job.

The GS1 Business Plan includes expansion of the GS1 System into targeted sectors. In order to accommodate new sectors, GSMP must balance the need for individual sector needs with a consistent overall process. In terms of recognition and governance, the GSMP allows the formation of a User Group for a specific sector based on the GS1 Business Plan.

The Nestlé GCI/GSMP network

Nestlé implemented a GCI/GSMP internal network to co-ordinate the approach to standards development and drive the standards implementation. The organization is built around 4 units: One Expert Network per subject; Subject Matter Owner; Central coordination role; Nestlé GCI/GSMP Steering Group.

Nestlé created an Expert Network for each subject in which they are involved in GCI/GSMP working groups. In general, the Experts could be anyone, who is working on the respective subject. They contribute their subject knowledge during standards development and communicate the decisions made back to their base (e.g. Market, Regional Center).

2. Overview of Global Data Synchronization (GDS)

2.1. Information sharing in the supply chain

Information sharing can address three key areas in a product life cycle: Greater sharing of information about consumer trends and market trends between trading partners can lead to greater insights into consumer behavior, enabling both partners to better serve the consumer. Sharing information about real demand between two trading partners can enable the development of products that better meet consumers' needs. Sharing of accurate, real-time operational information between the two trading partners can lead to better use of assets in the supply chain. This can improve product availability and consumer satisfaction at the point of purchase. Accurate information is the basis of any commercial enterprise. This is particularly true in the fast-moving, quick-response world of manufacturing and retail. [2]

New ways of working together is about developing new ways for vertical trading partners to work together – including sustainable changes in culture, collaborative business planning and new measures and rewards. For a bilateral trading partner relationship, it offers an integrated roadmap for getting alignment and commitment on four key strategic choices in the collaboration of trading partners, which can ultimately lead to more satisfied shoppers and the elimination of waste, both of which should, in the end, produce better business results.

Some of the changes that need to be made with regard to information sharing will affect the whole industry; others will be bilateral arrangements between individual trading partners, as each company finds out "what works for us". The reforms needed are in systems, in practice and in philosophy, and cover, for example, a common vision of the value to be created by sharing information across participants in the value chain or changing the way

data is exchanged. A GCI group worked on the development of data flows linked to the process of new product introduction, identifying what the information needs would be in 2018, as well as possible solutions, like a POS data sharing platform. The group analyzed the current situation and outlined the action needed to move the industry forward. A number of group members are now working to establish pilots on information sharing across several steps of the new product introduction process. [3]

2.2. Global commerce initiative vision for Global Data Synchronization (GDS)

Data synchronization is the process of sharing master data between trading partners (details of materials for sale within a market). GDS is based on a global network of data pools, or electronic catalogues, which are all inter-operable and compliant with the same business requirements and standards. Interoperability means that a manufacturer can publish a product and partner data on one single Data Pool without having to worry about the fact that customers may select different Data Pools to access the data. A Global Registry controls the flow of information within the network. Obviously , perfect alignment of Master Data is a necessity to support advanced collaborative practices, but the effort of undertaking such a project is worth it : exchange of master data through data pools is the most efficient and reliable method to implement modern collaborative practices.

Strategic direction

To support and implement the GCI vision for GDS is the strategic direction formany multinational companies. Under the Global Commerce Initiative was developed the first truly global approach to Data Synchronization.

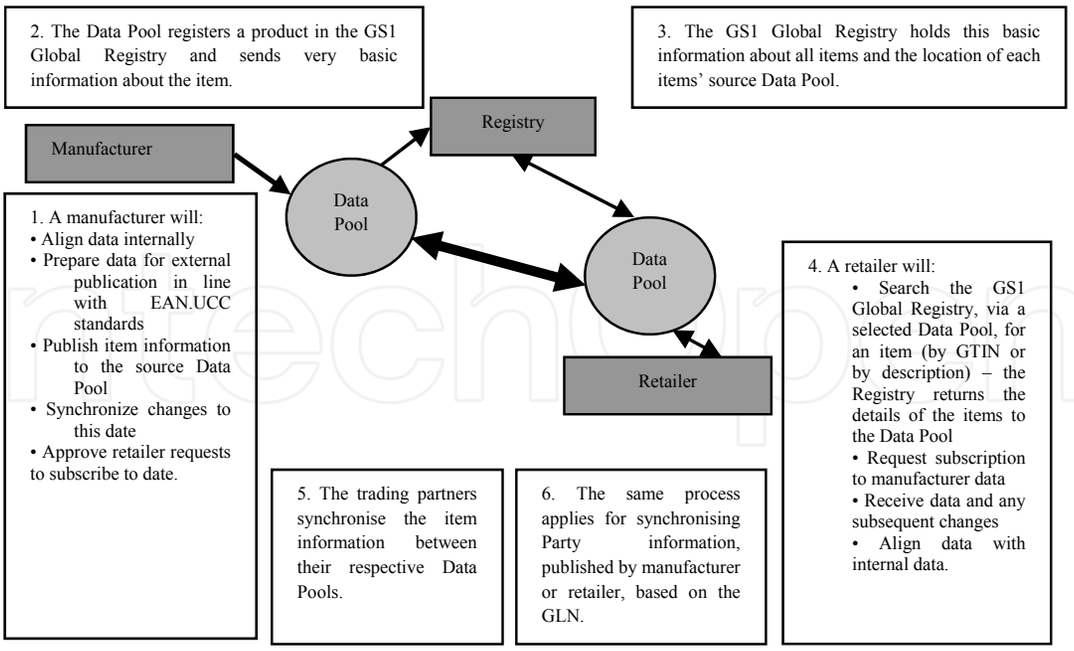
A known best practice in the area is always to collaborate with customers or suppliers with confirmed GDS commitment while aligning internally to create the readiness for efficient and effective large scale implementation of GDS, in terms of organization, processes, data and systems.

Buyers and sellers would be able to focus on building sales rather than on correcting misaligned information. When a new product is launched the data will be exchanged in a seamless and streamlined way through the supply chain, allowing the right amount of goods to become available at the right place and at the right time – and faster!

This is the vision that GDS enables through providing the fundamental infrastructure for the seamless flow of product information through the supply chain.

This GDS vision is delivered by the GDS Network. The network (Figure 1.) consists of:

- Interoperable, certified Data Pool,
- A Global Registry; provided by GS1,
- A set of EAN.UCC Standards (European Article Numbering – United Code Council), ensuring that all supply chain partners use common product descriptions and classification and the same message structures to exchange the data.



Source: An integrated view of the Global Data Synchronization network on the Electronic Product Code Network, GCI and IBM, 2004 [4]

Figure 1. GCI vision for GDS

These elements of the GDS Network collectively support the synchronization of product data between trading partners.

The GS1 Global Registry and the interoperable Data Pools are at the heart of the GDS process. Their roles and functions are distinct but complementary. The key role of the GS1 Global Registry is to ensure that original data is registered once, at one place. Data Pools provide for the publication of certified standard data and subscription to this data.

The Network works with the following principles:

- The GS1 Global Registry and the Data Pools will be EAN.UCC certified,
- There is interoperability among all Data Pools and the GS1 Global Registry,
- One single point of entry into the Network by all participants,
- Only the Data Pools will communicate with the GS1 Global Registry,
- Only GDS EAN.UCC Business Messages will be used within the Network.

2.3. Master data synchronization

Master Data Synchronization (or alignment) through data pools is recognized as the most efficient way to support the master data sharing between trading partners. The benefit of data pools is that the use of their services mandates the adoption of standards. The development of most national data pools in the world are claimed to be based on GS1 standards such as the Global Trade Item Number (GTIN) for the unique identification of items, GS1 messages such as PRICAT and PARTIN, etc. Although many data pools support GS1 standards, their development appears having been mainly focused on national

requirements. This has led to the implementation of different structures and designs. In order for global data synchronization to be viable, data pool inter-connection and inter-operability is essential.

Key business components and requirements of the global data synchronization process are:

- Leveraging data pools in order to benefit from the potential they offer,
- The registration of all items and locations to facilitate sharing of master data,
- The implementation of standardized information flow to support the data registration and synchronization.

In order to meet these requirements, the following is needed:

- Implementation of a Global Registry to control the registration of items and locations,
- Amendment and further development of data pools in order to comply with the GCI specifications (master data dictionary (GCI / Data dictionary), rules, principles, synchronization process, etc.),
- Development and implementation of standardized messages between data pools and the Global Registry,
- Development and implementation of standardized messages between data pools and users (companies) based on the GCI / Data dictionary,
- Establishment of a Neutral Body for the governance and certification of the Global Registry,
- Establishment of a Neutral Body for the Technical Certification of data pools.

The initial implementation of the GDS vision is focused around Master Data for 'Item' with 'Location' intended to follow soon after. Master Data is the set of data describing the specifications and structure of each Product (or Item) and Location (or Party) involved in Supply Chain Processes, based on the key identifiers, the Global Trade Item Number (GTIN) and the Global Location Number (GLN).

The Master Data is an Information Alignment that can be divided into Neutral and Relationship Dependent Data.

