The Global Language of Business

GS1 Data Quality Framework for Brand Owners

Best Practices

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1 Introduction

This document provides detailed information about best practices related to Data Governance, Product Data Inspection and Training and Education. It was developed as a sector-neutral, standardised set of best practices that enables trading partner collaboration to achieve the benefits of good quality data, regardless of size, sector, or supply chain role.

Consumers have become more demanding in their purchasing decisions. From a consumer's perspective, having access to the right product at the right time at the right price is paramount to their shopping experience – whether it is through traditional brick-and-mortar or on-line purchasing. With shrinking margins and increased competition, the ability to meet the consumer's needs in the most cost-efficient manner is critical to retailers and e-tailers alike. The ability to service the customer in the manner they are demanding is dependent upon accurate and complete data.

With this growing demand for additional product data attributes, so does the need for this data to be timely as well as accurate. A common approach to data governance will promote a level of trust about product information received by trading partners and consumers alike.

GUIDING PRINCIPLES

- The framework applies to new item introduction, changes and deleted items
- Universally applicable set of guidelines which any MO or Brand Owner or Third Party or Company can adopt, irrespective of size, sector, product type or channel
- The GS1 Data Quality framework for Brand Owners will enable each region/industry to add additional components to address their national/local industry-specific needs
- Comprehensive in structure, yet providing for flexible implementation as required by trading partners
- Based on a standardised approach for product audits (i.e., utilising the GS1 GDSN Package Measurement Rules, GS1 GTIN Allocation Rules

2 GS1 Data Quality Best Practice Framework

The GS1 Data Quality Best Practices Framework is designed to validate that an organisation's internal data governance process is documented and adhered to, and to demonstrate institutional knowledge of GS1 Standards, such as the GS1 Standard (GS1 General Specification, GTIN Allocation Rules and the GS1 GDSN Package Measurement Rules, by those individuals responsible ensuring data quality.

The framework provides an assessment process that focuses on the management system of data quality, which includes (not an extensive list):

- Data Governance
- Product Audit Inspections
- Training and Education
- Data Sharing

Trading partners require consistent, complete, accurate, standards-based, time-stamped product data. Trading partners measure product data quality as "electronic data exchanged equals physical data." Data quality reaches beyond accurate data - encompassing an overall framework within an organisation that includes executive leadership support, commitment to standards-based data, and processes to validate that consistent, complete and accurate information is being captured and utilised for both internal processes and external sharing. This provides the foundation for an efficient supply chain and enables trading partner collaboration.

2.1 Best Practice Guidance for Data Governance*

Within an organisation you can have several sources of data including internal departments and external parties e.g. suppliers. A best practice is to have strong processes in place for data quality to ensure all departments including supply chain benefit from working with and receiving high

quality data. A best practice is to also deploy 'audit inspections' and to define strong and measurable Data Governance parameters to formalise accountability of the creation of data where its quality is measured and reported.

Companies that have strong data management processes consistently follow industry best practices for continuity and consistency. These companies have documented processes that are shared throughout the organisation. Below are five step best practice aspects, which summarise the industry best practices for data quality:

1. Appoint a data steward, either an individual or department as the sole owner of the product data
2. Assign data owners throughout the organisation who provide data attributes
3. Adhere to GS1 Standards and Rules.
4. Audit all new items post production
5. Communicate post production data both internally and externally post audit

Note *: Five Step Best Practice, see footnote regarding copyrights

2.1.1 Executive Sponsorship

When launching a Data Governance program you will need executive sponsorship as it requires change management throughout the organisations, this will also support the change needed to execute the initiative across the organisation.

Best Practice Aspects:

- Gain senior sponsorship to execute your Data Governance program across various teams and departments
- These teams/departments would need to know both the business and technology aspects related to data input and the potential impact on data quality

2.1.2 Data Governance Roles and Responsibilities

Best practice is to have an individual or single department who is 'accountable' for data governance within your organisation. This person or department would look to have key assigned support resources from both the business and technology areas who would share responsibility for deploying, managing and monitoring data quality. This could lead to a company deciding to launch a committee to manage the entire data governance activities including measuring success and reporting back to the Executive Sponsor. It will also be a key best practice that this person/department/committee has a clear 'mission and vision' statement which is sponsored throughout the organisation. It will also be essential for this group to identify the 'responsible' owners of data and associated activities they are involved in linked to master data management.

