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# Direct Materials Data Quality at Conagra Brands

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Direct Materials Data Quality at Conagra Brands

An Undergraduate Honors Thesis  
Submitted in Partial fulfillment of  
University Honors Program Requirements  
University of Nebraska-Lincoln

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## **Abstract**

Data quality is driven by businesses processes and controlled through data management and data governance. It describes the reliability of data for making decisions. At Conagra Brands, the Data Management Organization (DMO) is the data governance body and continuously oversees data quality. The goal of this project is to build data quality measures for direct materials. Direct materials are materials used to make a food product, including ingredients, packaging, and semi-finished materials. Data quality measures were built for Product Lifecycle Management (PLM) and Enterprise Procurement (EP). Data validations determined the usage of fields owned by these departments. Analysis of transportation data found an error rate of 6.05% while material hierarchy data had errors in only 0.146% of data. Terms in Metapedia serve as a data dictionary, a key point for employees to access information. Each data term describes data fields that often have specific functions. In Metapedia, 1238 terms were identified for direct materials, with 758 of these terms reaching approval for completion. These data fields are monitored through rules in Information Steward based on the Metapedia terms to check for accuracy and completeness. Rules and scorecards allow employees to easily monitor data and take corrective action when needed. Two scorecards were built and tied to three rules. Data terms and rules are connected in Information Steward through the remediation process. The DMO should continue building upon data quality measures and educate employees on the importance of data.

**Key Words:** data management, data governance, data quality, Conagra Brands, SAP, Information Steward

### **Dedication/Appreciation**

Thank you to Conagra Brands for the opportunity to share my summer internship project as my undergraduate thesis for the UNL Honors Program. I would especially like to thank my manager Amy Jipsen and members of the Data Management Organization for assisting me in the completion of the project. I would also like to thank Dr. Lia Nogueira for serving as my mentor at UNL in the completion of this project. Finally, I would like to thank Dr. Madhavan Soundararajan for the advice and assistance throughout the completion of the project.

## **Direct Materials Data Quality at Conagra Brands**

### **Introduction**

Data management is becoming increasingly important for the food industry. Data play a critical role in all parts of the food industry, from the time it is a crop in the field to the time it reaches consumers. Data not only provide information about materials internally but connect to consumers when they receive a finished good at the time of purchase. While it can be challenging to implement a data management program, properly managing data is critical to the success of the business. Many companies manage data but fail to properly govern it (Jipsen, 2018). Data governance is an ongoing process and needs to evolve with the company (Reichental, 2016). Data are not simply chained to the Information Technology (IT) department; it has functions across all business functions.

Data management is control over data architecture, quality, security, policy, practices, and procedures (Spacey, 2016). Data management is the implementation of the tools and policies needed to achieve the goals of data governance. Data management takes the decisions of the data governance team and implements them with processes, technologies, controls, and one-time efforts (Spacey, 2016). Master data are the core data that is essential to operations in a specific business or business unit (Rouse, 2018). Master data management ensures that data are used consistently across the organization (Rouse, 2017). Master data management is essential to make sure that everyone is on the same page and reduce errors. Master data enable a single version of data to be kept so it is the same in all locations and makes it easier to relay information between groups. Master data supports the business and the business process components of planning, buying, making and delivering. All end users are impacted by data, so it is important to get it

right and fix errors when they are found. Data enable businesses to form strategies for how to move forward with projects and shows where there are successes and failures. Managing data leads to making better business decisions (Reichental, 2016). Data are arguably the most important intangible asset for a company. Data can even provide competitive advantages. Therefore, it is critical that data are complete, accurate, and timely.

Data governance is the decision making, monitoring, and enforcement body that has the authority over data management. (Spacey, 2016) Data governance includes the availability, usability, integrity, and security of the data used in a business (Rouse, 2017). Data governance is essentially deciding what to do with data and making sure that it gets done. Without data, it is difficult to support the business and determine strategies for moving forward. Data governance uses disciplined behavior across an organization. Data governance can include data stewardship, data quality, and master data management (Rouse, 2017). Stewardship means being held accountable for the data, ensuring that is accurate, available, consistent, complete, and updated when needed (Rouse, 2017). Data quality is a key driving force behind data governance, focusing on the accuracy, completeness, and consistency of data. Data governance can also be important for mergers and acquisitions and other applications within an organization. Mergers and acquisitions are increasingly common, and data must be handled properly as it enters the new company.

### **Data Validations**

Systems, Applications, and Products in Data Processing (SAP) is a German-based software company focused on enterprise resource planning software. SAP is used to manage data for all the goods and materials used by Conagra Brands. At Conagra, the resources planned in SAP are all the materials needed to make a finished food product that will be sold to customers.

At Conagra, materials are grouped by how they are used. Materials used to make a food product are direct materials, which can be defined as ingredients and packaging (code: ZROH) and semi-finished goods (code: ZHLB). These can be further sorted into material groups and categorized within groups using the material hierarchy. Finished goods (code: ZCAG) are the final food products that are shipped out to customers.

The goal of this project is to build data quality measures for direct materials. Figure 1 highlights the steps taken to complete this data quality project. Data quality measures were built through creating and defining Metapedia terms, writing rules and tying them to scorecards, and remediation, which ties the Metapedia terms with the corresponding rules. All these terms, rules, and scorecards are part of SAP Information Steward. Information Steward provides business users with the ability to gain continuous insight of enterprise data and understand how data quality impacts business processes. Metapedia serves as a data dictionary and allows terms to be defined as to their uses or lack of usage if Conagra does not use certain data fields in SAP. Metapedia identifies the SAP data field, how it is used, and the impact it has at Conagra.