Neutral Data is that which is generally shared between multiple parties and which is Relationship Independent. This can be split into three categories:

- Core Product Data – Core Data Attributes that apply to all instances of any product (e.g. description, brand name, packaging, dimensions, etc),
- Category Specific Data – Data Attributes that only apply to specific product categories (e.g. the color, grape and strength of a bottle of wine),
- Target Market Data – Data Attributes that are specific to product in a particular market (e.g. packaging indicators in a specific country).

Relationship Dependent Data – Data Attributes that concern all terms bilaterally agreed and communicated between trading partners such as marketing conditions, price information and discounts, logistics agreements and more.

2.4. Global Upstream Supply Initiative (GUSI)

The Global Upstream Supply Initiative (GUSI) was formed to define a common way for manufacturers of consumer products and their suppliers to provide tighter integration of their supply chains, without the need for costly and time-consuming IT integration projects with every customer or supplier. The UIM (Upstream Integration Model) developed by GUSI comprises a set of agreed business processes and information flows supported by electronic message exchange based on GS1 standards.[6]

The GUSI Working Group first established an Upstream Integration Model (UIM), which defined a number of standard business processes and information flows for different scenarios. These scenarios covered different situations where consignment stock was or was not involved and covered the case where the manufacturer initiated the order (Traditional Order Management) or where the supplier initiated the order (Supplier Managed Inventory).

In both cases, greater supply chain integration is achieved by improving visibility of both inventory and demand throughout the supply chain.

The GUSI Working Group decided to adopt the GS1 XML message standards to exchange information between the trading partners in support of these supply chain processes.

It is important to highlight that each business case must be tailored to the actual situation depending on the individual supplier and manufacturer, the industry, the products, etc. The starting point for the companies will also be different. The business case for companies that have already invested in collaborative supply chain solutions will focus on the cost to adopt the GUSI model vs. the benefits gained from extending their collaboration community, while the case for a company introducing collaborative solutions for the first time will focus on the initial investment vs. the benefits gained from collaboration based on the GUSI model.

The potential benefits can be categorized as:

- Hard benefits (tangible),
- Likely benefits (quantified) (tangible),
- Qualitative benefits (non-tangible),
- Stretched benefits (non-tangible).

Tangible benefits are those associated with a monetary saving, e.g. from collaboration which can give reduced inventory, material cost reduction, reduced errors, optimized production planning, reduced paper handling (e.g. e-billing) etc.

Non-tangible benefits refer to all those that cannot directly be put into monetary terms, e.g. improved data quality, increased flexibility and reliability towards customers. Although difficult to quantify, intangible benefits can be significant and add weight to an ROI study [5].

2.5. Business rationale

The current situation in the upstream supply chain of the CG industry is that all manufacturers and suppliers are faced with different business processes and data interchanges when they move into more integrated relationships. Different business processes and approaches create a barrier to the scalability of integration efforts whilst also imposing many costs: the time and money spent making transactions; the delays caused by the need for corrections; plus inevitable information gaps and misunderstandings. Both parties should obtain benefits from integration, among them improved visibility of demand and demand changes and reduced inventory. Today, to access these benefits, each program between manufacturer and supplier has to establish its own framework for process definitions, item and location coding and in many cases message content. This is both a wasteful process and in itself presents a significant barrier for scaled adoption. For example, integrated suppliers consists in the challenge to integrate with multiple manufacturers, each one with its own definition of the above factors. The existence of a framework based on industry standards overcomes the described barriers and:

2.6. Integrated suppliers

The working group has taken into account existing standards and work undertaken by previous projects. In particular it has built on work sponsored by ECR Europe.

The ECR "Integrated Suppliers" report summarized the concept of 'Integrated Suppliers' as follows: "*Integrated Suppliers is a concept for improving the part of the supply chain between manufacturers and the tiers of suppliers of ingredients, raw materials and packaging. By sharing information both parties are able to exercise judgment on costs, quantities and timing of deliveries and production in order to stream line the production flow and to move to a collaborative relationship.*" [7] Where the ECR report was about the 'supplier driven' continuous replenishment processes (supplier recommends the order to the manufacturer) it did not include 'manufacturer driven' ordering processes. The UIM covers both aspects and covers more elements that can be improved in the manufacturer/supplier relationship - for example, next generation electronic data exchange based on exception management.

2.7. Case for using existing GS1 item and location coding standards

A significant change proposed is that manufacturers and their suppliers should adopt the GS1 standards for item and location coding to create a common coding system across the supply chain - downstream as well as upstream. It is felt that the time is right for this move given that:

a. There is strong manufacturer commitment to the GS1 standards;
b. There is an increased manufacturer momentum to build automated solutions that will scale;
c. There is increasing supplier awareness of the inefficiencies of the existing methods;

d. There are new technologies expected over the next few years that will be based on existing GS1 standards. By adopting the existing standards, suppliers will be able to migrate to these new technologies. An example is the emerging use of Radio Frequency Identification (RFID). To use RFID companies will need to adopt the new GS1 Electronic Product Code (EPC) Network being developed. The EPC will provide a coding structure for radio frequency tags enabling individual items or groups of products to be tracked across the supply chain. The existing GS1 item-coding standards are embedded in the new EPC structure. It therefore provides a good first step towards new RFID-based solutions [6].

The main GS1 standards that suppliers and manufacturers should use are the:

- "*Global Trade Item Number"(GTIN):* a unique and international GS1 number is assigned to each trade item or to a standard grouping of trade items. This number is known as the GTIN. Each GTIN data structure is represented by a bar code symbol. This allow for the identification numbers to be scanned for automated data capture and electronic data processing.
- *Global Location Number (GLN).* Location numbers are a key concept in supply chain management. A location number is a numeric code that identifies any legal, functional or physical entity within a business or organization. The identification of locations is required to enable an efficient flow of goods and information between trading partners through electronic messages to identify the parties involved in a transaction (e.g. buyer, supplier, place of delivery, place of departure).

2.8. The Upstream Integration Model (UIM)

The UIM and Information Alignment offer common business processes and data interchanges to support upstream interoperability between manufacturers and suppliers.[6]

By engaging in such an integration effort, business partners wish to:

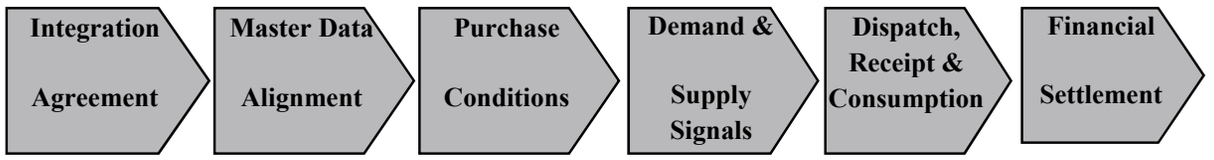
- Create value in the supply chain for mutual benefit,
- Apply practical solutions fitting the nature of their business,
- Share and synchronize data and processes,
- Co-manage the materials lifecycle through the definition of business rules,
- Apply industry standards,
- Push the concepts through the whole supply chain.

It has been designed to meet the major electronic communication needs in the following business areas:

- Procurement,
- Material forecasting,
- Inventory management,
- Dispatch, Receipt & Consumption of Materials,
- Financial Settlement.

By adopting this model manufacturers and suppliers will have a common language for the processes and data interchanges within their electronic integration relationships. To achieve this, the model contains very specific definitions of process terms, data exchanges and their content. Adopting the model allows companies to translate their internal processes and approaches into a common language that all other parties will be using. The UIM structure creates a common set of definitions that all parties can use, whilst still allowing them to use their own internal definitions and processes, possibly with a requirement to translate internal information into the standard structure of the UIM.

The concept of the model is based on six building blocks, structured as per Figure 2 below:



Source: GUSI working group [6]

Figure 2. UIM Building Blocks

The UIM offers a collaborative approach to both supplier- and manufacturer- initiated ordering processes and addresses the most common variants of them based on either a manufacturer or supplier driven scenario.

3. An integrated view of the Global Data Synchronization network with Electronic Product Code network

3.1. The EPCglobal network

RFID is a technology which allows an electronic 'tag' (a silicon chip attached to an antenna) to transmit its unique identification number to nearby electronic 'readers'. RFID tags are used in a variety of applications from automated bridge toll payments to dog tracking. The Auto-ID Center created the concept of a unique code EPC that can be stored on the 'tag' and, once read by an RFID reader, the code can be used to 'look up' information about the tagged item. Because a code uses very little chip memory the chips themselves can be very small and, therefore, very low cost. This makes the tags suitable for ubiquitous deployment on pallets, cases, inner packs, and even on individual consumer items.[4]

By using the RFID technology to increase the visibility of product movement and the EPC code to facilitate off-product information storage, supply chains of the future will be able to track objects in real-time through the total supply chain and the product's lifecycle. The increased visibility of pallets, cases, and items that the use of EPC technology can deliver will offer numerous new opportunities for improving supply chain measurement, performance tuning, and product collaboration. In order to take advantage of this product visibility across multiple trading partners in a supply chain, there will need to be a secure network for reliably sharing product information.