2.1.3 Data Steward within an Organisation

A Data Steward should be appointed as the central owner of the data governance program and should work with the data owners where necessary to resolve any conflicts. They should develop appropriate documentation and education to ensure all data owners have the correct parameters to perform their role successfully. They should also be responsible for centralised control over the assignment, allocation, and management of GTINs across the organisation.

Best Practice Aspects:

- Accountable to developing appropriate documentation
- Accountable for gathering data
- Accountable for understanding trading partner requirements and ensuring that accurate data is gathered, ensuring at all times that it adheres to industry standards
- Accountable for ensuring people are enabled to perform their duties by providing training and education. Keeping accurate training records for auditing purposes
- Accountable for the liaison between the IT department and the users of the information

2.1.4 Data Owners

The Data Steward needs to identify data owners across the organisations, who are responsible for generating and maintaining product attributes for their specific area of responsibility.

Data Owners can reside in several departments (e.g., buying, supply chain, package design, marketing, etc.) and have the ultimate responsibility for ensuring accurate and complete attributes sets are provided to the Data Steward prior to publication to the trading partners so, it's a best practice to define the role of the Data Owner and depending on the size of the organisation either deploy the role as a separate functional role, or add it to an existing persons job description.

Best Practice Aspects:

- Responsible for creating, gathering and/or maintaining consistent master data
- Responsible for providing their departments data attributes to the Data Steward
- Responsible for being the 'go to' person for data queries and issue resolution
- Have a genuine and passionate commitment to data quality in general and the data quality governance process
- Data Quality awareness programs should be conducted to communicate the 'mission and vision'

2.1.5 Item Maintenance: Add, Change and Discontinued

It is important to ensure on-going item maintenance during the product life cycle, and it can be broken down into three key parts: item launch (add), item update (change), and item obsolete (delete). A best practice aspect is to ensure a process is in place to manage 'change' and to ensure at all times that good quality data is synchronised with trading partners and at the appropriate time.

Best Practice Aspects:

- Document the process for all 'change' management; add, change and delete
- Ensure a workflow is in place to manage the capture of changed attributes across the organisation
- Where possible have integration of systems from attribute collection to synchronisation
- Train the people and communicate plans and processes throughout the organisation in the aspect of 'change' management
- Ensure the data steward has overall accountability for the data being sent to trading partners
- The data governance program needs appropriate processes and technology to support the data steward to evaluate the data quality levels

An organisation needs to have clear guidelines on when a product moves from the status of new to change or delete. And at all times it should adhere to the GS1 GTIN Allocation Rules.

2.1.6 Standards and GTIN Management Rules

It is essential that GS1 Standards are adhered to at all times and a best practice aspect is to ensure training both initial and ongoing is conducted to all data owners throughout the organisation.

Knowledge of the GS1 GTIN Allocation Rules is important.

- The GTIN Allocation Rules provide guidance about which differences in product attributes drive the need to assign a separate, unique GTIN to each product.
- The GTIN Allocation Rules provide guidance about which changes to a product's attributes drive the need to assign a new GTIN.
- Confirmation that the most current version of the rules are being used for training purposes.

Best Practice Aspects:

- Central point within the organisation for assigning the GTIN (Global Trade Item number) for all levels of the hierarchy

There are clear standards around the usage and allocation that brand owners need to follow when allocating GTINs in order to ensure are GTINs are globally unique and in a consistent format. The GS1 GTIN Allocation Rules explain when changes to product attributes take place and what drives the need for the assignment of a new GTIN. In addition, the GS1 General Specifications provide the standards for GTIN data formats, product hierarchies, barcodes and application identifiers.

2.2 Best Practice for Audit Inspection

Post Production and before the first dispatch of products to your trading partners it is recommended to carry out an audit, reviewing and updating the data attributes but also to re-measure the products following the GTIN GDSN Package and Measuring Rules, this will then ensure good data quality is used and exchanged with trading partners. Below are guidelines on how best to structure these audits within the data quality governance processes.