Once the strategy was determined, the first step was to complete some data validations. These initial validations were completed using Excel to understand the importance of data and how data quality tools can improve the ability to identify and correct errors. The first data validation was for transportation data. Transportation data are used to plan transportation of materials within Conagra systems. Transportation data for direct materials is not as critical to Conagra at this point. However, these fields would become critical if Conagra decided to plan transportation instead of having it planned by its vendors (Jipsen, 2018). Validation of three fields was completed: Standard Transportation Commodity Codes (STCC), National Motor Freight Classification (NMFC), and Material Freight Group. The STCC is a seven-digit numeric

code representing commodity groupings (Railinc, 2018). NMFC is based on material density, freight storability, ease of handling, and liability (Freightquote, 2018). These values were validated for materials in 02 statuses, meaning the material is in the production ready phase. Values from SAP were compared with those in the Material Hierarchy to determine the accuracy of the values. Using VLOOKUP in Excel, values for STCC and NMFC were compared and highlighted if the values in SAP did not agree with the values they should read according to the Material Hierarchy. There were no preexisting numbers for Material Freight Group found in SAP. The correct values for Material Freight Group were found using the VLOOKUP function in Excel and making a comparison to the Conagra Material Hierarchy data sheet.

Results of the transportation validation can be found in Figure 2. In the STCC data validation process, 1507 of the 81657 materials had an STCC value that did not match the material hierarchy. An additional 140 materials did not produce an STCC value (N/A). Upon further investigation, these N/A values were due to materials that need to be discontinued by moving them into 03 status. For NMFC, 755 of the 81657 materials had an NMFC value that did not agree with the material hierarchy table. An additional 1895 produced N/A. For Material Freight Group, 2675 of 81657 materials produced N/A. After accounting for duplicates, a total of 4937 materials have an incorrect value or N/A value. This fraction is equivalent to 6.05% of the 81657 materials.

Conagra should take steps to fix their transportation data issues. Better tracking of transportation codes can prevent materials from being held back at plants and ensure that everyone within Conagra is on the same page. Improved accuracy and completeness of transportation data has the potential to speed up the rate of getting to market and creating fewer



customer rejected loads. Transportation data helps Conagra complete their orders and deliver to customers on time, in full.

After completing the data validation for transportation, data validation was completed for all ZROH and ZHLB materials in 02 status. The material hierarchy table was used once again to complete the validation. A total of 172441 materials were listed. This validation consisted of investigating the accuracy five levels of the material hierarchy for materials in SAP. Each level provides a more detailed description of the material. Level 1 divides direct materials into Commodities, Ingredients, and Packaging. Level 2 defines which generic food or packaging category a food falls under, such as fruits, vegetables, metal-based packaging, and paper-based packaging. Level 3 is equivalent to the material group field found in SAP. Level 4 goes even further and would split a group such as fruits into apples, bananas, oranges, etc. Finally, level 5 is the most specific classification of the material hierarchy, grouping similar items together. There are over 1100 categories in the fifth level of the material hierarchy.

Figure 3 breaks down the results of the material hierarchy findings into the issues found at each of the levels of the hierarchy. A total of 94 level 3 errors were identified. These errors often occurred due to materials that need to be discontinued but have not yet undergone that process. An additional 158 errors were identified at levels 4 and 5. Some of these materials are clearly in the wrong group, while others may need further investigation to determine if there is another category that may be more suitable for that item. By adding all of the errors at levels 3, 4, and 5 of the hierarchy, a total of 252 errors were found out of 172441 materials, for 0.146% incorrect data points within 02 status direct materials. Material hierarchy data are much more critical to enter accurately, as the data flows from SAP into Right Angle Planning in the procurement department (Cuadrado, 2018). Inaccuracies can lead to problems down the road if

they are not identified and corrected in a timely manner. For example, if specific buyers are linked to specific hierarchies, perhaps a buyer wouldn't receive the demand signal and would fail to align supply, resulting in lack of production and a missed market opportunity. Finally, one error was identified within the hierarchy table itself. A level 5 identifier was found in the level 4 column. The code ZMH\_5\_01018 was found in the level 4 column and should be changed to ZMH\_4\_0087 to properly identify the category as oranges. The level 5 code would identify "Oranges – frozen peel".

Remedy is a tool used to track changes made to materials and trace them back to the correct people should any future issues occur. Users submit tickets requesting a change to material information in SAP. To determine some potential rules that would later connect to Metapedia terms, Remedy tickets for direct materials from the previous six months were analyzed. The highest volume areas included material extensions, storage location on the MRP2 tab of SAP, and reactivation of materials. These areas were not able to be used for the rules, but they provide business insight and can be used to build other data quality measures. If no rules can be created for these areas, educating employees would be a good solution to reduce the volume of some types of tickets like those described here. Despite the highest volume areas not producing potential rules, Remedy was still a beneficial tool to keep in mind to check for potential issues that related back to PLM or EP. Materials need to be extended to the proper locations when they are used in the business. If they are not extended to the proper locations, delays may occur in the production schedule. The same case goes for materials that need reactivated to be used in a specific plant location again.