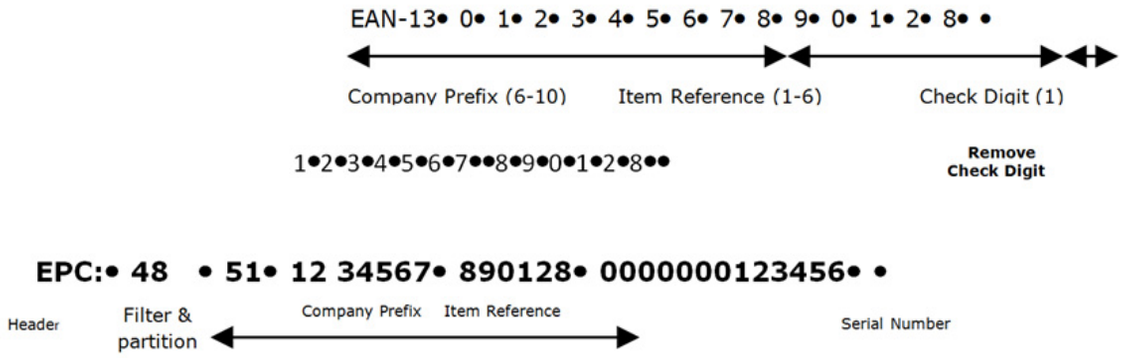
The EPCglobal Network is an open, standards-based system that will facilitate the sharing of unique product identification and tracking information among partners in the value chain.

The EPCglobal Network enables the secure storage and/or retrieval from other sources and networks of the following information about each tagged object:

- **Core Product Information:** Things true for all products with the same GTIN. This is identical to the Core Product Information in the GDS Network.
- **Manufacturing Time Information:** Things known about this pallet, case, or item at the time of manufacture. Data elements such as 'lot number' and 'expiration date' are not stored by the GDS Network and today are often only stored in the internal IT systems of the manufacturer.
- **Lifecycle History Information:** The distributed track and trace details of the lifecycle of a product. Data elements such as 'date/time received in back of store' are not stored by the GDS Network and today are often only stored in the internal IT systems of the various supply chain partners.

3.2. The link between GTIN and EPC Code

The GTIN (e.g. EAN13, UPC12, etc) and the EPC are standards based numbering schemes for identifying items.



Source: [3]

Figure 3. Example of a GTIN used to build an EPC Code

The diagram shows a high level schematic of how a GTIN can be used to build a unique EPC code.

Reference should be made to the EPCglobal Tag Data Specifications.

The GTIN is an umbrella term used to describe an entire family of EAN.UCC data structures for trade items identification. The family of data structures includes the UPC (UCC-12), EAN.UCC-13, EAN.UCC-8 and EAN.UCC-14. Items at every level of the trade item configuration (consumer selling unit, case level, inner pack level, and pallet) require a unique GTIN.

The EPC is an identification scheme to uniquely identify an individual item. The difference between the two is that a GTIN identifies a particular class of object, such as a particular

kind of product or Stock Keeping Unit (SKU), but does not uniquely identify a single physical object.

To ensure the continuity, but still being able to create a unique identifier for individual objects using the GTIN, the GTIN is augmented with a serial number. The combination of a GTIN and a unique serial number is called **Serialised GTIN (SGTIN).**

Other GS1 standards based numbering schemes can also be used to build unique EPC codes.

The publicly available EPCglobal Tag Data Specifications give details on how to create 96-bit EPC codes, which encapsulate existing industry numbering schemes such as:

- EAN.UCC Serial Shipping Container Code (SSCC®)
- EAN.UCC Global Location Number (GLN®)
- EAN.UCC Global Returnable Asset Identifier (GRAI®)
- EAN.UCC Global Individual Asset Identifier (GIAI®).

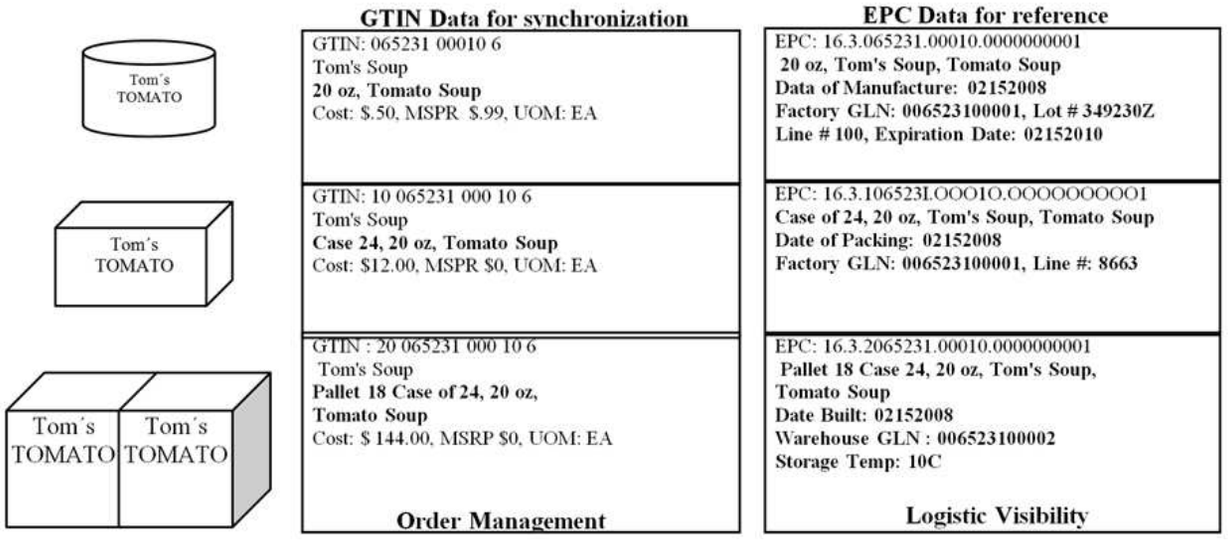
For other industries, it is intended that different numbering schemes will be used to build the EPC to ensure minimal disruption and investment protection, while at the same time ensuring that all EPC codes are globally unique. Today, in addition to consumer products and retail, many industries are considering EPC adoption – including defense, aerospace, pharmaceuticals, healthcare, logistics, airlines, chemicals, medical equipment, consumer electronics and paper.

3.3. Electronic Product Code: RFID drives the next revolution in adaptive retail supply chain execution

RFID-Based EPC Will Fail in Supply Chains Built on Inaccurate Data

The benefits promised by RFID-based EPCs can only be delivered if trading networks also address the issue of inaccurate data that pervades today's supply chains, especially in the retail sector. There is little point in knowing that a case of goods with a particular EPC is speeding its way through the system if you think it is toothpaste when it is actually shampoo. Since the EPC is a GTIN-based number, synchronizing the meaning of the GTIN during the order management process is critical to ensuring accurate fulfillment of that order and downstream supply chain processes based on EPC scanning.[11]

Therefore, prior to the implementation of RFID readers and tags, all retailers and their suppliers must adopt the single global data synchronization (GDS) vision being promoted by the Global Commerce Initiative (GCI) and GS1. GS1, the standards organization for retail, has not only developed a single standard for identifying products, the Global Trade Identification Number (GTIN), but also an infrastructure—the Global Data Synchronization Network (GDSN)—to allow the retail industry to share data more easily. When fully implemented, GDSN will allow detailed data about products from any supplier anywhere in the world to be accessed by any retailer anywhere in the world, through a network of locally held databases of GTINs called data pools.



Source: [10]

Figure 4. GTIN and EPC in Supply Chain Synchronization

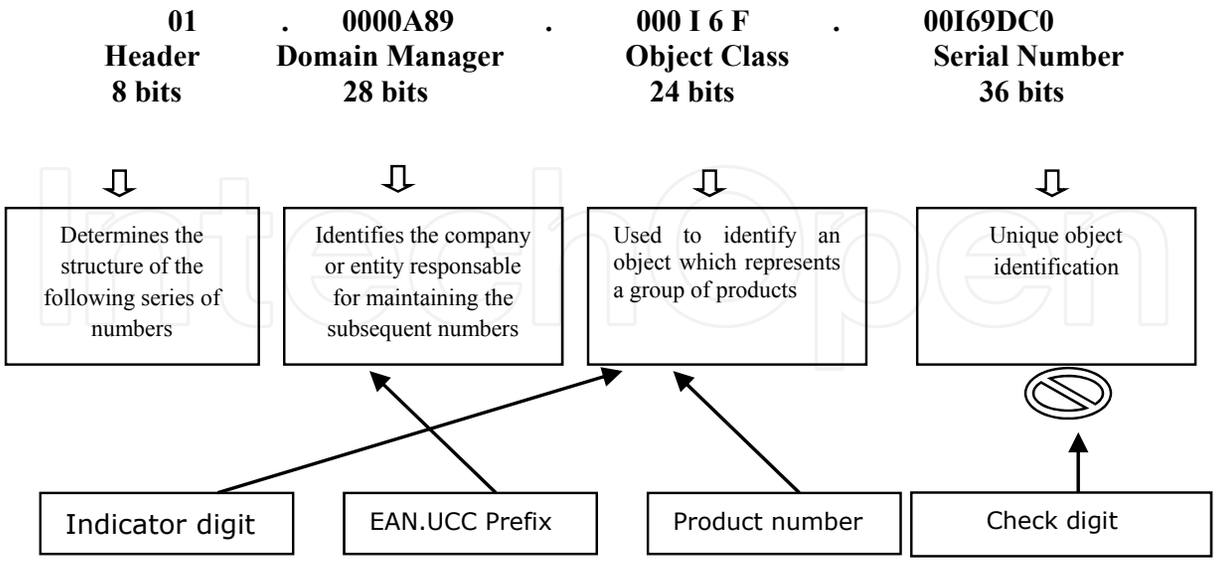
3.3.1. RFID (Radio Frequency Identification) and EPCs—The basic technology

RFID tags storing EPCs are a way to associate data with a physical product. Anyone handling the physical item can (with the right technology) access the business data about that item—everything from its identity to which invoice it has been charged on. Each RFID tag contains a microchip that stores identification data—the EPC—and a wireless transmitter and antenna that can broadcast that data to readers. Unlike the conventional barcode, readers do not have to be in "line of sight" of the tag.

