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From Green Screen to Browser:

Bringing an Industrial Order Entry Interface
into the 21st Century

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UPA Presentation

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Goals for Today

- Share case study of transforming an order entry application from AS400 to HTML
- Discuss challenges of identifying user needs for specialized work applications
- Share two ways to help tell the story of variation in users and their needs:
 - Dimensional analysis
 - Qualitative customer segmentation
- Consider ways to optimize web interfaces for:
 - rapid, efficient data entry
 - large variations in user workflow



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Background

The Client

- Midsize Midwestern software vendor
- Specialized in ERP software for window, door and cabinet manufacturers
- Key advantage over generalist ERP providers is ability to support extensive product configuration
- Smaller size, lower profile pose challenge to earning trust of prospective customers

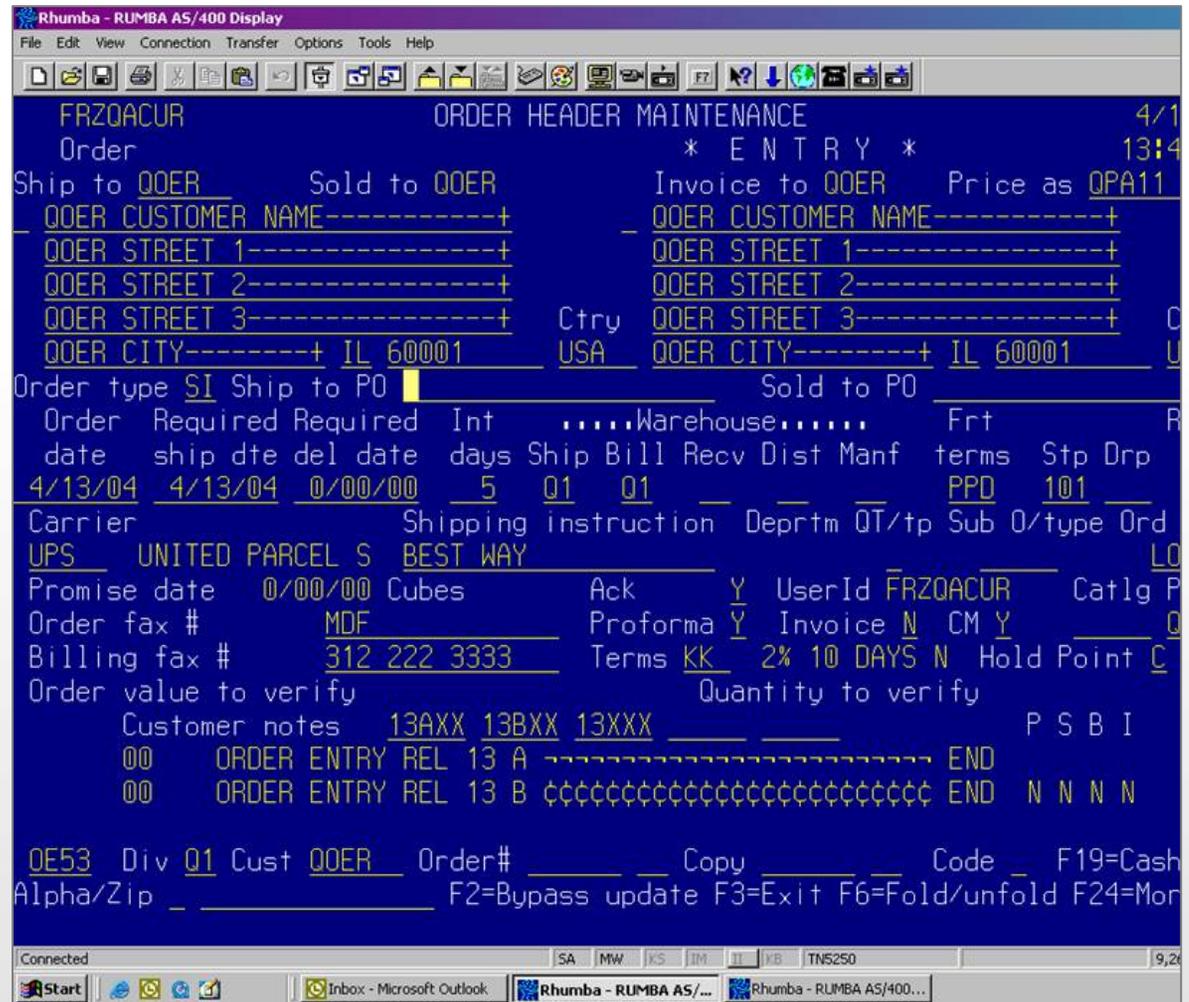
The Product

- Mainframe order entry application
- Character-based interface
- Configurable to reflect manufacturer rules
- Used to record:
 - Identity of the customer
 - What they have ordered
 - Quantity
 - Time and place for delivery
- Data feeds to production, finance, shipping & sales