Data management has progressed greatly during the last two decades. Prior to implementing SAP at Conagra, each department had legacy systems for their data (Maciejewski,

2018). These legacy systems were old methods used by Conagra and paved the way for how the company tracks data today. Everyone kept different types of data that were needed for their business processes to function. As SAP was implemented and continued to evolve, more master data was needed, and its use spread throughout the company. Data has shifted from having an internal focus to being more valuable externally. Data has always had an external impact but will experience an even greater impact in the digital age. Even nutrition labels are data. Previously, people only could shop for their food in physical stores and could see exactly what they were purchasing. Currently, data are experiencing a large shift as the world continues to become more digitalized. With this increase of digital shopping, Conagra is striving to provide consumers with as much data transparency as possible so they can make the same purchase decisions without holding the product in their hands to access the data. No matter the industry, digital presence and access to data has become an important focus.

With any shift, there are challenges. Data governance takes people to run the system and set up rules to keep the data in check. Data governance is often challenged by the software systems used. People need to be trained in how to operate these systems, and it can take time to give the right people the access to the systems they need to do their jobs. It can be a challenge keeping knowledgeable people in the Data Management Organization (DMO). At Conagra, the DMO serves as an entry level position for many employees. By hiring the right employees, young professionals will have to ability to transition to other positions and apply what they have learned on a larger scale. Work with data does not go away, so it is important to improve processes and revolutionize approach. The better Conagra gets at data governance, the less there is a need for remediation, and the easier the onboarding process becomes. Better data governance will provide balance in a department that expects to experience turnover by design.

Data must be added to the system when a merger or acquisition occurs. Mergers and acquisitions bring in many new materials, but when a company is divested, materials may not be flagged for deletion and moved to 03 status. Sometimes the wrong material may be moved into 03 status. In this case, a Remedy ticket is needed to reactivate the material at the proper locations. Remedy tickets are an essential process in record keeping. Even the DMO requires governance. Due to the production impact that any change to a material or good can have, it is in Conagra's best interest to have record of any change that is made including who it comes from, what they want changed and why. The Remedy tickets provide Conagra the necessary documentation for tracking changes. Should something go wrong in the downstream supply chain, the activity can be traced back to that request and then connected to the right people.

Through completion of the validation process, several materials were identified that need to be discontinued in SAP. To be discontinued, a product needs to be moved from 02 to 03 status. These missed discontinuations often occur when a brand is divested, or sold off to another company. While divesting occurs, many materials may slip through the cracks and remain in 02 status for several reasons. For example, some materials may simply need to be tracked for financial purposes. Others may still be used for a period after a divestiture to use up remaining supplies and give the new owner's time to adjust their production.

### **Data Challenges**

While cleaning up all data inaccuracies is ideal, if they are not causing critical issues, it is best to put resources elsewhere, such as migrating new data into the company after a merger or acquisition. Mergers and acquisitions are becoming increasingly common in the food industry. Data migration is an essential part of acquiring any new products, and all data fields must be properly entered in the owner's system. For example, Conagra bought Elan Nutrition in 2010,

which manufactured Clif bars (Conagra, 2010). Another circumstance where Conagra had to deal with challenges in data management was the purchase of Ralcorp in 2013. A lot of work had to be done to get all these new products and materials into SAP. Conagra's ownership of Ralcorp was short-lived, and Ralcorp was sold to TreeHouse Foods in February 2016 (Conagra, 2016). After a merger or acquisition, there are several steps to prepare for before the products can go live under their new ownership during integration. Conagra recently completed the integration of Angie's Boomchickapop and Sandwich Bros. At the time of integration, members of the DMO are on call so they can respond to any data issues as they occur (Kuna, 2018). These integration processes ran rather smoothly as the company had learned from other recent integrations of Frontera and Thenasi. Throughout the integrations of smaller projects, the DMO and other departments have built guidelines for the integration process and make notes, so further improvements can be made to their business processes (Kuna, 2018). Now that Conagra has completed several smaller integrations, the business will be able to apply what it has learned on a larger scale with the Pinnacle Foods integration.

The area of mergers, acquisitions, and divestures has great potential for growth in data quality measures. One of the biggest challenges with mergers, acquisitions, and divestures is that a business is often left with extra data for materials that may only need to stay active for a short period of time as business transactions are completed. Materials may need to stay active for many reasons. Conagra may continue producing product after a divestiture as a contract manufacturer for the new owners for a certain period of time. After this period, the project team has already moved on to new things and no longer can tell the DMO to deactivate them. Divestiture is an area where remediation could make a big impact. A scorecard could be built with rules to flag when a material is no longer part of an active BOM (recipe) or when the material no

longer has any inventory or future demand. Remediation steps like these will allow issues to be caught and fixed without losing valuable time that needs to be spent on other projects.

Organizations like Conagra are challenged to run very lean on selling, general, and administrative expenses, so employees must make tradeoff decisions (Jipsen, 2018). An employee is going to choose to focus on an innovation that will meet a consumer need and drive incremental sales for the organization as opposed to going through the system and deleting items that are not causing critical issues. Information Steward is a powerful tool. It will point out not just any data inconsistencies, but those that create significant production or consumer related issues (Jipsen, 2018). Employees can then focus their resources on these issues that have a direct impact. Ideally, all data issues would be fixed, but unfortunately that is not realistic. The DMO must prioritize where data governance will be the most advantageous for the company.

Mergers and acquisitions can create synergy and add new channels for a company. Employees must be able to adapt to changes as they happen and be willing to take on new challenges (Schaefer, 2018). eCommerce opens the opportunity for direct to consumer sales, an area that food companies have not been able to explore much until recent years. The addition of direct to consumer sales can provide businesses with better consumer data which can in turn lead to better business decisions that will benefit the company. An important part of these contemporary sales tactics is ‘click and collect,’ a hybrid e-commerce system where consumers order goods online and pick them up in an agreed upon location. It combines the digital and physical shelf. Consumers get to interact with their purchase online, but orders are fulfilled in a physical store.