As with the barcode, a set of standards is emerging to govern the EPC data structure stored on RFID tags, so that a tag attached to a pallet by a supplier can be read and understood when that pallet reaches the customer. The format of EPC is governed by EPCglobal, an RFID standards development joint venture between GS1 and GS1 US. EPCglobal is also developing standards for the radio frequencies at which RFID tags will operate to ensure global interoperability of tags and readers.

3.3.2. Structure of EPC

RFID tags can be active, passive or semi-passive. Active tags include a battery that powers the antenna to broadcast a signal to be picked up by the reader. Passive tags have no battery but draw power from the reader, which sends out electromagnetic waves that induce a current in the tag's antenna. Semi-passive tags use a battery to run the chip's circuitry, but communicate by drawing power from the reader. Active and semi-passive tags can be read up to 100 feet (30 meters) away while passive tags can only be read from within 10 feet (3 meters). Active and semi-passive tags are also much more expensive. This means they are economical for tracking high-value goods that need to be scanned from a distance but are not suitable for tagging very low cost items.



Source: [10]

Figure 5. Structure of EPC

3.3.3. How RFID works as part of the supply chain

When an RFID tag is attached to a pallet or case, the manufacturer needs to either program the tag with an EPC containing the relevant code for that product or capture the pre-programmed EPC. In either case, the EPC needs to be associated with the appropriate data describing that product.

This product data is stored using Physical Markup Language (PML), a subset of eXtensible Markup Language (XML), devised to allow the attributes of physical items to be described in a standard way which can be interpreted by any PML-compliant application. The PML standard is also managed by EPCglobal, drawing on work undertaken by bodies such as Le Système International d'Unités (SI) and the National Institute of Standards and Technology (NIST) in the US.

When an RFID tag is read, the EPC code is sent to an Object Name Service (ONS) on a local network or the Internet, which points to a server where comprehensive data about the product can be found in PML format. That data can be retrieved and passed to a company's inventory or supply chain applications.

Readers can be arranged and configured to capture RFID data in several ways:

- to conduct a scan of an area to identify everything in that area at that time. Such scans could be continuous, scheduled on a regular basis or triggered by an event in another system or by a person;
- to continuously scan for tags passing through a narrowly defined area (such as the doorway to a loading dock);
- handheld scanners could be used to scan for tags on individual items.

However readers are configured, they will pick up a constant stream of EPCs. Many of these will be duplicate readings of the same RFID tag. Existing business applications such as Enterprise Resource Planning (ERP), Supply Chain Management and Logistics applications are ill-equipped to deal with these high volumes of repetitive data. The reader therefore needs to pass the information to a middleware application that can manage the flow of data.

4. Creating the business case for Global Data Synchronization in the company

The basic building blocks of Global Trade Item Number (GTIN) and Global Location Number (GLN) have been around for a number of years whereas GDS is now being set in place. The GTIN is a single, unique number assigned to all products and services, so that these products and services can be easily and accurately identified by everyone, regardless of country, region or continent. The GLN provides businesses with a globally accepted method of identifying legal entities and locations, such as plants, offices, stores and any other shipping or receiving point. GDS is a process designed to help keep everyone in the industry on the same page by ensuring that basic data such as item and party information stored by one company matches the corresponding data in the systems of their business partners. There are many paths that can be taken on the journey to a global system language. In an effort to limit the scope, we chose to focus the business case on the first "island of stability" in this move to global standards: the Global Data Synchronization (GDS) process and the necessary preparation for that, the adoption of GTINs and GLNs. The reason for this is that GDS is the first step after implementing GTIN and GLN that will really bring the benefits from these foundational standards.[12]

Let's take a closer look at some examples of how the benefits can be mapped to specific process areas:

Building the Case for Global Standards The Global Commerce Initiative (GCI) is working to promote the necessary standards for the adoption of a common system language. GCI has already published several recommendations ranging from implementation guidelines for the Global Trade Item Number (GTIN) to best-practice recommendations for Collaborative Planning, Forecasting and Replenishment (CPFR).

5. Global Trade Item Number (GTIN) definition

A GTIN is used to identify any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain. This definition covers raw materials through to the end user products and also includes services, all of them having predefined characteristics.

	Manufacturer	Retailer
Corporate management	• Simplified corporate reporting (D) • Expand geographic retailer base (I) • Eliminate IT system redundancy (I) • Opportunity for shared service creation (I)	• Simplified corporate reporting (D) • Enable global sourcing (I) • Corporate transparency/sales synergy (I) • Eliminate IT system redundancy (I) • Opportunity for shared service creation (I)
Category/Promotion management	• Improve visibility/stock-level planning (I) • Product posting/maximize retail exposure (I) • Reduce time spent on complaints/disputes (D) • Simplified and enhanced category reporting (D) • Reduce product introduction lead time (D) • Reduce product promotion lead time (D)	• Reduce need for local agents/intermediation (I) • Expand supplier base (I) • Corporate sourcing price transparency (I) • Improve visibility/stock-level planning (I) • Reduce time spent on complaints/disputes (D) • Simplified and enhanced category reporting (D) • Reduce product introduction lead time (D) • Reduce product promotion lead time (D)
Administrative data handling	• Eliminate need for cross-reference tables (D) • Fewer invoice disputes (D) • Fewer write-offs (D) • Reduce accounts receivable (I) • Fewer sales order defects (D)	• Less catalogue maintenance (D) • Eliminate need for cross-reference tables (D) • Fewer invoice disputes (D) • Fewer order defects (D) • Improved fill rate (I)
Logistics	• Simplified order tracking and tracing (I) • Fewer return shipments (D) • Improved rate of perfect orders (D) • Fewer emergency orders (D) • More accurate picking (D) • Optimized short-term planning (I)	• Error-free shipment receiving (D) • Fewer return shipments (D) • Fewer backorders (D) • Less excess/safety stock (I) • Optimized location dispatch (I)

Source: [12]

Table 1. The benefits for manufacturer and retailer for implementing GDS

5.1. Basic principles for assigning a GTIN

- GTIN assignment is governed by the rules contained in the General GS1 Specific actions Manual .
- A series of identical items use the same GTIN.
- Any series of items different from another, for trading purposes (ordering, stocking or billing), is assigned its own unique GTIN.
- A GTIN used at the lowest packing level, often the unit sold in the retail store, must be based upon the EAN/UCC-8, UCC-12 or EAN/UCC-13 Data Structure.

5.2. GTIN allocation rules

A Global Trade Item Number (GTIN) is used to identify any item upon which there is a need to retrieve pre-defined information and that may be *priced* or *ordered* or *invoiced* at any point in any supply chain. A separate unique GTIN is required whenever any of the pre-defined characteristics of an item are different in any way that is relevant to the trading process. The guiding principle is if the customer is expected to distinguish a new trade item from an old trade item and purchase accordingly, a new GTIN should be assigned. Specific rules that apply to prevalent industry practices have been endorsed by the Global Commerce Initiative Board, for the Fast Moving Consumer Goods (FMCG) industry. These rules covering many common business cases can be found in Section 3 below. While all GS1 standards are voluntary, the rules are intended to drive normative practice within the FMCG sector. [13]

The Brand Owner is the organization that owns the trade item specifications and may be:

- The manufacturer or supplier. The company manufactures the trade item or has it manufactured, in any country, and sells it under its own brand name,
- The importer or wholesaler. The importer or wholesaler has the trade item manufactured, In any country, and sells it under its own brand name or the importer or wholesaler changes the trade item (for example by modifying the packaging of the trade item).