The Interface

Order Header Entry

Enables user to identify customer, order timing and shipping logistics

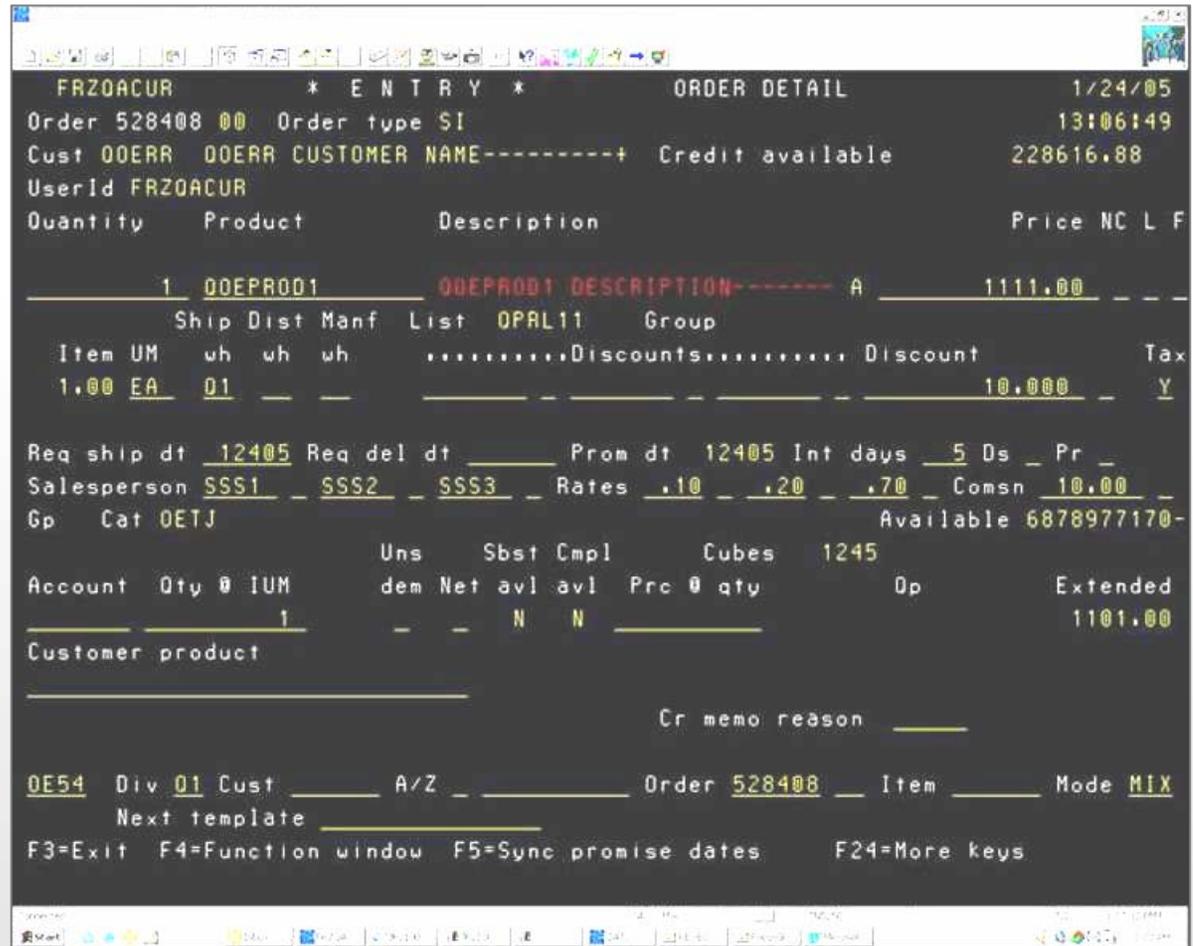


The Interface, cont.

Order Detail Entry

Enables user to specify products ordered, their quantity and price...

And a host of other more occasional-use fields



The Interface, cont.

Option Selection

Allows user to configure each product (potentially hundreds of decision points per item)

```
Session A - [24 x 80]
File Edit View Communication Actions Window Help
TSTQACUR          OPTION SELECTION AND MAINTENANCE          11/17/04
                                                16:01:12

Sales order      527168 00
Item             1.00 SUBMODEL          SUBMODEL

Option           Selected option        Dimension/Quantity    X

** DIMENSION **
LENGTH           _____            _____            X
WIDTH           _____            _____            X
DHEIGHT         _____            _____            X
SETLEN          _____            _____            X
SETWID          _____            _____            -
DISC-3          _____            _____            -
TEST7           _____            _____            -

** COLOR **
COLOR           RED                    _____            X
DHCOLOR         ORGBRW                _____            X
DFCOLOR         _____            _____            -

WS54
F3=Exit  F6=Fold/unfold  F7=Copy  F10=Menu Bar  F11=Restart

MA  a X SYSTEM          MW          21/079
```

The Problem

- Green-screen interface is a major turn-off for new sales prospects
 - Looks dated
 - Looks impossible to use
 - Long training process
- However, existing user base is satisfied with Green screen interface!
 - It's fast
 - They've been trained
 - They've customized it
- Company unable to maintain both platforms, committed to shift to GUI

The Design Challenge

- Design an HTML interface that can:
 - Win over existing “Green Screen” users
 - Align with user goals and order entry processes
 - Decrease training time
 - Maintain or increase productivity
 - Work with the existing back end
 - Make a positive impression in sales demonstrations



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Where do we start?

- Planning for the field



Working Group Topic

- Please spend five minutes discussing:
 - What do we need to learn in the field ?
 - What issues should we consider in choosing our sample and method ?



Research Questions

- What is the nature of the work environment?
- How are orders taken? Phone? Fax? Email?
- What happens before an order can be entered in the system?
- How do employees manipulate the Order Entry screens?
- How much data is actually entered? In what order is it entered?
- How many employees touch an order? What are their roles?



Research Questions

- How long does it take to process an order?
- Does the order entry process differ by vertical? How and why?
- Are some parts of the process not computerized? Why?
- What activities take place after an order has been entered?
- What do users like and dislike about the current application?
- Do employees use other programs in conjunction with this one?