Many complexities could arise within this hybridized system. For example, a change to an item like packaging may be reflected online and show one image. However, the consumer

might receive their food in the old packaging if the store has not sold out of their old inventory yet, which could potentially lead to confusion for consumers and provides consumer packaged goods companies (CPGs) with a challenge. CPGs are where the GS1 rules come into play. CPGs follow the 10 GS1 rules to help with these scenarios. At Conagra, these ten rules are the foundation for managing data. GS1 rules are the guiding force for creating a Global Trade Item Number, or GTIN (Allison et al., 2016). The GTIN rules are new product introduction, declared formulation or functionality, declared net content, dimensional or gross weight change, add or remove certification mark, primary brand, time critical or promotional product, pack/case quantity, pre-defined assortment, and price on pack (Allison et al., 2016). These rules lay out the guidelines for creating new GTINs, allowing companies like Conagra to manage their data in a standardized manner. The Global Trade Item Number (GTIN) Management Standard is designed to help industry make consistent decisions about the unique identification of trade items in open supply chains. This standard has been developed in accordance with the GS1 Global Standards Management Process (GSMP) and is considered a part of the GS1 system of standards. Overall, costs are minimized when all partners in the supply chain adhere to the GTIN Management Standard (Allison et al., 2016).

Conagra will soon be up against a new data governance challenge with the announcement to acquire Pinnacle Foods on June 27, 2018. It is a very exciting time for Conagra Brands, which just completed its third year of transformation under CEO Sean Connolly. Pinnacle Foods will add over 30 brands to Conagra's portfolio (Conagra, 2018). It creates a synergistic blend of two growing companies with a mix of iconic brands and areas to grow. Conagra will not only be expanding its brands, but there is a large opportunity to grow an even larger network of employees with this acquisition. Having a training option such as Metapedia that employees can

independently explore will greatly enhance the onboarding process and help make the transition of employees into the DMO smoother.

### **Metapedia Terms**

Metapedia is a part of SAP Information Steward. Metapedia serves as a data dictionary and allows users to define terms. These terms are the names of SAP fields and describe how the term is used within the business. SAP validations are used to determine any fields that are not in use so they can be entered into Metapedia as “field not in use,” allowing users to easily determine if a particular piece of data is necessary or not. To identify which terms to define, the SQVI function in SAP was used to validate which terms are actively used and which fields are not in use. After completing SQVI and meeting with business users, 28 PLM and 67 EP terms were chosen to work on for the duration of the project, with additional time being spent entering the inactive terms. Due to time sensitivity, the EP list was divided in ZROH and ZHLB. Out of the list of ZROH materials, eight were chosen to move forward to the approval stages, with validation class being chosen for creating a rule in Information Steward.

To create a Metapedia term, there are some basic areas of information needed that must be defined to create a high-quality term based on Conagra requirements (Fly, 2018). Figure 4 identifies the key components in creating a Metapedia term. First is the SAP field name. Most of these names were already entered as placeholders into Metapedia. This project focused on working with business users to define how the terms are used at Conagra. Field use describes the basics of the term and what it means (Fly, 2018). A short description is added to describe where a field is located within SAP (Fly, 2018). This part is especially helpful for training purposes when employees have questions on where something is located. Finally, a data impact may also



be included in the description. Data impact describes the consequences of incorrect data for business partners within Conagra (Fly, 2018).

Data impacts may range from no critical impact to very critical. The more a piece of data impacts other parts of the company, the more crucial it is to have data accuracy. For example, old material number has no critical impacts (Strain, 2018). Many materials will not even have an old material number – they often occur due to a merger or acquisition. Unit of issue has minor impacts and PLM will be contacted by the plant if any changes are needed (Strain, 2018). The base unit is more important as it affects procurement and pricing (Cuadrado, 2018). In addition, the base unit cannot be changes once the data are entered (Strain, 2018). Any mistakes will lead to the need for a new material number. Certificate type, Inspection Setup, Control Key, QM procurement are necessary for using or receiving ingredients at the plant and could potentially lead to plant shutdown if incorrect (Strain, 2018). Shelf life data are essential for determining expiration dates and ensuring that materials are used in a timely manner at the plants. Any shelf life errors should be fixed as quickly as possible. Temperature and storage conditions are central to warehouse management as food must be stored under the proper conditions to remain fresh (Strain, 2018). Materials will not properly flow into Oracle Transportation Management if the value is incorrect. Specification and batch management are very critical items that can have big impacts. Specification numbers are important for pricing. Batch management is needed for traceability of certain materials (Strain, 2018). Traceability can determine where an error came from should any issue arise. For example, if there was a recall on a product, you would not be able to trace it back to a specific batch without the use of batch management.

Additionally, custom attributes are defined in Metapedia. Figure 5 shows what the screen will look like when building the custom attributes of a Metapedia term. The active governance

tool connected to direct materials is Just in time (JIT), an inventory management tool (Jipsen, 2018). The business function and data owner are the same and identify the business partner (Fly, 2018). In this case, the data owner is PLM, EP, or “field not in use” for inactive data fields. The data entry method used is mapped. Passive governance is completed using Information Steward (Bennett, 2018). The required field can be identified as required, conditional, or optional and describes the SAP field use at a business level (Fly, 2018). Required means the field is always used with the material, conditional means it may or may not be used depending on material type, and optional is used when the field does not have to be used but may be used under certain circumstances. The technical name and field name should match. The technical and field names identify the SAP table and corresponding field names. The data type is typically string and was used for all terms in this project. Finally, the system of record is SAP, as that is the system all data fields are found within.