6. An introduction to the Serial Shipping Container Code

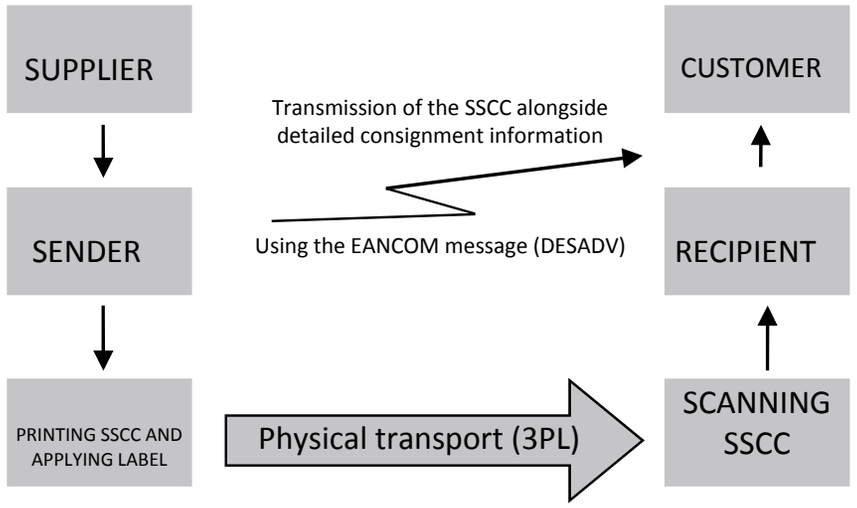
6.1. The Serial Shipping Container Code

The Serial Shipping Container Code (or SSCC) is a voluntary standard designed to provide a standard code and symbology system that can be used by all parties in the supply chain, from manufacturer to transporter, distributor and retailer to track product distribution. The standard was designed to support as wide a range of applications within the distribution system as practical. When coupled with shipment information provided in advance by means of Electronic Data Interchange or EDI, the standard will support applications such as shipping/receiving, inventory updating, sortation, purchase order reconciliation, and shipment tracking.

The SSCC is used to uniquely identify goods on the way from sender to final recipient and can be used by all participants in the transport and distribution chain. Each shipping container at the time of its creation is uniquely identified by the sender with a SSCC. A bar code label encoding the SSCC is applied to the shipping container using the GS1 Application Identifier Standard and the GS1 bar code symbology. [14]

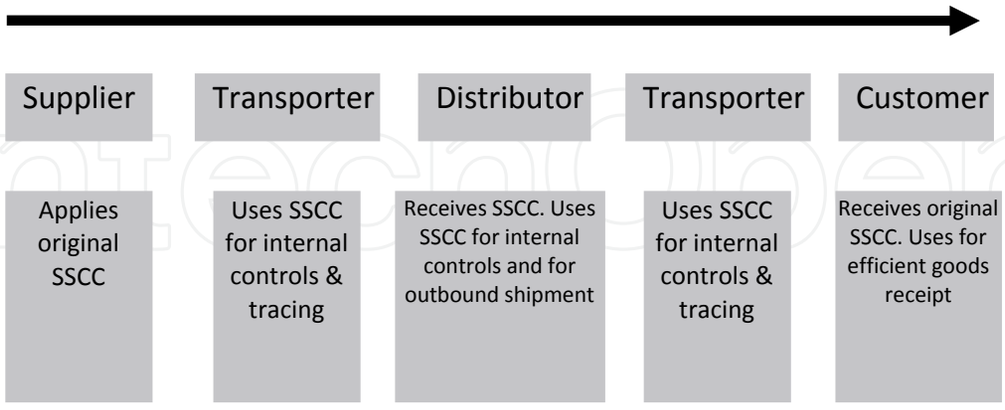
The sender then communicates to the recipient in advance via the EANCOM Despatch Advice (DESADV) message, the SSCC's of each shipping container to be shipped and all the relevant shipment and container information. The shipment information will usually include information such as date and time of shipment, expected date and time of arrival, carrier

identification, references to a customer purchase order number or contract, etcetera. Container information will include the product or products and the relevant quantities contained in each shipping container identified by an SSCC along with any additional information such as final delivery location(s), relevant dates such as best before date, or expiry date, batch numbers, etc.. The recipient stores this information in a computer data base. Upon reception of a shipment, the receiver scans the bar coded SSCC, and all the relevant information stored on file for that particular shipping container is transmitted from the computer to the application for further processing. The SSCC can be used by all parties in the supply chain as a reference number or license plate to extract all the relevant shipping container information held in computer files within the receiver's information systems. The SSCC uniquely identifies the transport entity (the shipping container it is applied to) for the lifetime of that transport unit.



Source: [14]

Figure 6. The GS1 messages



Source: [14]

Figure 7. The SSCC as an entity identifier

Use of the SSCC as an entity identifier means it can be used in multiple transactions by all companies across a supply chain. All companies will benefit from the implementation of one common and unique shipping container reference number.

7. Global Product Classification (GPC)

7.1. Overview

The GS1 Global Product Classification (GPC) is a system that gives both sides of trading partner relationship a common language for grouping products in the same way. It ensures that products are classified correctly and uniformly, everywhere in the world. The term "product" as used throughout this guide refers mainly to physical products; however GPC is expanding into services as well. [15]

The business objectives of GPC are to:

- Support buying programs by allowing buyers to pre-select groups of applicable products
- Provide a common language for category management, thus speeding up reaction to consumer needs
- Be a key enabler of the Global Data Synchronization Network
- To be a Pivotal classification system between the information exchange parties

How it works

GPC is a rules-based, four-tier classification system for grouping products. The four tires are *Segment*, *Family*, *Class*, and *Brick* (with attributes and attribute values). A Brick identifies a category incorporating products (Global Trade Item Numbers (GTINs)) that serve a common purpose, are of a similar form and material, and share the same set of category attributes.

7.2. General principles

1. Modularity and Flexibility of the classification structure in order to meet industry objectives for the GPC.
2. The logical grouping of bricks. The logic behind the schema should be transparent.
3. All categorized information must be universally applicable, i.e. the terminology used in the schema should not be culturally or nationally biased.
4. The schema is initially published in Oxford English with an explanatory glossary, which helps to clarify specific terms. Both the schema and the glossary are being translated to other languages, including US English.
5. Schema should facilitate the collection of relevant classification information, and allow it to be presented in a view acceptable by the industry.
6. The schema can cover all products in the supply chain
7. Any changes to the classification schema should be communicated in delta report.

7.3. GPC rules for assessing GPC attributes

A clear and unambiguous understanding of classification concepts is critical for the development and maintenance of a coherent classification system. Within the fields of

electronic catalogues and data synchronization there is confusion due to differences in terminology (e.g. property = attribute) or different understandings of concepts like identification, description, and classification. Typical terms that can cause misunderstanding when not precisely defined include ontology, taxonomy, classification system, data dictionary, vocabulary, thesaurus, characteristics, property, attribute, and feature.

Recommendations below relating to these terms and definitions do not imply that the other terms and definitions are erroneous or inferior. This section seeks to establish a consistent vocabulary for supporting the GPC, and recognizes that other terms may be equally valid in the same or a slightly different context.

8. Shelf Ready Packaging (SRP) - A collaborative approach

SRP is a reality today. Numerous stores all across Europe demonstrate a fairly high level of implementation. Expected benefits from SRP sit both in the area of productivity (shelf replenishment effectiveness) and of business opportunity (On Shelf availability improvement, improvement of product recognition in shelf by the shoppers). But surprisingly, so far very little shopper research has been done to understand in detail how the shoppers interact with SRP. [17]

For these reasons, SRP cannot be considered as a standalone best practice, whose generalization would bring substantial and measurable benefits at the industry level. Its implementation should follow a case-by-case iterative, rather than systematic or dogmatic approach. This report aims to provide you with a methodological framework, comprehensive tools, and testimonials for embarking on your journey through the SRP world.

8.1. Scope

Shelf Ready Packaging (SRP) is the term used throughout this publication to refer to a product that comes in a ready merchandised unit which is easy to identify, easy to open, can easily be put onto the shelf and disposed of, allowing an optimisation of shelf replenishment and enhanced visibility. SRP is synonymous with RRP (Retail Ready Packaging), and ready to sell or PAV (prêt-à-vendre). SRP covers all types of packaging which goes to the retail outlet, including promotional displays, pallets, trays, crates, etc.

8.2. Guiding principles

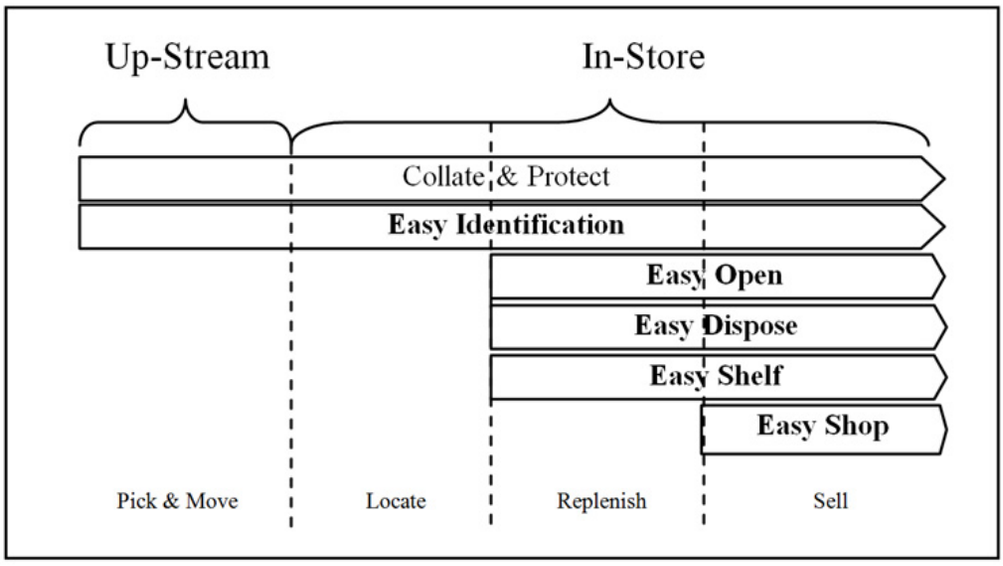
First of all, to guide the discussion between manufacturers and retailers, the following comprehensive set of guiding principles for SRP implementation has been established:

- Always of Value to the Shopper, Retailer and Manufacturer,
- Compliance with Environmental Legislation and Public Policy Concerns,
- Avoid Fragmentation and Complexity,
- Maintain Brand Identity,

- Measure Implementation,
- Requirement of Long-term Commitment from Retailers and Manufacturers,
- Compliance with total Supply Chain Efficiency Principles.