Sample Selection Issues

- Client had access to users
- Budget and customer productivity concerns limited us to ~7 three hour visits
- Who should we study?
 - Manufacturers of windows, doors, cabinets, furniture?
 - Specialized user roles?
 - Sample the range, or central tendency?
 - Focus on exemplars & trend setters?
 - How do we know which is which in advance?

Observation Issues

- How do we study a complex or high speed activity without disrupting it more than necessary?
- How do we know when to observe?
 - Does the process vary daily or seasonally?
- How do we know what we are seeing?
 - Comprehension is hard without an organizing framework:

Observation Issues, cont.

What are the authors describing?

“The procedure is really quite simple. First you arrange things into different groups depending on their makeup. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you’re pretty well set. It’s important not to overdo any particular endeavor. It is better to do too few things than to do too many.”

- Bransford & Franks, 1972

Observation Issues, cont.

What are the authors describing?

Doing laundry.

“The procedure is really quite simple. First you arrange things into different groups depending on their makeup. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you’re pretty well set. It’s important not to overdo any particular endeavor. It is better to do too few things than to do too many.”

- Bransford & Franks, 1972

Our Research Strategy

- Sample selection
 - Differences in products may map to differences in process, so sample the range of product types
 - Absent business strategic focus on certain types of clients, sample the range
 - Slant toward more successful, progressive clients within each product type
 - Study distinct user roles within each company
 - Involve client in the selection process
 - But beware political selections

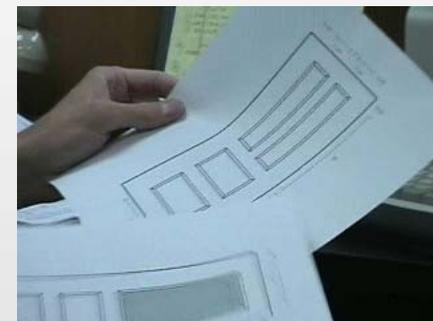
Our Research Strategy, cont.

- Approach to observation
 - Within each session, try to alternate between:
 - Fly on the wall observation
 - Initial Q&A / Guided walkthroughs
 - Further observation
 - Additional Q&A
 - Establish working knowledge of the product and activity before field observations
 - Seek training from client
 - Ask customers to nominate “typical” order entry periods

Field Session Procedure

We spent 2-3 hours on site with each customer, watching several employees as they completed their work and interviewing them about their company's order entry processes.

- Observed and interviewed order entry personnel as an apprentice, allowing them to teach us their jobs
- Followed order entry from start to finish, including handoffs
- Retrospective discussion of orders processed over days or weeks





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Making Sense of the Data



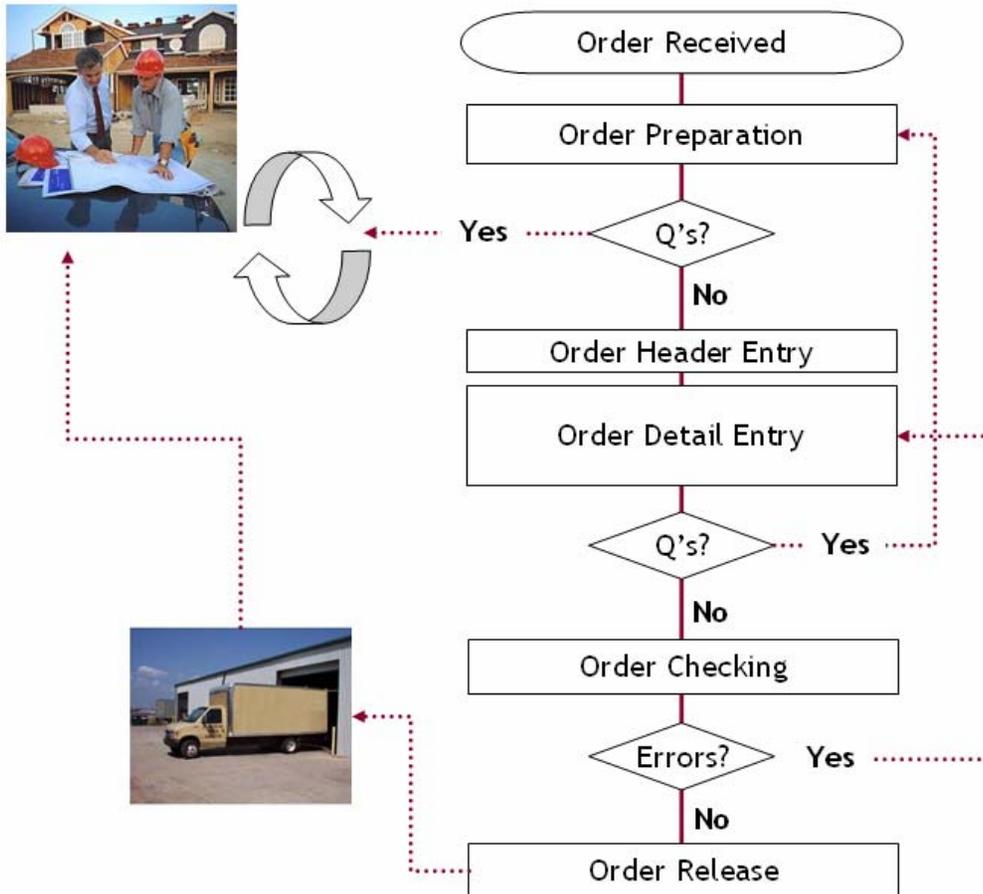
Analysis Approach

Our analysis process consisted of three approaches:

- Task analysis: an analysis of common aspects of customer workflow
- Dimensional analysis: an analysis of variations, and reasons for them
- Qualitative customer segmentation: a simple way of communicating about varying user types

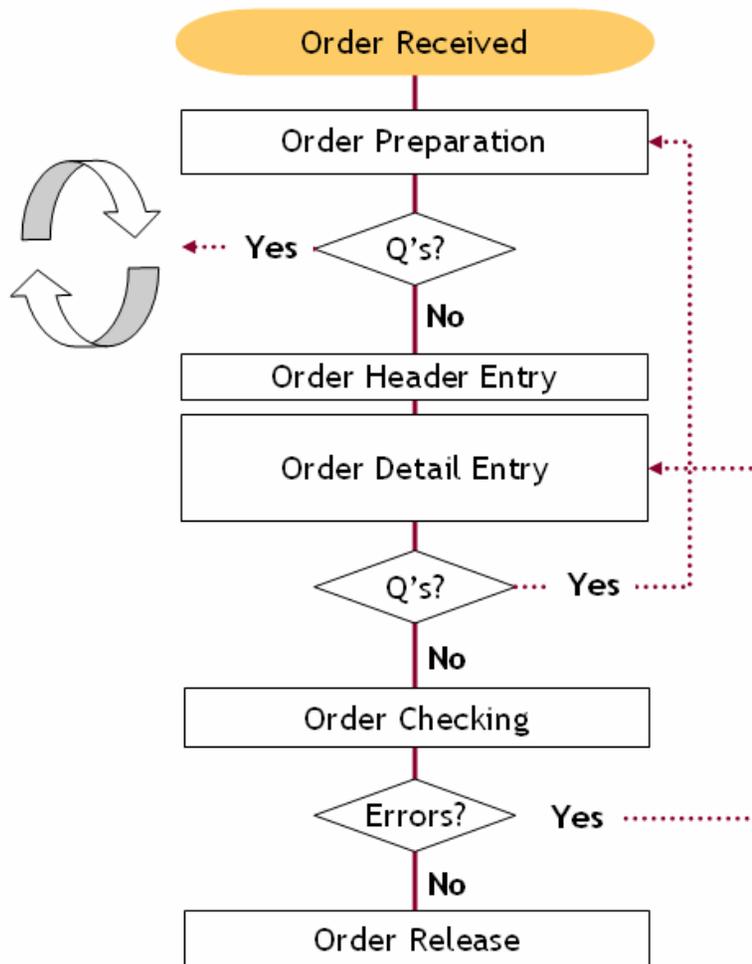
Step 1: Task Analysis

Our first step was to develop a general flow of the order entry process:



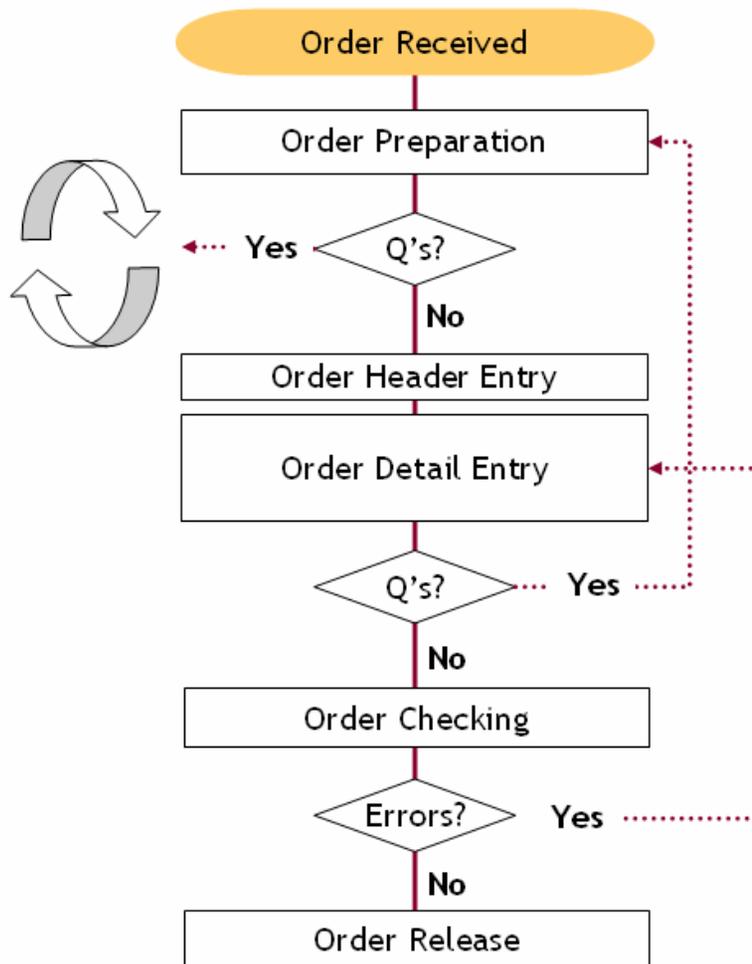
- The general steps in the order entry process were the same for all customers visited