When a term has completed editing, it is submitted for approval. The terms are reviewed for accuracy and completeness before being approved in Metapedia. Terms can be sorted and searched in Information Steward to identify terms in editing, submittal, and approval phases. Terms can also be sorted by author. The data owners of PLM and EP were chosen as the focus. These areas were chosen due to known issues based on data validations and previous company knowledge in addition to their relation to food science and agribusiness. It can be challenging to assign ownership to data since it can be used by several groups across the company (Reichental, 2016). At Conagra, data ownership is typically defined by which group is creating the field in SAP. Data owners should care about their data; they are the data stewards. Everyone in a business is responsible for data governance (Reichental, 2016). Figure 6 provides a numerical breakdown of how many total terms Conagra has in Metapedia, those that related to direct

materials, and the total approved terms. At the beginning of the project, 3231 Metapedia terms were identified using SAP. Of these, 1238 were for direct materials. Before, only 88 terms were approved for direct materials, but after the completion of PLM, EP, and inactive fields, 758 were approved. A total of 28 terms for PLM and 67 terms for EP were approved.

## **Rules and Scorecards**

In Information Steward, rules can be created and applied to scorecards to see how well data are performing. Information Steward provides a data governance tool that allows users to be more proactive in catching and correcting errors. Information Steward is a form of passive governance, meaning that data are monitored after they are already in the system. At Conagra, JIT serves as a form of active governance, monitoring data in present time. Rules can be used to point out data that do not align with normal results. There were two main criteria for making rules during the completion of this project. The rules had to connect back to the EP or PLM Metapedia terms and be relevant in recent Remedy tickets. The use of these two criteria would ensure that the rules created have more impact to key issues at Conagra.

Figure 7 identifies the key components for building a rule in Information Steward. When creating a rule, the first key step is to give the rule a detailed name and description to state what the purpose of the rule is, as in which data it will be monitoring. The parameters vary by rule, but some items will always be included. These are material number, material description, material group, material type, and material status (Bennett, 2018). In addition, any related data fields that affect the rule should also be included. The definition and filters provide the ability to sort by the parameters so only the necessary data are pulled from the extensive list of materials (Fly, 2018). The definition describes what the data should or should not be, while the filters sort by the parameters to only look at certain materials based on the selected filters (Bennett, 2018). For

example, with valuation class, the value must be 3001 for packaging and 3000 for ingredients. The proper valuation class value is included under the definition. Under the filters, the search is limited to ZROH materials, material groups starting with RP, and material status 03. Valuation class was chosen since it is a default value on JIT forms and can be easily missed when employees are filling out the forms. Additionally, a rule was created for temperature conditions, as according to SAP, the value cannot be 13. This SAP rule does not mean that a temperature cannot be 13 degrees, but rather that 13 is not a usable code to indicate under which temperature conditions (i.e. refrigeration, freezer) a product is to be stored (Jipsen, 2018).

After the rules are created, a summary of the rules can be viewed. Figure 8 summarizes the results of three rules that were written in Information Steward. Here, employees can see how many pieces of failed data exist out of the total checked in Information Steward. A score is provided, with 10 being the highest and representing no failed data. These scores are calculated using a formula built into Information Steward. Users can also use the colors associated with the numbers. A green score is in good shape, a yellow score is wavering, and a red score is bad. Rules or scorecards with red or yellow scores should be prioritized in handling to identify the error and take corrective action. The rules created for this project resulted in very high scores, but there is still room for improvement. Although the scores are nearly perfect tens, there are still failed pieces of data. In Figure 8, temperature conditions and valuation class for packaging only have 2 pieces of failed data out of extensive lists. Valuation class for ingredients has the fewest total pieces of data but the greatest percentage of failed data. Ideally, ingredient valuation would have fewer failed pieces in the future as the use of rules is implemented further. Additionally, more rules should be created moving forward. These include QM procurement, description, specification, batch management, shelf life, and global material status.

Scorecards provide a more proactive response to issues and allow any problems to be caught faster than a manual data validation using Excel. Figure 9 shows the scorecards created for EP and PLM. These scorecards summarize the rules tied to each department. Scorecards group rules related to different business entities, so each department can monitor its own performance. There are scorecards for PLM, EP, Plant MRP, M&OP, and Plant Finance (Jipsen, 2018). These scorecards are used to share data performance with the data owners, so they can be proactive about implementing changes if there is a particular area that needs stronger data completeness or accuracy. There are two additional scorecards for the DMO and Infosys which are used for remediation purposes.

## **Remediation**

Remediation is the final step and connects all the pieces together. Remediation ties Metapedia terms to the corresponding scorecard. It provides the ability to easily monitor data and take corrective action when data issues arise. Remediation can identify negative patterns within data that may require a process change to reduce these negative patterns in the future. Impacts of implementing data quality measures include reduced costs, fewer data issues, reduced time, and fewer Remedy tickets. When there are less data issues and Remedy tickets, members of the DMO spend more of their time in other areas rather than fixing minor details found using the data quality measures built into Information Steward. The results of reduced issues will show that Information Steward is doing its job and allows the DMO to keep its focus on more critical issues. Data are essential across all parts of business and it is crucial to get it right. Data forms connections between all parts of a business, and incorrect data can interrupt the flow of business processes. Fewer Remedy tickets will be needed as errors can be caught sooner by using proactive measures such as scorecards to catch problems sooner.