8.3. Functional requirements

Experience shows that it is generally easy to define what is not SRP. Reversely, it is sometimes not so straight forward to define precisely what is SRP. An industry agreement on common functional requirements for SRP design, applicable across Europe, is therefore an important pre – requisite. The following diagram illustrates the five SRP requirements validated by the ECR Europe workgroup:



Source: [17]

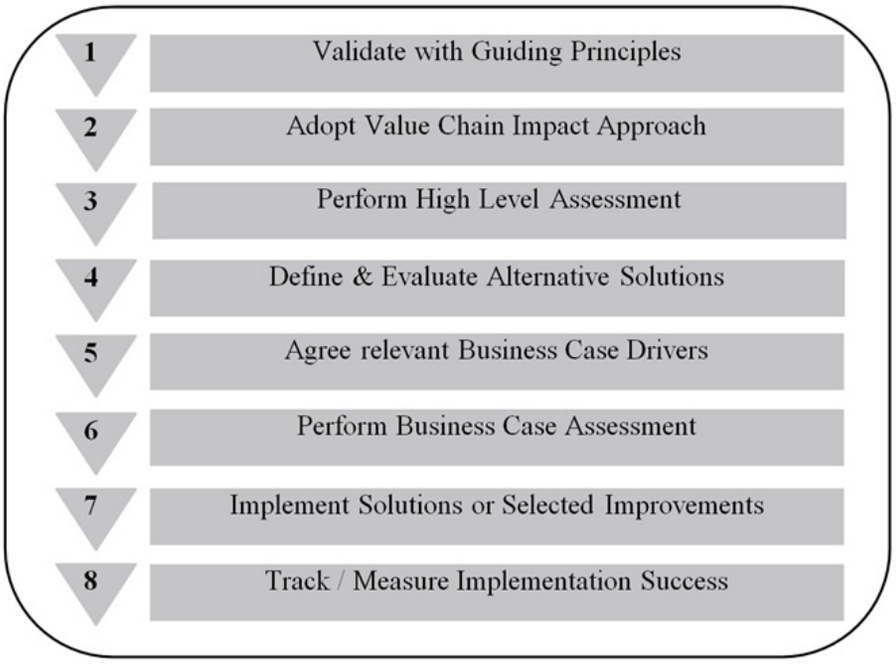
Figure 8. The five SRP requirements

The requirements listed above can vary in importance according to the product, and should be taken into consideration alongside existing ECR Europe recommendations pertaining to efficient unit loads design throughout the supply chain (1997). The assessment tool provided in this document allows the relative importance of these requirements, for a specific product or group of products, to be weighted collaboratively, and to measure the compliance of a specific SRP design with each of these requirements. 100% compliance with all the functional requirements should not be a systematic target: depending on product characteristics, it may appear that some of these requirements are not applicable in a particular case. However, Easy Identification (facilitation of product identification in warehouse or back store) will always be considered best practice for most packaging solutions, whether SRP or not.

8.4. Business case

SRP implementation, can in many cases, impact the cost structure of a product, since it may require industrial investment or additional outer packaging cost. However, as mentioned above, shoppers are not willing to pay for any extra cost related to SRP implementation. A collaborative and consistent business case approach is therefore required to assess the costs and benefits of implementing SRP on one specific product or group of products.

The eight step approach illustrated below enables retailers and manufacturers to take a total supply chain view and to make an informed decision on SRP execution, with the ultimate goal of enhancing shopper experience and maximizing joint business benefits.



Source: [17]

Figure 9. The eight step of SRP implementation

The eight-step approach includes a business case assessment tool.

8.5. In store execution

Once a retailer and a manufacturer have agreed on the development of an SRP solution in line with the guiding principles, functional requirements and business case approach, it is imperative that the solution is fully utilised.

To maximise the success of implementation, SRP should be approached as a company initiative, supported by the top management, both at manufacturer and retailer level. The following 3 step process will ensure a successful in store execution



Figure 10. Ensuring Successful In-Store Execution

Successful execution relies mainly on management communication, staff training, usage tracking and feedback. The store audit checklist provided in this document will facilitate the initiation of a continuous improvement approach on SRP, by capturing at the shelf level the feedback from the store personnel in light of the expected benefits of a specific SRP execution

9. CPG company best practices

9.1. Overview of a typical Landscape

Best Practice: nowadays the ERP systems like SAP most probably will not offer the full range of attributes needed to GDS; therefore companies like IBM have developed special products to "fill this gap". It is very important to have in mind the scale of the GDS implementation before acquiring such a product like WPC-GDS, the installation and configuration costs for such solutions could be considerable. Also is important to notice that, despite 1SYNC cannot be "connected" to the ERP system, massive uploads can be done using the web interface of the system.

In the example above the ERP system of the company is SAP R/3. The solution provided by IBM (WPC-GDS) is implemented. WPC-GDS is periodically updated to meet the full attributes set of 1SYNC. Also will be noticed that 1SYNC is offering Pre-Prod and Prod environments, therefore the necessary testing and simulations can be conducted

A typical landscape of a GDS implementation in a large company will look as follows (Fig. 11.)

9.2. Cutover steps (testing scenario)

The 7 points below are a testing scenario for the environment mentioned earlier:

1. Review of material from Data Quality point of view: GTINs inconsistency, completeness.
2. Replication from SAP to WPC
3. Enrichment (at least at mandatory in WPC fields level: GPC Description/Code, Start Availability Date, GTIN name)
4. Approval (an intermediary step in WPC, specially designed as a quality gate)
5. Add Item (Items are moved from WPC to 1SYNC)
6. Add Links (GTINs linked between them)
7. Publish

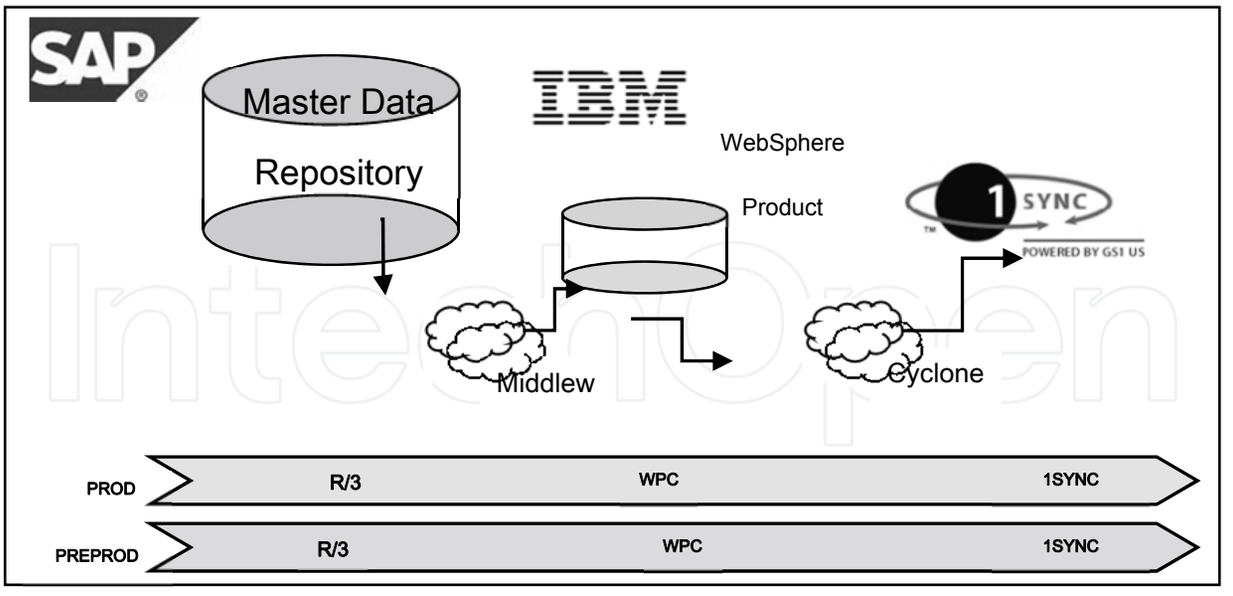


Figure 11. Typical Environment for GDS

Best Practice: to perform full reconciliation after each step above

The goal of conducting such a test is to check the end-to-end process of moving the data from SAP R/3 to 1SYNC. Based on the results of this test the massive publication of items can be carried out (remember: an item 1SYNC can be deleted only by 1SYNC clerk).