Step 1: Task Analysis



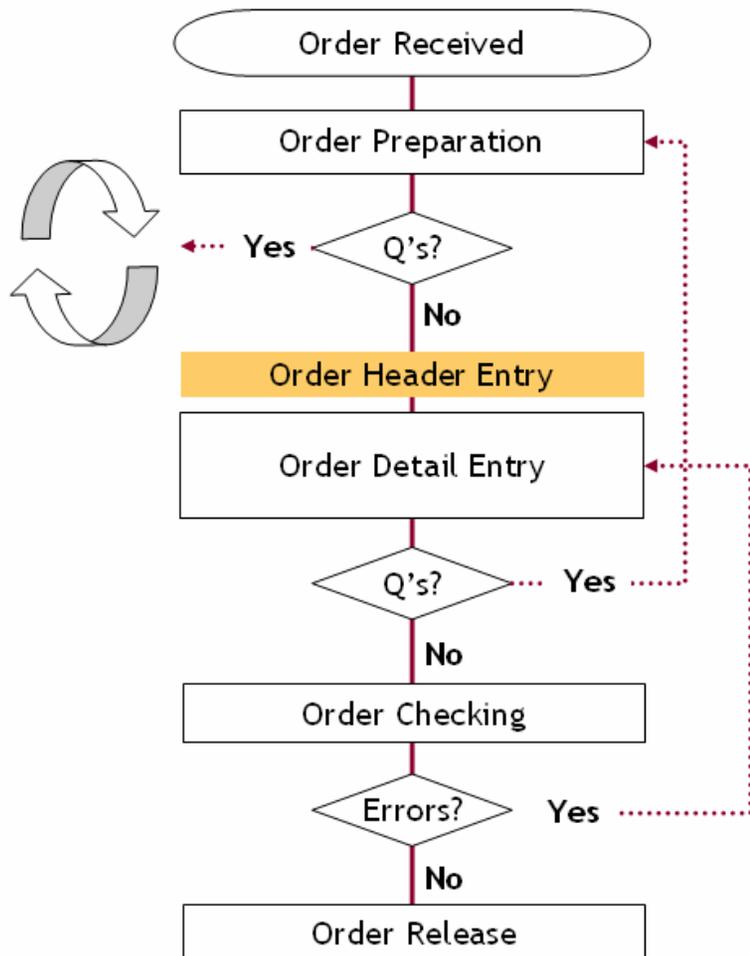
- Orders are received by sales or customer service employees, most often via fax or email
- While the company has standard forms for orders, many customers use their own “forms”

Step 1: Task Analysis



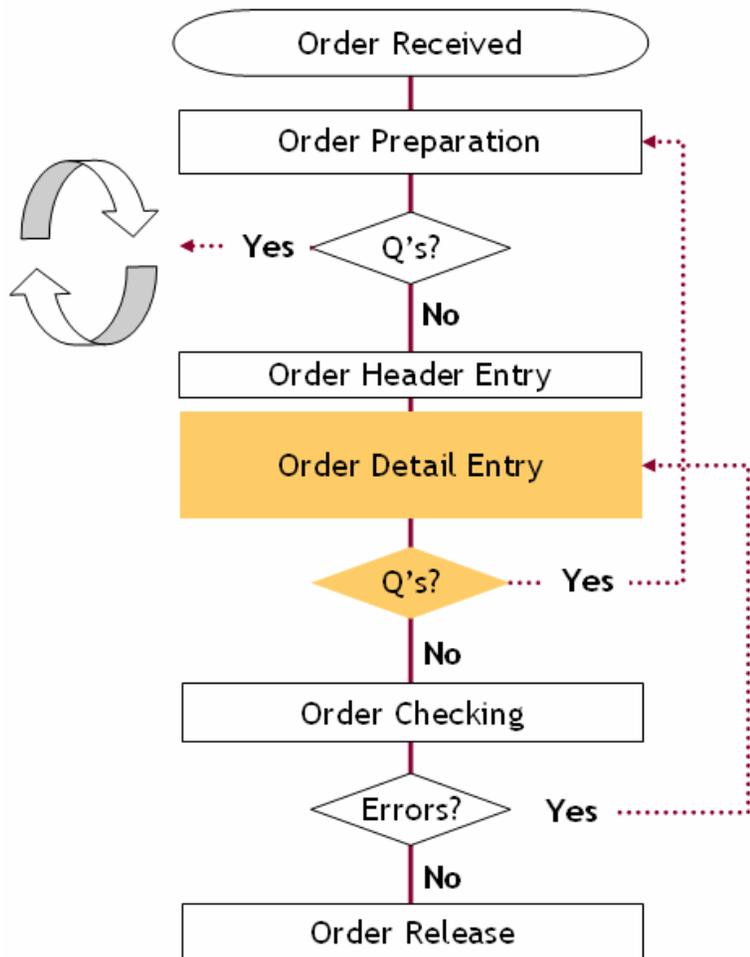
- The employee who “preps the order” reviews the information provided by the customer in detail, looking for:
 - Inconsistencies or impossible parameters, such as weird measurements or option combinations
 - Anything that needs to be clarified
- The order prepper then contacts the customer to resolve the open issues
- While they try to consolidate as many questions as possible before calling the customer, it may take several calls to resolve all outstanding issues with the order