Moving forward, there are still several steps that the DMO can take to continue building data quality measures. First, it is essential to continue building and updating Metapedia terms and Information Steward rules as new issues and business requirements arise. Next, the DMO needs to continue working with data owners in procurement to get more terms reviewed and approved. These terms are already housed in Metapedia but need to be reviewed for accuracy and completeness. Data owners in all areas need to be educated on scorecards and remediation to better understand how using these tools can help them improve their business processes and complete them more efficiently. Finally, data quality measures have great potential to strengthen the success of integrations, especially with the upcoming Pinnacle Foods integration once the acquisition is finalized. As new materials are created for all the new brands, Information Steward rules can be run to monitor the progress of integration. Scorecards will allow users from each department to view their progress and take corrective actions as needed.

## **Conclusion**

Data management involves problem solving and process improvement. It is a fast-paced environment with many challenges (McGovern, 2018). The areas of data management and data governance are gaining more attention and focus as they continue to become more imperative to a company's success. One of the biggest challenges in data management is keeping up with technology, as technology ages quickly and companies want to ensure return on investment. Technology ages rapidly, and it is hard to implement the most up-to-date systems as a large company like Conagra Brands as they have a higher cost to implement to more people. Most large purchases at major organizations are amortized over 5-7 years and are expected to meet return on investment within the first one to three years (Jipsen, 2018). Certain systems only operate using Internet Explorer. Technology is like a car, it is expensive and outdated almost the

moment you buy it. It makes it very challenging to justify the purchase of new technology, since it will likely be useless before we hit breakeven on the investment.

Many people in the DMO have an IT background which is beneficial when any technology issues arise. The PIM (Product Information Management) team within the DMO is working on getting up to speed with digital to keep market shares, but they must have different data for different customer websites. Each customer website is formatted differently, and customers will have their own preferences for image size and format. Other new challenges are beginning to rise as Generation Z comes of age. This generation shows more preference towards voice recognition technology (Mangles, 2018), and companies do not yet know how to make sure their products show up as the first result when people order by voice and do not specify one of the company brands. Conagra will need to be leader and must adapt to these growth areas with a quick response. However, it is expensive to be the first to adopt new technologies, especially in a large and growing company. Watching other companies and learning from their mistakes and successes will be very beneficial to Conagra moving forward. Studying others will help the company find an ideal balance to be able to provide the right solution for the consumer at the right time.

Data quality helps business processes run smoothly. Data quality is driven by businesses processes and controlled through data management and data governance. It describes the reliability of data for making decisions. At Conagra Brands, the Data Management Organization (DMO) oversees making sure anything related to data quality runs smoothly so other business processes proceed as efficiently as possible. The DMO is the decision making, monitoring, and enforcement body with the authority over data management. Data governance is a continuous process that must continue to evolve with the company.

Data quality measures were built for direct materials, which are materials used to make a food product, including ingredients, packaging, and semi-finished materials. Data quality measures are implemented through data governance. The data fields for PLM and EP were chosen as the focus for building data quality measures due to their high impacts at Conagra. Data validations revealed errors in 6.05% of transportation data and 0.146% of material hierarchy data. Metapedia terms were defined and will continue to serve as a key access point for information about SAP software data fields and learn about how Conagra uses each term for various business functions. Within direct materials, 758 terms have reached the approval state with several others in progress. SAP data fields will continue to be monitored using Information Steward. Data terms and rules are connected in Information Steward through the remediation process. The rules and scorecards created will allow employees to easily monitor data and take corrective action when needed. Scorecards will reveal any negative patterns that can trigger the need for a change in business processes. The DMO should continue to build data quality measures by building and updating Metapedia terms, creating more Information Steward rules, working with data owners to educate them about Metapedia and Information Steward, and using the measures built to assist with future product integrations.



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## **List of Acronyms and Abbreviations**

DMO: Data Management Organization

EP: Enterprise Procurement

IT: Information Technology

JIT: Just in time inventory management tool

PIM: Product Information Management

PLM: Product Lifecycle Management

SAP: Systems, Applications, and Products in Data Processing planning software

ZCAG: code for finished goods

ZHLB: code for semi-finished goods

ZROH: code for packaging and ingredient materials

## Figures

Figure 1. Steps for completing direct materials data quality project.

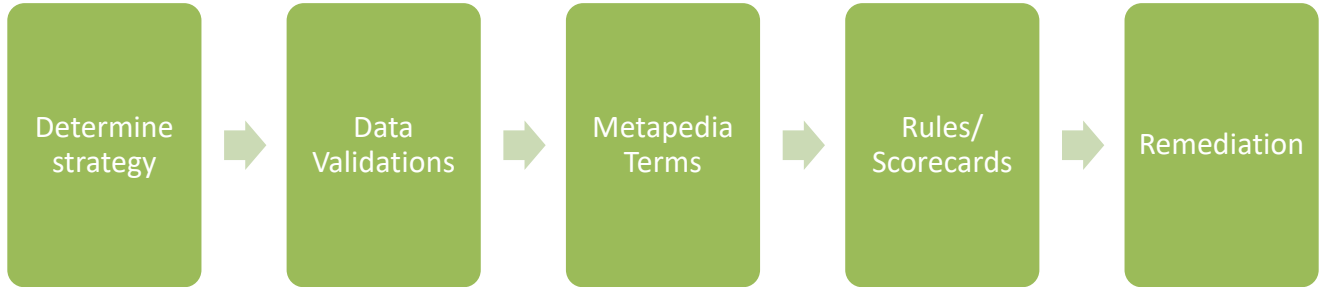


Figure 2. Transportation data issues for Material Freight Group, NMFC, and STCC.