2.2.1 Audit all Products Post Production

New product lines before the point of first production are in a state of evolution, and therefore have a higher risk of changing so it's important to look at the product attributes during the audit procedure. Once checked and validated following the audit it's important to communicate both internal and external the final post production information to your trading partners e.g., attributes, weights and measurements.

The internal audit best practice approach should be documented as part of company's data governance process.

Best Practice Aspects:

- Defining the scope of the inspection/audit
- The information sources that will be compared
- Goals and objectives for the inspection/audit.
- Foundational[1] and Fundamental* (See appendix for definition) attributes to be compared
- Scope of the inspection and how it will be recorded in order to guide the rest of the inspection/audit process and identify areas that are out of the scope of the inspection/audit
- Sample size to be audited and sample criteria
- **Note** *: Foundational and Fundamental, see footnote regarding copyrights

Before the inspection/audit, the organisation should collect and make accessible all data relevant to the product sample and verify that upon inspection the most recently published data is available to the inspection body. Prior to the inspection, the organisation should provide the inspection body with the recommended pre-inspection documents, which include:

- Sampling justification on New Line(s)
- Product data sheets with all product data due to be published to trading partners
- Publish results of inspections/audits both on present and previous inspections/audits.

[1] Five Step Best Practise and Foundational and Fundamental attributes are copyright terms of GS1 US

- Feedback mechanism to data owners to enable them to update their internal systems and improve their processes related to providing information on New Lines

At all times the data quality governance process for new and changed/updated lines process should be adhered to and the data owners held responsible for their data entry pre- and post-production on all finished products.

The organisation and inspection body should define the appropriate measuring equipment to be used and the location(s) for the inspection. It is also essential to ensure that the products for inspection are readily available and clearly tagged for identification and there is safe and easy access to the products.

All these considerations should be defined based on:

- The number of products
- Types of products and packaging
- The number of sites to visit
- The extension of the site(s)
- The data supplier's preparation.

Following each inspection it is recommended to prepare a written report that contains the following sections:

- Inspection summary
- Inspection scope
- Reference documents
- Overview of inspection findings / results / performance.

Measuring equipment is fundamental to conducting the audit and in order to ensure valid results, the appropriate measuring equipment should be purchased and always:

- Be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards. Where no such standards exist, the basis used for calibration or verification shall be recorded.
- Be checked, adjusted or re-adjusted as necessary.
- Be identified to enable the calibration status to be determined.
- Be safeguarded from adjustments that would invalidate the measurement result.
- Be protected from damage and deterioration during handling, maintenance and storage.

2.2.2 Data Quality Metrics

An organisation needs to be able to measure success. Therefore, data quality should be measured on its completeness, timeliness and accuracy. A best practice is to have a clearly defined set of metrics that are measurable and a way to successfully communicate the results back through the organisation.

Before embarking on setting a set of metrics you need to first set a base line to be able to measure against and once defined you will be able to provide a 'measurable' insight to the level of data quality within your organisation and not only track the level of performance but, also identify needs for additional training and educational needs.

2.2.3 Communicate Data on Finished Products

The need for strong communication is critical. A documented communication plan needs to be defined and communicated across the organisation. It needs to encompass both internal and external communication.

When the audit is complete on the final production products and recorded, any updates need to be reflected in internal systems then communicated externally to trading partners. It is recommended to use the GDSN, as it makes the supply chain smoother, quicker and more efficient with the most

accurate and reliable data about products however, data exchange can depend on business sector and companies may have different ways of sending and receiving and sharing data. Regardless of the method it is critical the most up to data and recent version is exchanged to guarantee data quality on going.

2.2.4 Data Sharing and Communications

Companies may have different methods of sharing and communicating data. This list illustrates some of the acceptable best practices for sharing data:

- GS1 Global Data Synchronisation Network (GDSN)
- EDI
- Web Portals (GDSN)
- Product Catalogues

Regardless of the method, the data sharing process should include all necessary provisions to ensure that communication is based upon the most recent version of the product and it doesn't eliminate the need for the continued interaction and discussions between the buyers and their trading partners

2.3 Best Practice for Training and Education

An organisation should ensure that they have a documented education and training policy in place.

Appropriate records of education, training, skills and experience should be kept for each individual, along with an evaluation of the effectiveness of training. This information can help identify instances where additional training may be required.