Step 1: Task Analysis



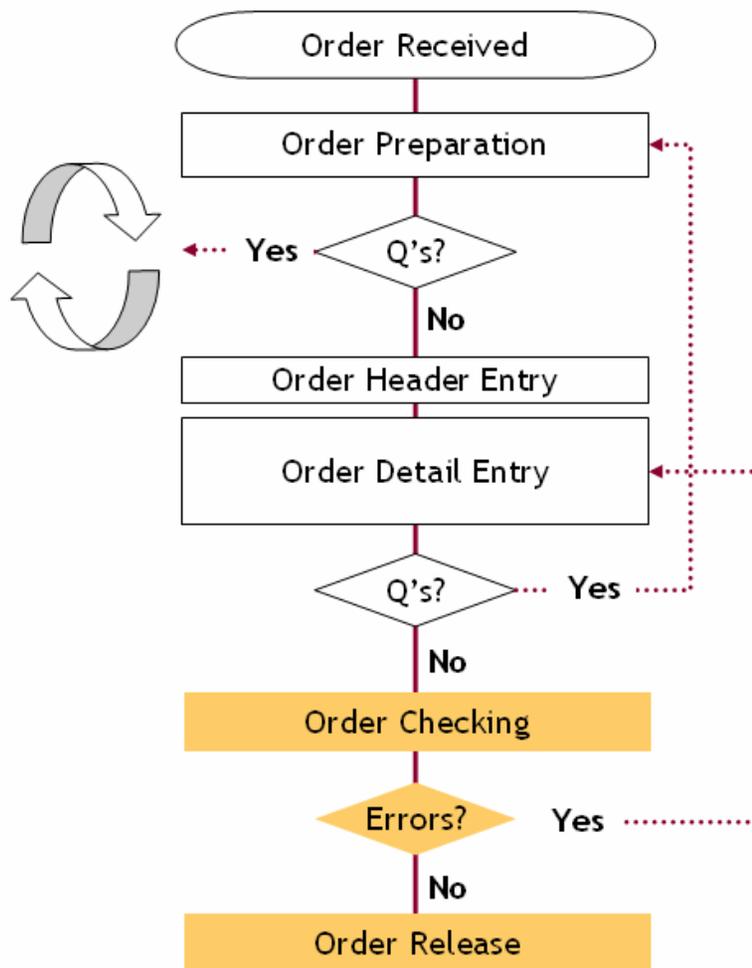
- After the outstanding issues have been resolved, the order header data is entered for the order
 - These entries may be done in large batches when volume is high
 - This is generally where the Order Entry application screens are first used
 - Customer number is generally entered first, followed by shipping information

Step 1: Task Analysis



- The individual line items and options are then entered:
 - Quantities and product numbers are generally entered first
 - The options for one line item are then entered
 - These options are then copied (F7) for subsequent line items and modified as necessary
- If a required option is not specified, the order will be held (F3'd) until the issue is resolved with the customer

Step 1: Task Analysis



- After the order has been entered, it is checked for errors
 - Certain line items are checked during the entry process, especially if they will be copied
 - A printed acknowledgment is often used to aid in checking the order
 - If errors are found, they are corrected by the person who completed the line item entry
 - If no errors are found, the order is officially released to production

Step 2: Dimensional Analysis

- Despite a common overall task structure, the data showed large variations from company to company
- Issue: how do we analyze and explain variations?
- Analysis of variation along several dimensions:
 - Extent of customizability
 - Order volume
 - Number of participants in the process
 - Roles of order entry personnel (consultative v. clerical)
 - Order completion rate
 - Number of items per order

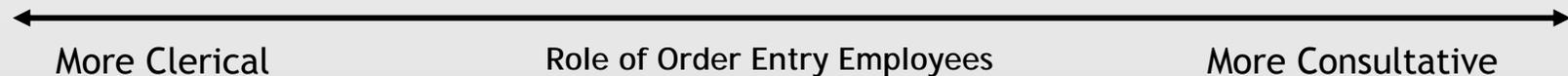
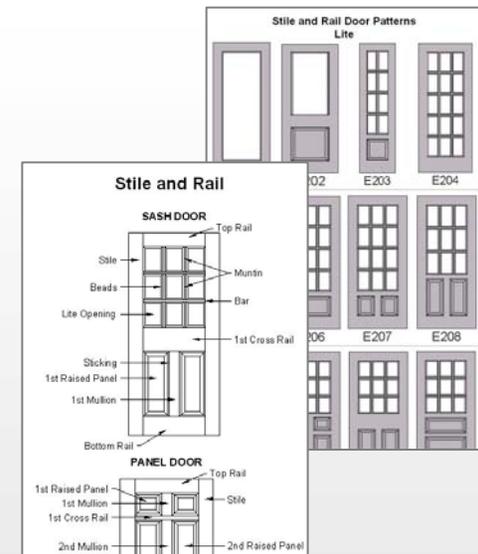
Step 2: Dimensional Analysis

	Company 1	Company 2	Company 3
Vertical	Furniture	Doors	Cabinets
Customizability	Low	High	High
Order Volume	High	Low	High
Order Entry Staffer Role	Clerical	Consultative	Clerical
Division of Labor	Consolidated	Consolidated	Distributed
Completion Rate	Fast	Slow	Fast
Items per Order	Few	Few	Many

Step 2: Dimensional Analysis

Impact of Product Customization:

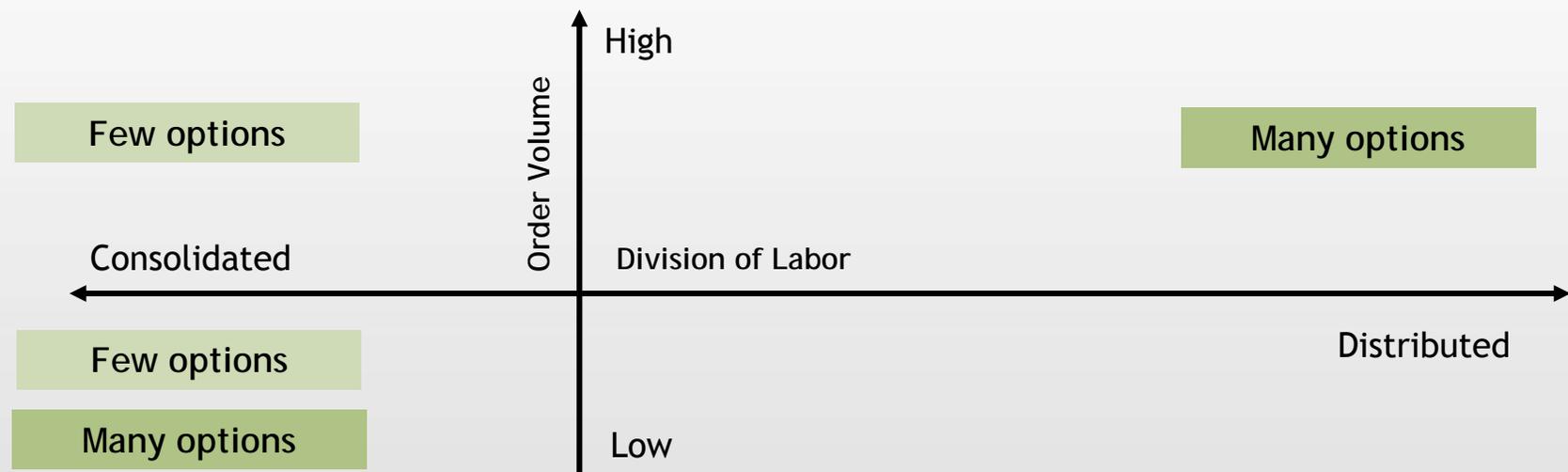
- Products that required more options and adjustments to meet customers' needs generally resulted in more consultative, less clerical order entry processes



Step 2: Dimensional Analysis

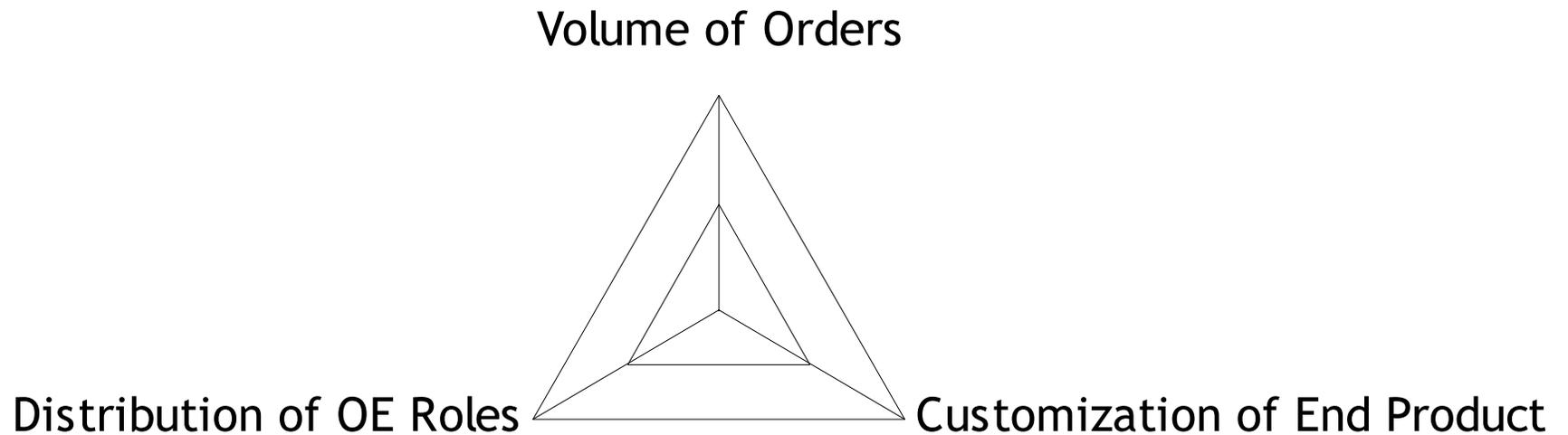
Impact of Order Volume:

- For products with few options, high volume can be managed by one or two individuals
- However, for complex configurable products, a higher volume of orders requires that the process be distributed across multiple people
- In a distributed process, consultation is assigned to customer service, resulting in a more clerical order entry process



Step 2: Dimensional Analysis

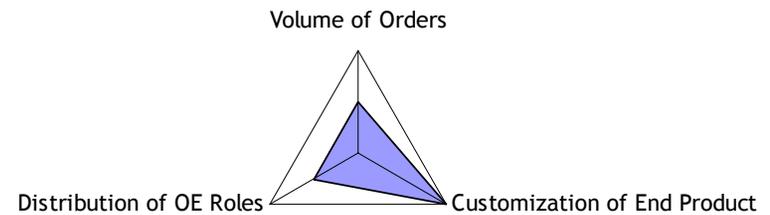
A visual framework for presenting multidimensional variation:



Step 3: Qualitative Segmentation

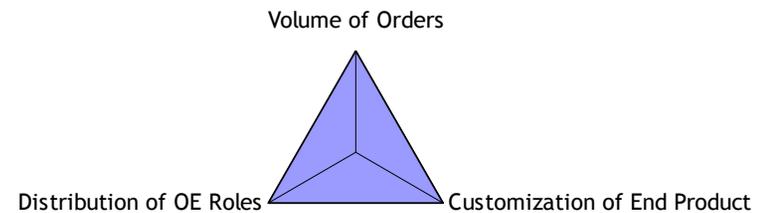
The Consultant

- Highly customizable product
- Relatively low order volume
- Process consolidated in a few people



