no•ein, v. 'nō-en [fr. Gr. nous, *mind*.] to think; to realize the truth

Visual Specification of Complex Medical Appliances in Internet Transactions

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Executive Summary

Customized orders of medical appliances can be difficult to accept in an eCommerce paradigm. Many medical appliance manufacturers have continued to use paper, but paper does not allow organizations to enforce business rules in an automated fashion during order placement. This white paper presents alternate solutions, including methods for visual configuration, using a mouse and canvas, of appliances in a web browser.

Background

Paperless workflows are cost effective, but some complex orders can't be handled electronically.

Organizations in many industries have achieved cost reductions and improved quality by migrating to electronic workflows. The workflows allow orders to be submitted over the Internet using eCommerce applications.

Some organizations, such as orthodontics labs, have not been able to fully benefit from the integration of electronic commerce and workflows. Their products allow for customizations that are too complicated to be specified using typical eCommerce software. Therefore, many organizations have combined traditional methods with electronic workflows. Some organizations inject faxed or mailed orders into paperless workflows. Other organizations still use paper prescriptions, the Postal Service, and paper workflows to manage production and fulfillment.

Paper workflows have several problems that have inspired organizations to adopt electronic workflows:

- They are less efficient. Orders take longer to move from intake through shipment.

- Orders cannot be tracked easily. It is hard to run reports to assess where orders are in the queue.
- Orders can be misplaced.

To resolve these problems, some organizations combine paper orders with electronic workflows. Orders are received by mail or fax and then inserted into an electronic workflow. While this combination improves efficiency and allows orders to be tracked, measured, and reported on, it has its own downfalls. Specifications received on paper can be incomplete or incorrect. Manufacturers must follow up with the customer who submitted an incomplete or incorrect order and complete or correct it. This takes staff time and delays the shipment of an order.

When orders on paper are incorrect, the order is delayed and staff time is needed to fix it.

Efficiencies and correctness will be best achieved using a workflow that is electronic from one end to the other. Therefore, complex orders must be specified electronically.

Electronic Solutions End-to-End

Optimal efficiency and correctness are often achieved when using an electronic workflow end-to-end. First, a method for specifying orders electronically must be adopted. That method must allow complex appliances to be designed electronically and submitted during the eCommerce session.

One solution would be to make an application available for download to all customers. The customers could download the application, install it on their computers, and use it to design the appliance. The customer would then upload a file from that software when the customer places an order. This solution is used by machine shops that make custom parts. They make a CAD application available to their customers as a download from the machine shop's website.

This solution is problematic because the

manufacturer must maintain and support that application on all client computers. This is an expensive and challenging prospect.

Noein's Canvas Software

Noein developed software that allows complicated medical appliances to be specified visually in a web browser. The specifications are fed into the manufacturer's workflow application for fulfillment.

The software contains business logic to prevent customers from designing items the manufacturer is unable to supply.

The software allows appliances to be specified along with the features that define the appliance and the options that are available when selecting the appliance. Appliances are built from parts, which are stored in a library. Customers can drag parts from the library onto the canvas. Once on the canvas, parts can be moved around to adjust how they are positioned with respect to each other and the object the appliance will be attached to. The parts may have options that can be selected to set attributes associated with the part, such as size, color, materials, or a similar feature.

FIG 1: The Adams Clasp.

Additionally, each appliance has associated business logic that prevents customers from placing the appliances in configurations or combinations that cannot be manufactured.

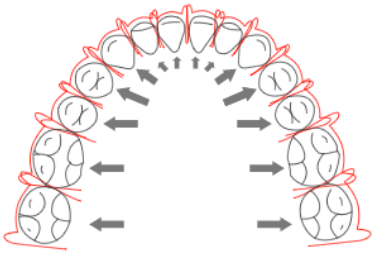

FIG 2: The 14 possible positions for an Adams Clasp.

Delivering the software in a web browser, rather than using desktop applications, means customers can submit orders on any device with a web browser, including the Apple iPad and similar mobile devices.

The software is modular and can be integrated with any eCommerce software. An organization does not have to replace its eCommerce or workflow solution to take advantage of Noein's canvas software. Additionally, the software is standards compliant and runs in all modern web browsers.

Orthodontic Lab: An Example Application

Orthodontic labs build retainers and other appliances used by doctors in the practice of orthodontics. Labs manufacture appliances from hundreds of parts. The parts can be combined in thousands of configurations. The parts are customized to each patient: placement, part components, and visual elements can be specified.

Traditionally, appliances were specified using a paper prescription. Orthodontists would draw the appliance on the script with specifications and notes that would help the lab manufacture it. Scripts were sent via mail or fax with study models. When the script was received, an employee of the lab would review the script. If clarifications or corrections were required, due to incomplete or incorrect specifications, the employee would call the doctor.

With Noein's canvas software orthodontists can draw a prescription in a web browser. They drag parts from a library and position them on the teeth. They can add other parts and configure the interaction of those parts. The orthodontists then set options on the parts, such as wire gauge and color, and add notes. Additionally, orthodontists can create template prescriptions, which can be customized per patient and submitted. The templates prevent orthodontists from having to create each prescription from scratch.

The software maintains a list of rules indicating where parts can be placed and how they can be combined. Therefore, when a prescription is submitted, lab technicians know the appliance conforms to all rules and is ready to be manufactured. Consequently, orders can be shipped faster, and time is saved checking the orders.

Parts can be joined in thousands of combinations, placed precisely on the teeth using a mouse, and characteristics, such as wire gauge, can be specified.

ZOOM POSITION 1:

ZOOM POSITION 2:

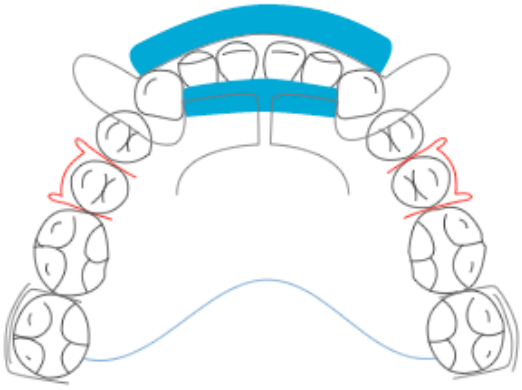

FIG 6: Two Adams Clasps in a larger design.

FIG 3-5: The Adams Clasp smoothly transitions through the set of possible positions.

The Bottom Line

Adopting electronic workflows increases productivity, decreases costs, and improves consistency of production. The complexity of some transactions prevents some orders from being handled within an electronic workflow. This is especially true of orders that allow for complex customization or precise specification.

Emerging technology allows for complicated appliance and part designs to be specified in a web browser. These technologies enable an organization to adopt a workflow that is electronic from end to end and apply business logic rules to orders before they enter the workflow.