With GS1 Standards under constant review its critical change is managed and the internal data governance process should ensure it captures all additional trading and education needs. It is also essential that personnel changes are managed and for example any new intake of staff are trained on the 'mission and vision' of data quality and the data governance process, regardless if they will be responsible for managing product data within the organisation.

Best Practice Aspects:

- Data Governance 'Mission and Vision'
- Data Governance documentation
- GS1 Standards
- GTIN Allocation
- Product Measurement
- Data Synchronisation

A APPENDIX: Data Quality Management System

A management system describes the set of procedures an organisation needs to follow in order to meet its objectives along with standards which can be applied to any organisation, large or small, whatever the product or service and regardless of the sector of activity.

The benefits of an effective management system include:

- More efficient use of resources
- Improved risk management, and
- Increased customer satisfaction as services and products consistently deliver what they promise.

Audits are also a vital part of the Data Quality Management System (DQMS) approach as they enable the company or organisation to check how far their achievements meet their objectives and show conformity to the standard.

In some small organisations, there may not be an official system, just "our way of doing things" that is mostly kept in the heads of the staff.

But the larger the organisation, the more likely that procedures need to be recorded to ensure everyone is clear on who does what. This process of systemising how things are done is known as a **Data Quality Management System**.

A Data Quality Management System is a natural enhancement to a data governance management process that companies in the industry have already developed and implemented internally to manage their product information.

Due to its nature, a Data Quality Management System involves a wide spectrum of areas and activities and it supports bringing together a wide range of different functional elements into a single, harmonised work-stream.

There is a comprehensive and detailed section within the Data Quality Framework v3.0 called The Data Quality Management System and it covers key functional areas:

- Organisational capabilities: that define the organisation's action capacity
- Policies and standards: needed to provide governance and reference
- Business processes: which drive the day to day operations
- System capabilities: necessary to support the business

Within each one of those functional areas, there are four main types of activities where the recommended Data Quality Management System play a role and should be considered as part of an organisation's approach. These types of activities are:

- **Plan:** refers to all activities related to the definition and strategy and approach used
- **Document:** the activities to formally document processes and procedures
- **Execute:** practical execution of processes within an organisation and support uniformity in the fulfilment of tasks
- **Control:** continuous control and measuring of results and impact of the actions by the organisation and also, supports the assessment of possibilities for continuous improvement

A.1 Organisational Capabilities

The key principles fall under section 2 of this document Data Quality within your organisation however, its key to ensure there are clearly defined organisational roles and responsibilities ensuring everyone understands their role and this should be measured against the flow efficiencies and that clear steps are defined in case controversies arise or decisions need to be taken along the execution.

Listed below are some key considerations:

- Are their job descriptions defined for the data quality management roles and responsibilities

- To what extent has the organisation identified what skills are required
- Are their HR records available showing training records

A.2 Policies and Standards

A developed and/or updated missions and vision statement to reflect the expectations for a med/long term planning of the organisation in regards to management of the quality of data is key and it should support the general direction and the planning of the organisation in ensuring high levels of data quality are maintained.

Listed below are some key considerations:

- Does the organisation have a data quality policy
- Does the documentation include data quality management manuals, objective and targets
- To what extent are the objective of data quality management measured
- To what extent are people working with master data part of an on-going training program
- Are formal responses issued to customers in regards to their data quality complaints
- Does the organisation periodically audit the data quality management structure

A.3 Business Processes

A defined process for the initial set up of products information in the organisations back-end systems ensuring that only reliable data is ultimately added and a controlled process is in place when creating and entering product data into the back-end systems to guarantee that the data is its subsequently evolution are based on quality foundations.

The product data should be verified before being entered and set up in internal systems, monitoring that data conformance to internal policies, for instance, policies to allocate new GTINs.

Listed below are some key considerations:

- Does the organisation have specific process for generating and checking the data for new products, prior to first distribution
- Does the organisation make use of a single source of the truth for product master data to manage and share data with trading partners
- Is there a process in place to identify and communicate changes/corrections to the data itself
- Does the organisation periodically audit the data quality management structure
- Are the results of these audits shared within the organisation

A.4 System Capabilities

A central data repository for all 'final' product data is essential to support the organisations vision for a single source of the truth for products and a recommendation is to study well the organisations current and future needs to evaluate if an organisation has a system architecture design that supports not only data quality management but related systems such as data pools, internal data repositories etc.