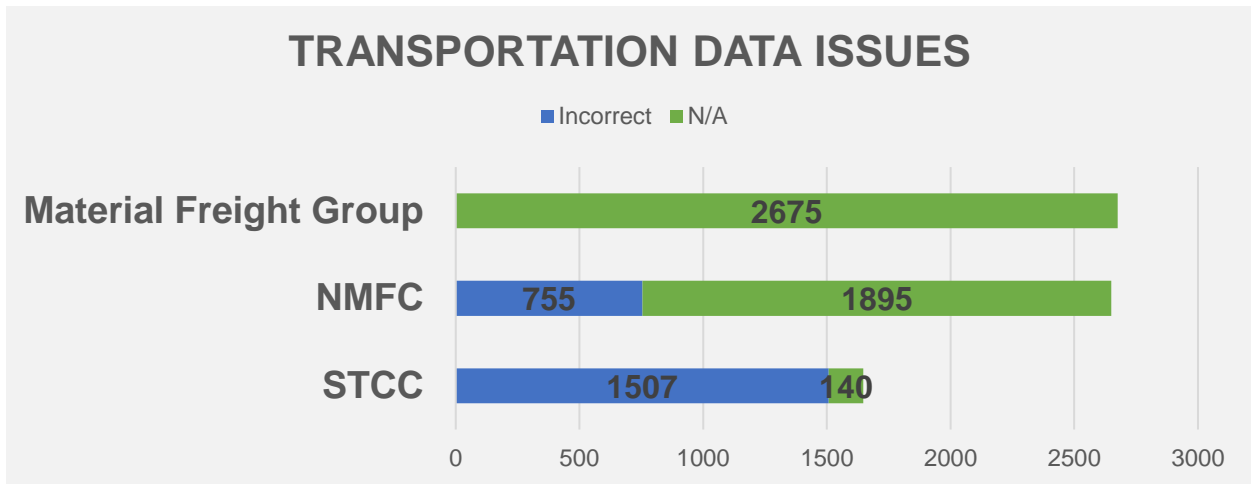


Figure 3. Material hierarchy issues, classified by level within the hierarchy.

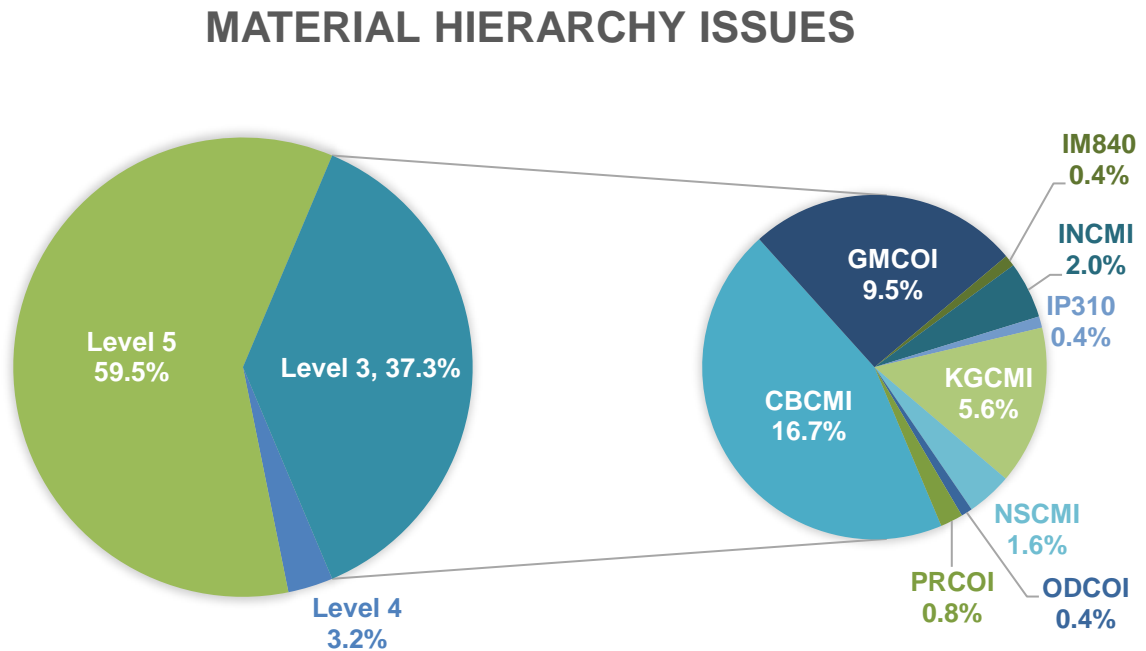


Figure 4. Key components needed for building a Metapedia term, shown here with the example of Batch Management.

SAP field name	Name: * <input type="text" value="SAP Batch Management [ZHLB]"/>
Field use	<b>Description*</b> If the new material is to be batch managed mark the Batch Mgmt checkbox. Batch Class must be created when Batch Management is selected.
Short description	Short Description: Batch management Field Location: Sales: general/plant Field Label: Batch management Field Length: X Field Format: check box if batch managed
Data impact	Remember that once a material is used in SAP this cannot be changed so make sure it is correct. Batch management is typically used for food or food contact packaging.  Global field. Big impact. Without batch management where needed, traceability is lost. For example, if there was a recall on a product, you would not be able to trace it back to a specific batch without the use of batch management.