Details for each step:

9.2.1. Review of material from data quality point of view: GTINs inconsistency, completeness

In the example from Figure 4 a material will be published from SAP system. The material has 2 GTINs – one for CS (case) and another for (each), therefore resulting in a publication of 2 GTINs linked to each other

Obviously, a check should be conducted in both WPC and 1SYNC to make sure that these GTINs don't exist already.

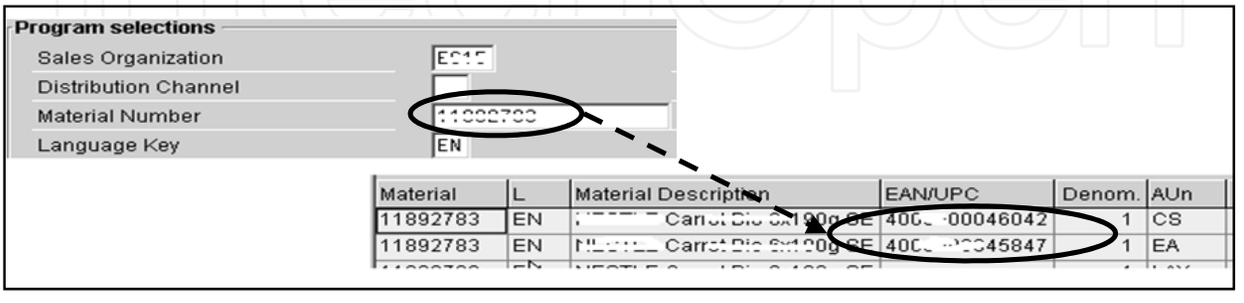


Figure 12. The check of material member (EAN/UPC)

During testing the materials will be reviewed "manually", but for big amounts of data applications such as Athanor from Similarity Systems can be successfully used to make

sure the data in the master data repository is cleansed and compliant with the standards.

Best Practice: Athanor is a recommended tool not only for GDS implementations .Due to its capacity to maintain data quality it can be at the core of data cleansing activities in general. Before taking the decision to use Athanor a correct estimation should be done taking in account the costs of the Athanor implementation *per se* and developments needed to have Athanor effectively checking the data.

At this step is also good to notice that some retailers have developed own guides to easy synchronization through 1SYNC. For example Carrefour has developed a "1SYNC-Carrefour Implementation Guide" which, once again, underlines the crucial importance of a good coordination between producer and retailer during the implementation phases. The purpose of the guide mentioned above is to give 1SYNC manufacturer users instructions needed to synchronize their item data with Carrefour using 1SYNC Item manager. It is intended to highlight any specific processes, attributes or validations that are in addition to the standard 1SYNC GDSN synchronization process.

Best Practice: once again the link with the GDS partner is proved to be very important. It is important to notice that some of the partners participating in GCI have special instructions to be taken in consideration

Basically, a very important part of the project will be solving on the points below:

- Data Cleansing:

i. Athanor implementation and training (recommended, especially in case of big volumes of data);
ii. Cleansing.

- GDS Data Standards adoption:

i. Understand Data Standards;
ii. Prepare all values;
iii. Implement in WPC or/and ERP (SAP R/3).

- Attribute analysis:

i. Mapping between 1SYNC , WPC and the ERP system (SAP R/3);
ii. Agree fields (attributes) with the partner.

9.2.2. Replication from SAP to WPC

An IDOC is generated from SAP system once the GDS flag activated and the information for the selected material is transmitted. The key for this transmission is GTIN – GLN – TM (Global Trade Item Number – Global Location Number – Target Market). The IDOC will contain the information of the parent and child GTINs.

In Figure 5 can be seen the Outbound Idocs in SAP and the corresponding XML Message in WPC Process Monitor. In the XML message can be seen information on both GTINs and the corresponding hierarchy organization for this GTINs.

SAP R/3:

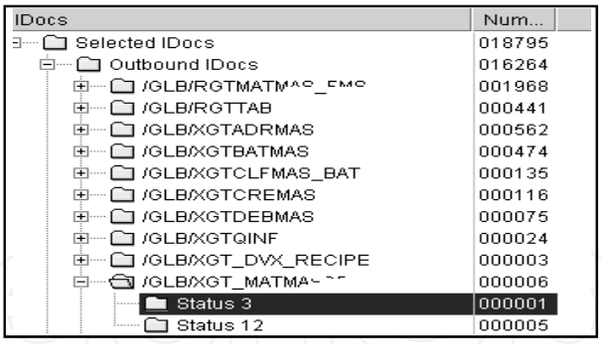


Figure 13. The Outbound Idocs in SAP R/3 (Status 3)

WPC:

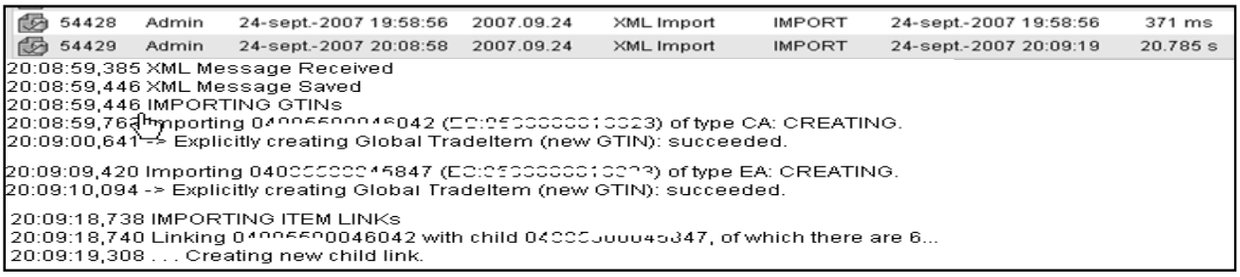


Figure 14. The corresponding XML Message in WPC Process Monitor (the link at SAP R/5 to WPC - GDS)

Best Practice: at this point it is important to notice the time needed for this replication, which for bigger volumes will be taken in consideration. If this replication is successful the technical work of linking SAP R/3 to WPC-GDS is completed, therefore the idols generated and the XML message in WPC-GDS will be checked for any discrepancies very carefully.

9.2.3. Enrichment (at least for mandatory in WPC fields, for example: GPC description/code, start availability date, GTIN name)

During tests this enrichment can be done manually directly in WPC. During a cutover this enrichment will be done using built-in mass uploads WPC facilities.

Best Practice: both manual and mass uploads enrichment will be tested. For mass uploads development work in WPC-GDS will be required. Is important to notice that, every time a new attribute is added in GDS these developments (for upload), will need to be adapted. Also is known that, when 1SYNC implements a new attribute, IBM-WPC-GDS is not always up to date. A "waiting time" for a new attribute in WPC is to be taken in consideration.

The status in WPC at arrival of the items will be "Draft with Variant" for Global attributes and "Edited" for Local attributes (note that the statuses can be different, depending on WPC configuration). The enrichment with supplementary attributes, not stored in the ERP system will happen uploading flat files having structures aligned with the way the upload facilities were designed in WPC. Below can be seen the flat file and the successful loading (results).

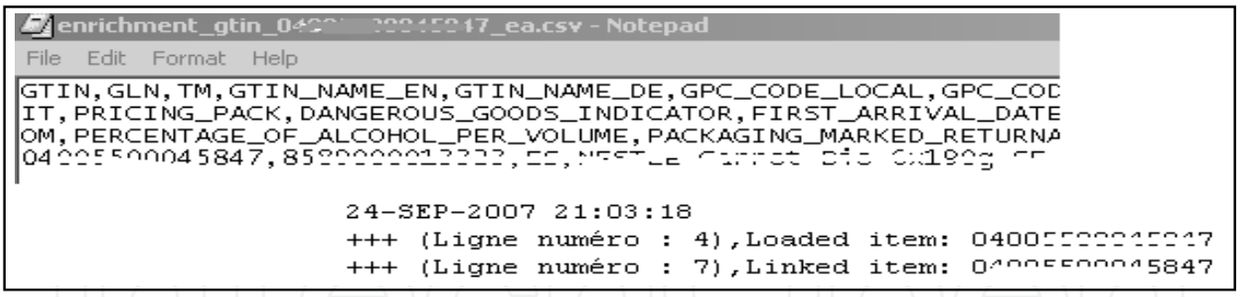


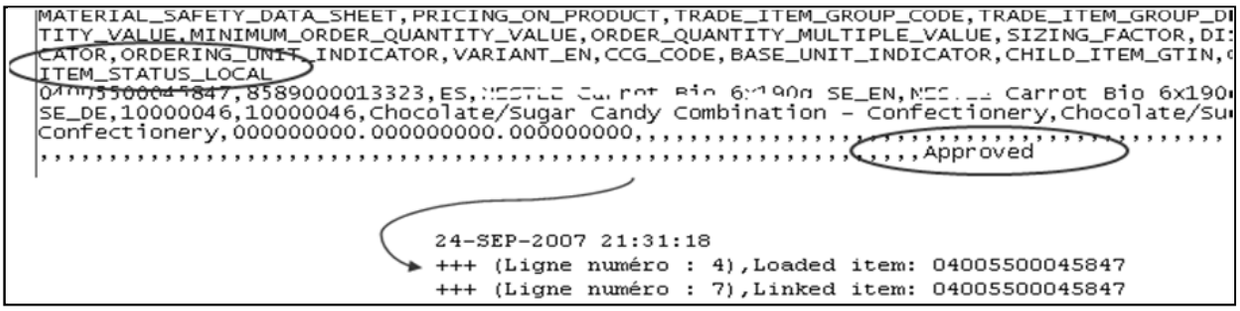
Figure 15. The uploading of flat files designed in WPC

After such operation the status of the items will change in WPC to "Draft with Variant" for Global attributes and "Compliant" for Local attributes of the GTINs.

