



Centralized Label Management Systems

Data-Driven vs. Layout-Driven Label Management

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Introduction

A label is, in simple terms, a self-adhesive sheet with readable content, applied to a product or a container. Anybody who understands the “language” of the label can work out the attributes of the product it describes. The diversity of “languages” that find their way onto the label has considerably increased in recent years due to the growing adoption of automation, globalization and standardization by businesses. So have complexity and maintenance associated with labeling.

This paper first portrays the impact of that increase in complexity on labeling, and thus on the software solutions that produce the labels. Next, it outlines the different types of centralized label management solutions that can be linked to an ERP system and examines the reasons why this kind of functionality is rarely integrated into the ERP system itself. In conclusion, the different types of solutions are weighed up against each other.

Significance of Labeling in the Supply Chain

A typical organization stores basic data about a shipping unit, such as product name, batch number, recipient name or address, in an ERP system. Once this unit begins its journey through the supply chain, information is added to that data bit-by-bit in order to properly identify and track it throughout its journey. A selection of these information bits is expressed on a label, which is applied to the product or its packaging. By encoding the identifying values for the unit in a bar-code, the label can be scanned, and is therefore machine-readable.

One of the common standards that have been developed to that effect is the GS1 standard (formerly known as EAN-International). The organization behind that standard counts more than a million member businesses in over 30 industries and 104 countries. What such standards do is – simply put – bring the processes of suppliers and recipients closer together.

The exact information that has to be added and maintained to comply with the GS1 standard can be found in the specification documents on the GS1 web site. However, one element of the communication protocol embedded in GS1 worth mentioning is the Serial Shipping Container Code, commonly referred to as the SSCC. This 18-digit code can be expressed on a label as a bar-code, and is used to identify a pallet or a container.

In addition to the labeling effort, the supplier can send a matching despatch message to the recipient via Electronic Data Interchange (EDI). The despatch advice message contains information that conforms to the standard and the possible agreements between supplier and recipient.



The SSCC bar-code makes it possible to track the shipment throughout the supply chain. When the recipient scans this bar-code at the time the goods are received, the embedded code is matched to the despatch advice message that has been received previously, providing the recipient with a detailed overview of the contents of the pallet or container. While it is possible to use the SSCC without the associated despatch message, doing so increases the risk of errors and decreases the efficiency of the process.

Most ERP systems support the use of SSCCs for both suppliers and recipients, and expose interfaces allowing to receive and store despatch messages, and to link them to an SSCC. When a pallet or a container is delivered, warehouse staff can scan the bar-code printed on the label, and are then presented with all characteristics of the container or pallet in question.

Using standards, making labels machine-readable, and implementing EDI all contribute to a more optimal supply chain. In a supply chain optimized in that fashion, the label, as the carrier of the identifying information, plays a central role.

Labeling Requirements

The complexity of a label is largely related to the requirements articulated by the internal organization and the recipients of the product, and to the legal provisions that are applicable in the countries in which an organization is active or to which an organization exports goods.

Legal Provisions

Legislative powers in every country define rules that can directly or indirectly have an impact on the contents of a label. Disregarding these rules can result in reputation damage, and sometimes costly fines.

An example can be found in the commodities regulations, which stipulate that every consumer product has to sport an expiration or best before date. The party that determines and issues this date is responsible for the quality of the product.

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Other examples of legal provisions that affect labeling are language stipulations, regulations related to the origin of the product, or labeling requirements for hazardous materials.



Customer Specifications

Customer requirements can also have quite an impact on labeling, with demands ranging from a custom logo to compliance with world-wide standards such as GS1. Frequently, the rationale behind such requirements is a desire to optimize the supply chain by harmonizing the arrangements made with the different suppliers. As a rule of thumb, the diversity of labeling requirements increases evenly with the number of customers an organization serves, while their complexity increases exponentially. To satisfy the wide variety of requirements, and in doing so ensure customer satisfaction, manageability and flexibility play a significant role.

Internal Factors

Company-specific factors such as the number of products and facilities, corporate identity and internal quality procedures are in direct correlation with the complexity of labeling and the resulting maintenance burden. The amount of flexibility and maintenance necessary to satisfy the internal requirements increases evenly with the size of the product portfolio and the number of facilities across which these materials have to be managed.