Listed below are some key considerations:

- Does the organisation make use of a single source of truth for product master data to manage and share data with trading partners
- To what extent does the database structure ensure traceability of amendments (change history)
- To what extent does the organisation use equipment as recommended by in the GSDN Packaging Measurement Rule within all relevant data quality management processes for dimension measurement
- Does the data publishing procedure include: appropriate authorisation

A.5 Data Governance Process and Assessment

In sections 2 and 3 you have learned about the Data Quality Framework of Brand Owners and how best practices can lead to achieving trusted high quality data and the following section now covers the process, product and people procedures and assessment.

Verification of the Data Governance Process is comprised of an assessment designed to determine the degree to which people, processes, and procedures are in place within an organisation to validate that quality data is maintained and shared across all necessary business entities. It also allows you deploy confidence levels on all three areas; people, processes and procedure

A.6 Process, Product and People Procedures and Assessment

The Data Governance Process assessment consists of a series of activities and questions regarding:

- Data Governance
- Data Quality
- GTIN Management
- GS1 Key(s) Authentication
- Product Management
- Product Accuracy
- Data Synchronisation
- Training and Education

Each section includes requirements for documentation, and/or additional questions that will be asked by the person who will conducting the assessment The documentation and preliminary responses may be provided to the assessor in advance of an on-site interview at the supplier's location. The Data Governance Process assessment can serve as a tool to help a company determine whether they are ready to begin the certification process.

A.7 Process Procedure

Documentation of procedures is foundational when building a data quality management system. It is the most common area however of non-conformance among organisations wishing to implement data quality management systems.

Documentation of data quality management systems should include:

- Documented statements of a data quality policy and data quality objectives
- A data quality manual
- Documented procedures and records
- Documents needed by the organisation to ensure the effective planning, operation and control of its processes

Data Quality documentation is generally prepared in three levels as illustrated below:

Data Quality Manual: states the scope of the data quality management system; describes the processes of the data quality management system and their interaction. Generally give an organisation profile; presents the organisational relationships and responsibilities of a person whose work affects data quality and outlines the main procedures

Data Quality Management System procedures: describes the activities of individual departments, how data quality is controlled in each department and the checks that are carried out

Data Quality Documents (forms, reports, work instructions, etc.); work instructions describe in detail how specific tasks are performed; include drawing standards, methods of tests, customer specifications etc., and finally forms to be used for recording observations, etc.

A.8 Product Data Audit Inspection Procedure

The ultimate proof of an organisation's capacity to produce and maintain good quality data lies within the product information itself. The quality of an organisation's product information provides insight to internal challenges and/or opportunities within the organisation's processes. An analysis of an organisation's data output can offer clear indications of whether something is not quite right in the data governance process.

To that end, the Product Audit encompasses an inspection of select key product attributes to validate that the attribute information being shared with trading partners matches the physical product (also known as a "physical audit").

To measure the degree to which product information can be considered of good quality, the GS1 Data Quality framework for Brand Owners examines a series of attributes whose data accuracy provide good indicators of organisational data quality. These attributes can be considered data accuracy Key Performance Indicators (KPIs) (i.e., accuracy in these specific attributes can be indicative of good data quality). In general, data accuracy KPIs are measured as the degree to which the product information stored in a repository is consistent with the physically observable characteristics of the trade item. Data accuracy KPIs can be periodically monitored to verify the actual accuracy of the product information, and are considered validation of adherence to the data governance process.

In order to support businesses from all industry sectors, the data accuracy KPIs represent product attributes that are universally applicable. The initial set of KPI attributes has been separated into three categories: Foundational Attributes, Fundamental Attributes and Business Process Specific Attributes. The attributes included in each category are shown in the table below.

Foundational Attributes*
Brand Name
Declared Net Content/Unit of Measure
Pack Quantity
GTIN
Fundamental Attributes*
Linear Dimensions/Unit of Measure
Gross Weight/Unit of Measure
TI-HI
Country of Origin

Foundational Attributes*

Foundational attributes should adhere to the GS1 GTIN Allocation Rules during the innovation process. Once shared with trading partners, any change made to these attributes is subject to the GS1 GTIN Allocation Rules which may require a new GTIN be assigned at all applicable levels of the hierarchy.