9.2.4. Approval (an intermediary step in WPC, specially designed as a quality gate)

***Best practice*: The approver will be usually a separate user**

During cutover the approval step will be "automated" using the uploading facilities of WPC:


MATERIAL_SAFETY_DATA_SHEET,PRICING_ON_PRODUCT,TRADE_ITEM_GROUP_CODE,TRADE_ITEM_GROUP_DI
TITY_VALUE,MINIMUM_ORDER_QUANTITY_VALUE,ORDER_QUANTITY_MULTIPLE_VALUE,SIZING_FACTOR,DI:
CATOR,ORDERING_UNIT_INDICATOR,VARIANT_EN,CCG_CODE,BASE_UNIT_INDICATOR,CHILD_ITEM_GTIN,
ITEM_STATUS_LOCAL
SE_DE,10000046,10000046,Chocolate/Sugar Candy Combination - Confectionery,Chocolate/Su
Confectionery,000000000.000000000.000000000,,,

9.2.5. Add item (items are moved from WPC to 1SYNC)

WPC:

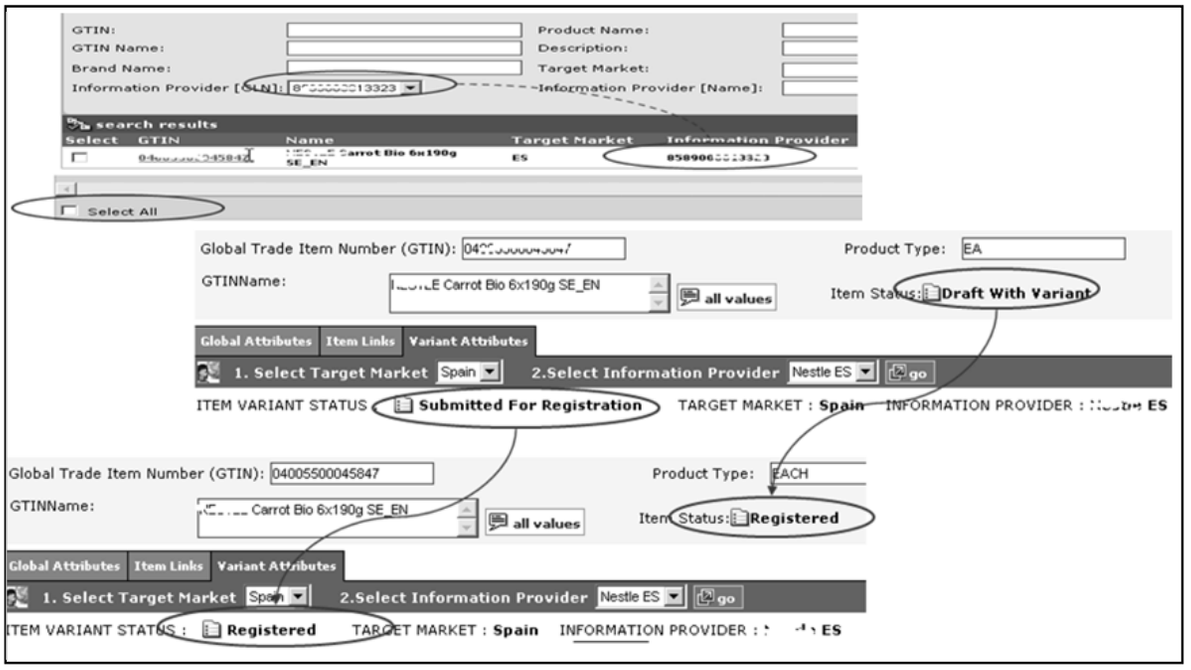


Figure 18. The global information alignment – adding the Item to 1Sync (Registered)

Adding the Item to 1SYNC will take place from inside WPC. The status of the items will change from "Approved" for Local attributes to "Submitted for Registration" and after receiving the confirmation from 1SYNC to "Registered" (Figure 10).

At this stage the items can be finally viewed in 1SYNC (both GTINs and the corresponding link ready for creation):

1SYNC:

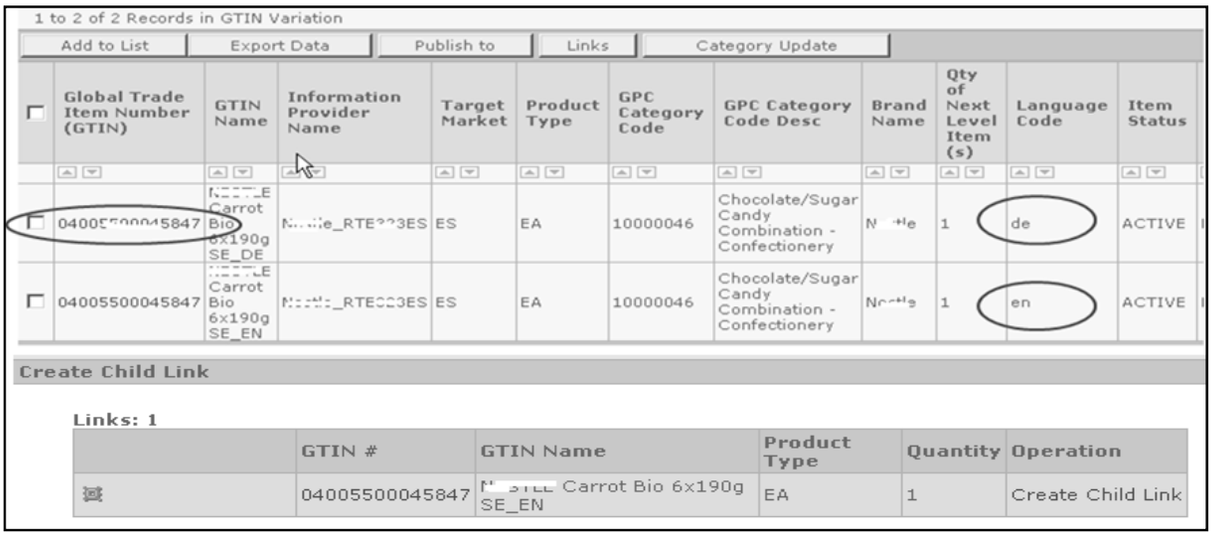


Figure 19. Final checking – the chain/link SAP R/3 – WPC – GDS - 1SYNC WORKS

The success of this step proves that the "chain" SAP R/3 – WPC-GDS – 1SYNC works correctly.

9.2.6. Both "Add links" and "Publish" steps are done from WPC

Best Practice: it is important to involve the partner at this stage- to check that he can "see" correctly what was published. Attention to correct GLNs and TMs.

10. Conclusions

Master data sharing between trading partners (e.g. buyer / seller) is one of the most important supply chain processes since master data is fundamental to all business systems. The integrity and timeliness of master data is critical for the uninterrupted flow of goods throughout the Supply Chain. Sharing data effectively and efficiently is reliant on access to precise data definitions by all partners, data accuracy and agreement on the process used to support the exchange of data between trading partners. Such data sharing is commonly called Master Data Alignment or Master Data Synchronization. The master data exchanged is defined and agreed in the context of a common understanding of the business requirements between trading partners.

Since 1990, increased awareness of the importance of master data synchronization has triggered the launch of national (public) initiatives.

- A primary objective of these initiatives was to offer trading partners efficient "tools" to support master data synchronization between national trading partners, namely the implementation of National Data Pools;
- Currently, there are many data pools around the world, most of who are affiliated with EAN / UCC organizations.

With the emergence of free trade regions, global and international commerce, increasing use of e-commerce, master data synchronization has rapidly become an international concern. In March 1999, the report of the ECR Master Data Group (Inter-Operability of EAN Compliant Data Pools, IODP) highlighted the diversity of the existing data pools. This diversity prevents proper global master data synchronization and, makes the harmonization of the national data pools a necessity in order to support the global business needs [7].

Best practices at Nestle confirm the Global Standards of Global Data Synchronization (GDS), launched by Global Commerce Initiative (GCI), now renamed Global Consumer Forum (GCF)

Companies are working together, both retailers and producers, to overcome the technical and organizational difficulties of GDS implementations. In this environment is important for each company to understand GDS implementation in terms of its own particularities (from technical, organizational and financial point of views) and to adopt the most suitable solution to meet the standardized criteria recommended by entities like GCI, which are supported by most of the industry players.

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