The complexity of the labeling problem increases under the influence of legal provisions, customer requirements and internal factors. The more products, facilities and customers an organization has to deal with, the more flexible and manageable its labeling solution will need to be.

Centralized Label Management

When facing a growing number of products, facilities and customers, organizations tend to centralize label management in order to maintain a grip on labeling. A Centralized Label Management System, which we will refer to as CLMS, is a system used to that effect. Besides the obvious layout information, it holds – and allows maintenance of – information that has a direct or indirect influence on the label.

Label Management in an ERP System?

Because labeling rules apply to data elements that are typically stored in an ERP system, it would seem logical to manage labeling in the ERP system as well. However, this hardly ever happens. Probably this is due to the fact that the investment that would be necessary to embed this functionality in the ERP system is disproportionate to the benefits that can be achieved. Furthermore, suitable linked labeling solutions are readily available on the market.

Layout-Driven Solutions

The most common labeling solutions are layout-driven. That means that the emphasis is placed on the layout of the label, and that rules can be applied to data elements that exist within these layouts.

Data-Driven vs. Layout-Driven

The most distinctive feature of a CLMS as opposed to a layout-driven labeling solution is the fact that it is data-driven. A CLMS implements rules that are applied to data elements from the ERP system in order to obtain a label, while a layout-driven labeling solution implements rules that are applied to data elements within the individual layouts. This difference is illustrated in figure 1 below.

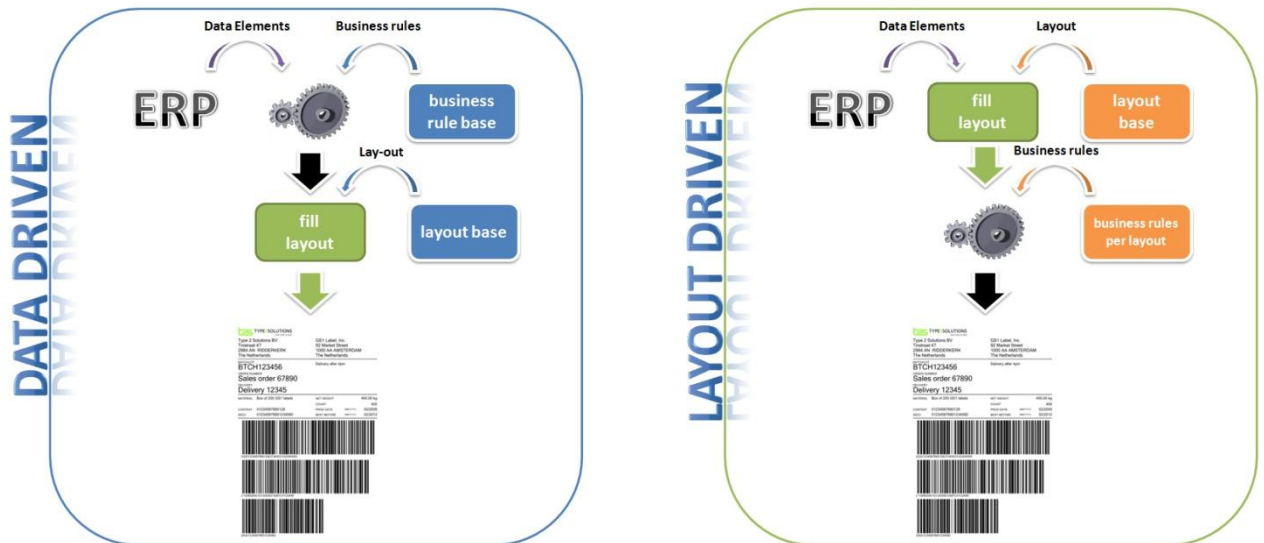


Figure 1 – A data-driven approach to labeling compared to a layout-driven approach

Practically, this means that a layout-driven labeling solution is unable to centrally maintain rules applying to data elements, and to apply these rules to multiple layouts. As a consequence, rules have to be repeated on every relevant layout, and therefore have to be maintained multiple times.