The foundational attributes have been identified as:

- Brand Name,
- Declared Net Content/Unit of Measure,
- Pack Quantity,
- GTIN

Fundamental Attributes*

Fundamental attributes are those attributes not requiring a new GTIN if a change occurs *during the innovation process*. However, once in production, any change is should follow the GS1 GTIN Allocation Rules.

The fundamental attributes have been identified as:

- Dimensions,
- Gross Weight,

- Ti-Hi,
- Country of Origin

Note *: Foundational and Fundamental are the copyrights of GS1 US

Business Process Specific Attributes

To be determined by the working group

The product audit inspection is not aimed to be used as a solution for data accuracy, but as a means to verify objectively the reliability of the quality of the information output of an organisation. Therefore the application of an 'inspection procedure' should be accompanied by other elements of a data quality management system in order to offer a sustainable solution.

A.9 Inspection Body Selected

An organisation should appoint an appropriate person or inspection body to conduct the inspection. An appropriate inspection body is a qualified person or company who is familiar with the inspection goals and objectives and must understand all aspects that may affect the inspections.

The main requirements that the inspection body should meet are:

- Independent status/sufficient safeguards for objectivity
- Inspection body was not involved in the original measurements
- Individual inspector experience and qualifications in the field of inspections

A.10 Inspection Preparation

An organisation should start by defining the scope of the inspection, including the type and extension of the products that will be inspected including the sources of information that will be compared and the goals and objectives of the inspection.

Scope of inspection

The scope can be set by product type, location of production, target market, product category etc. The scope should include the attributes that will be inspected and compared between the physical product and the shared data.

Sample identification

The ultimate proof of an organisations capacity to produce and maintain good quality data lies within the product information itself so based on the scope, a sample of products should be determined. The organisation should verify that sample sizes and sample criteria are applied accordingly. For instance, an organisation may want to take a sample that considers each 'unique' item on the sample as a different combination of GTIN/GLN/Target Market while in other cases (depending on the scope) each individual GTIN may count as a unique item.

The table below presents the representative sample sizes upon which Attribute Audits should be based. The actual sample size for each audit will vary by the number of items in a category and the levels of hierarchy.

Number of items in the category	Sample Size Unique GTINs		
	1 level	2 levels	3 levels
100	40	80	120
200	50	100	150
300	55	110	165
400	60	120	180
500	60	120	180
1000	64	128	192

Number of items in the category	Sample Size Unique GTINs		
	1 level	2 levels	3 levels
2000	66	132	198
4000	67	134	201

Sample size is based upon 90% confidence rate and 10% confidence interval (margin of error).

Inspection planning

Before the inspection, the organisation should collect and make accessible all data relevant to the product sample and verify that upon inspection the most recently published data is available to the inspection body.

Prior to the inspection the organisation should provide the inspection body with the recommended pre-inspection documents, which include:

- Sampling justification
- Product data sheets
- The data on the manufactures measuring equipment
- Inspection reports of previous inspections
- Measuring equipment

In order to ensure valid results, measuring equipment should always be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis used for calibration or verification shall be recorded.

Listed below are some key points on measuring equipment:

- Be checked, adjusted or re-adjusted as necessary
- Be identified to enable the calibration status to be determined
- Be safeguarded from adjustment that would invalidate the measurement results
- Be protected from damage and deterioration during handling, maintenance and storage
- Inspection
- Inspection is performed by inspection body and in line with all reference documentation and procedures as well as principles of good practice.

Data is verified against the data published to the defined data source (data pool, internal systems, etc.) Data contained within the data source should be within the definitions of the applicable GS1 Standards and the data inspection should also match such definitions and specifications.

Inspection reporting

After each inspection it is recommended to prepare a written report that contains the following sections;

- Inspection summary
- Inspection scope
- Reference documents
- Overview of inspection findings/results/performance

B Case Study & Helpful Links

Mondelez UK and Tesco Certificate of Excellence case study

https://www.gs1uk.org/~/media/documents/case%20studies/92950_casestudy_mondelez_2014.pdf

GTIN Allocation Rules

http://www.gs1.org/gtinrules