Figure 5. Custom attribute fields for creating a Metapedia rule. Fields that should be completed are active governance tool, business functions, passive governance tool, required, technical name, breadcrumb, data owner, data type, and system of record.

The screenshot shows a window titled "Metapedia Term" with a "Custom Attributes" tab selected. The window contains two columns of fields. The left column includes: Active Governance Tool (JIT Direct Materials), Business Functions (EP), Data Entry Method (Mapped), System Lineage, Data Remediation, Data Transformations, Field Lineage, Last Audited Date, Passive Governance Tool (Information Steward), PIM Attribute 2, PIM Attribute 4, PIM Channel ID, Required (Required), System of Origin, and Technical Name (SAP^MBEW.BKLAS). The right column includes: Breadcrumb (SAP^MBEW.BKLAS), Data Clerk, Field Impact, Data Owner (EP), Data Restriction, Data Type (String), Last Audited By, Manual Maintenance Plan, PIM Attribute 1, PIM Attribute 3, PIM Channel Display Name, PIM Status, Required Condition, and System of Record (SAP). At the bottom right, there are buttons for "View History", "Cancel Task", and "Close". A timestamp "Last modified by ZEL3002 on 7/23/2018 4:27:51 PM" is visible in the top right corner.

Figure 6. Numerical breakdown of total terms into direct materials and approved terms.

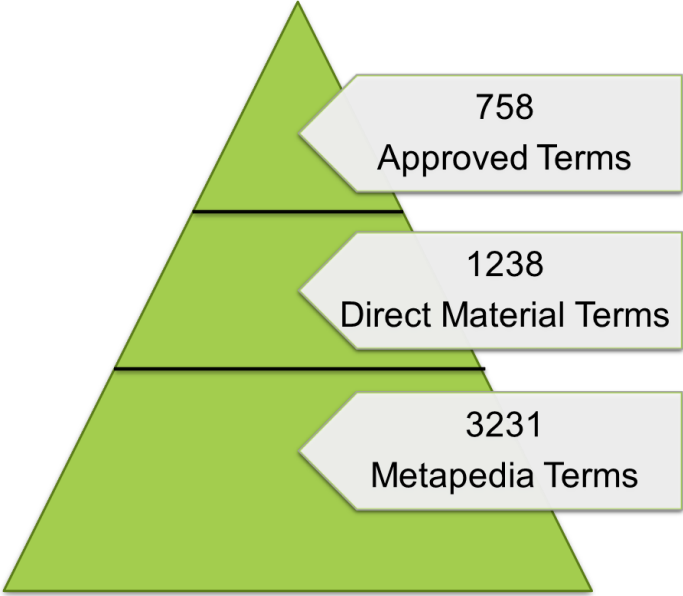


Figure 7. Key components for building a rule in Information Steward, shown here with the example of valuation class for packaging.

**Name & Description**

Name: \* ZDIR\_VALCLASS\_BKLAS\_ZROH\_PACK\_ACC  
 Description: Default value for the valuation class for valuated stocks of this material. Default is 3001 for packaging. Determined using material group. Packaging starts with RP.

Financial Impact Per Failure: \$ 0 Edit... Custom Attributes

**Parameters:**

Name	Data Type	Content Type	Score	Description
\$material_type	varchar	New	✓	MARA.MTART
\$material_description	varchar	New	✓	MAKT.MAKTX
\$material_number	varchar	New	✓	MARA.MATNR
\$valuation_class	varchar	New	✓	MBEW.BKLAS
\$material_group	varchar	New	✓	MARA.MATKL
\$plant	varchar	New	✓	MARC.IWERKS
\$plant_status	varchar	New	✓	MARC.MMSTA
\$global_status	varchar	New	✓	MARA.MSTAE

**Expression:**

Definition Filters

Clear All

Parameter	Function	Value
\$valuation_class	=	3001

Figure 8. Summary of individual rules from Information Steward. The red boxes indicate how many pieces of failed data occurred out of the total data set.

ZDIR_TEMPCOND_TEMPB_ACC									
Description: Temp conditions can't be 13									
Author: ZLB0001 Approver: Data Insight Rule Approver									
Connection	Schema	Table	Columns	Score	From Last	Failed	Total	Low	High
Views	DMO Direct Materials	MARA	MATNR,MAKTX,MTART	9.99		2	49,933	5	8
ZDIR_VALCLASS_BKLAS_ZROH_ING_ACC									
Description: Default value for the valuation class for valuated stocks of this material. Default is 3000 for ingredients. Determined using material group. Ingredients start with RF and RC.									
Author: ZLB0001 Approver: Data Insight Rule Approver									
Connection	Schema	Table	Columns	Score	From Last	Failed	Total	Low	High
Views	DMO Direct Materials	SV2_MARA_MAKT_MAF	Material Type,Material I	9.97		25	12,423	5	8
ZDIR_VALCLASS_BKLAS_ZROH_PACK_ACC									
Description: Default value for the valuation class for valuated stocks of this material. Default is 3001 for packaging. Determined using material group. Packaging starts with RP.									
Author: ZLB0001 Approver: Data Insight Rule Approver									
Connection	Schema	Table	Columns	Score	From Last	Failed	Total	Low	High
Views	DMO Direct Materials	SV2_MARA_MAKT_MAF	Material Type,Material I	9.99		2	26,505	5	8

Figure 9. PLM and EP scorecards.