If the number of layouts is limited, and the legal provisions, customer requirements and internal factors mentioned earlier are relatively stable, this does not have to be an issue. However, if these factors are of a more volatile nature, a data-driven solution might be the wiser choice. This data-driven approach offers tremendous flexibility and makes setup and maintenance very intuitive. After all, rules are constructed on data elements representing business concepts such as “customers” or “products”, and therefore constitute a direct reference to business reality.

To illustrate this notion, consider the following example.

A customer would like the delivered products to be marked with anonymous labels, with no reference to the supplier whatsoever (logos, names, etc.).

Layout-Driven Solution

In a layout-driven solution, this matter can be solved in two different ways:

- by developing a separate set of layouts without supplier logo and name;
- by making the display of the supplier name and logo conditional on each relevant layout.

Data-Driven Solution

In a CLMS the matter can be resolved by simply assigning a rule to the data element “customer”. This rule will ensure the (in)visibility of the supplier name and logo controls in general terms, regardless of the layout in which they appear, whenever a label is generated for that customer.

A Data-Driven Solution – Powerful, Flexible and Simple

This example illustrates the power, flexibility and simplicity of label management in a data-driven solution. Assigning a rule to a data element results in a change of behavior for all labels, regardless of the layout. Likewise, if another customer wants his own logo on the label, a different bar-code symbology or a non-standard language, the answer is equally simple: centrally assign a rule to data elements. In other words, rules governing the behavior of a label, its content and its layout can be assigned to any data element available in the ERP system.

No User Interaction or Hard-Coded Values

User interaction is limited to a minimum by the fact that the rules are the ones that determine which layout has to be used, or which elements have to be displayed in what manner. Further, no hard-coded values need to be maintained in the ERP system to indicate what layout has to be used, since the label, including its layout, is composed dynamically by a rule set operating purely on data elements sent from the ERP system to the CLMS.

The Contradiction between Flexibility and Control

As for any system that offers increased flexibility, the setup is of utter importance. Considering that an unlimited number of rules can be assigned to a given data element, it is crucial that these rules do not interfere with each other. In order to trace the different decision moments passed by the rule engine that applies the rules, an audit trail is no excessive luxury. Logging these actions serves two purposes: on the one hand, it gives an insight into systems and users that generate labels. On the other hand, it clarifies the decision paths walked by the rule engine to come to a specific label, in terms of layout and content. Furthermore, an audit trail can be used to automatically document a number of critical decisions made to populate a label. This can be useful for rules in specific applications such as customs regulations or trade agreements like NAFTA, EU or ASEAN.

Besides the obvious layout information, a Centralized Label Management System (CLMS) holds – and allows maintenance of – information that has a direct or indirect influence on the label. Despite the obvious benefits of this data-driven solution in complex environments, it has not really found its way into the market. This might be due to the fact that businesses are unaware of such solutions, and to the strong establishment of the layout-driven solutions. Nevertheless, data-driven solutions can deliver considerable gains in flexibility, maintainability, and user interaction compared to layout-driven solutions.



To Conclude

The supply chain can be optimized by implementing standards, using machine-readable labels, and making use of EDI. The label is the carrier of the identification within the supply chain, and therefore a crucial link in the chain.

The complexity of the labeling process depends on legal provisions, customer requirements and factors internal to the organization. With an increasing number of products, facilities, and customers comes an increasing need of flexibility and manageability of the labeling process.

A Centralized Label Management System (CLMS) offers that flexibility and manageability. Although the ERP system would appear to be the ultimate candidate to accommodate centralized label management, it hardly ever does. This might be due to the absence of specialized modules serving that purpose in ERP systems, making expensive custom development inevitable.

The most common non-ERP labeling solutions can be typed as "layout-driven". Systems of that class emphasize the layout of the label, and allow for rules that can be applied to data elements within individual layouts.

In a Centralized Label Management System (CLMS), the layout coexists with information that is maintained to directly or indirectly govern the behavior of the label on the sole basis of data elements known in the ERP system. This class of labeling solutions has not found its way into the broader market yet, despite its obvious advantages in complex environments. This might be due to the relative unfamiliarity of the market with such solutions and the established market position layout-driven solutions hold. Nevertheless, the fact remains that data-driven solutions are in many ways superior to layout-driven solutions when it comes to flexibility, maintainability, and user interaction.