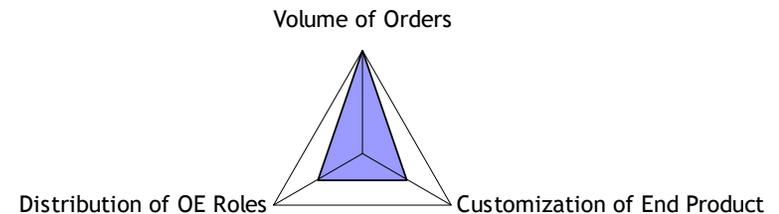
The Cog

- Highly customizable product
- Relatively high order volume
- Process distributed across multiple people



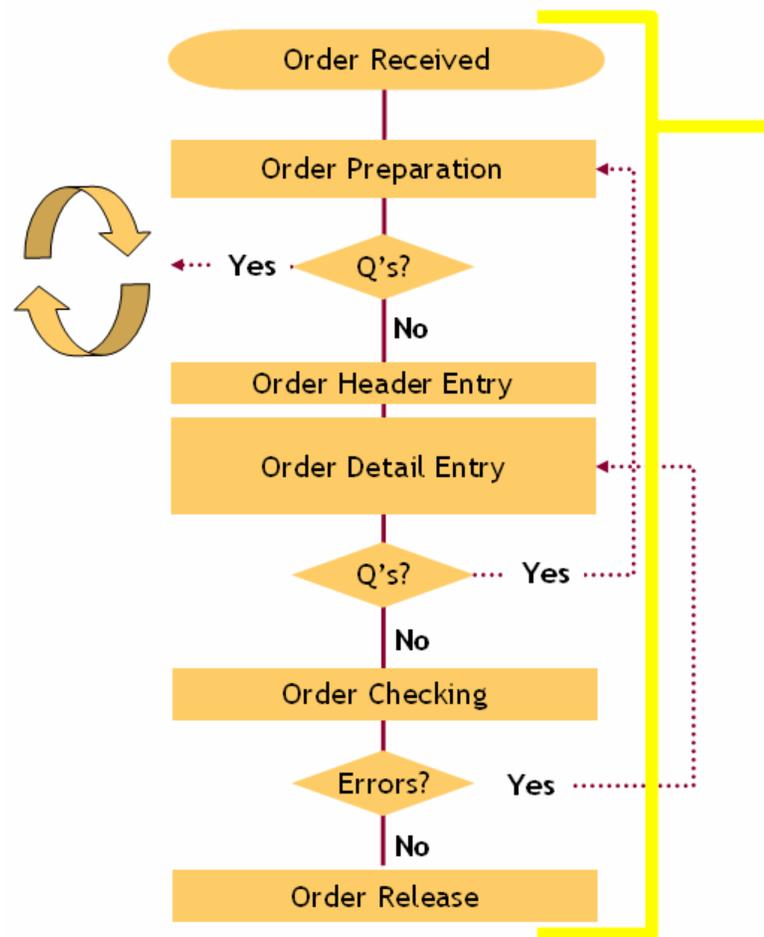
The Clerk

- Few customized product options
- Relatively high order volume
- Process consolidated in a few people



Step 3: Qualitative Segmentation

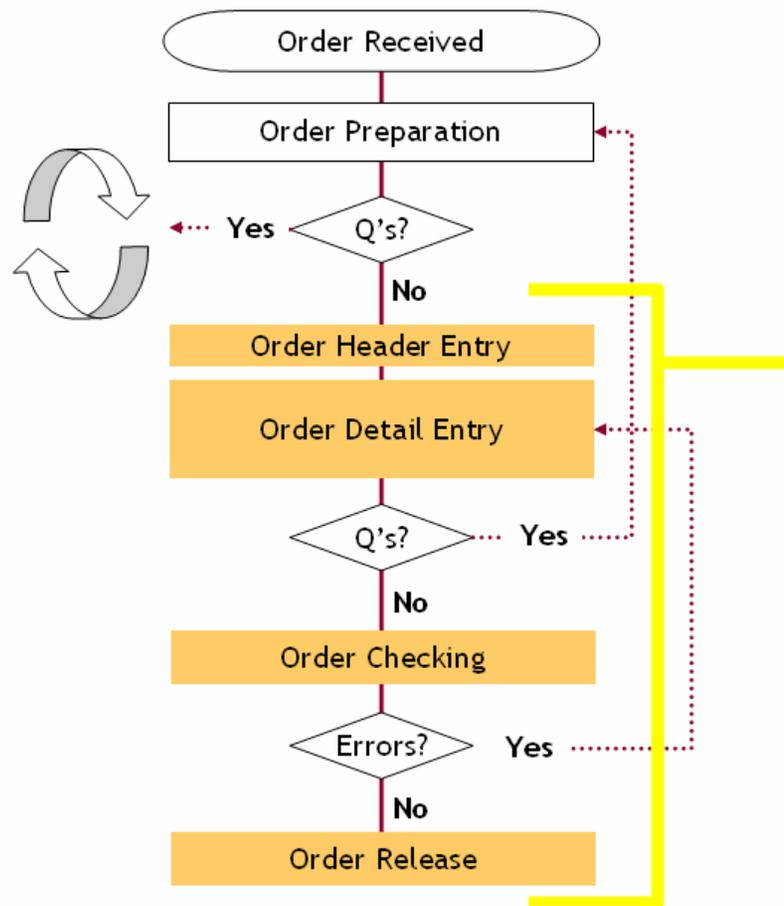
Order Processing by the Consultant:



- A “Consultant” is responsible for orders from start to finish
 - The user works on a small number of orders at any given time; each order might take weeks to complete
 - Order preparation often involves several conversations with the customer
 - Order Header Entry and Order Detail Entry are part of the same step for this type of user

Step 3: Qualitative Segmentation

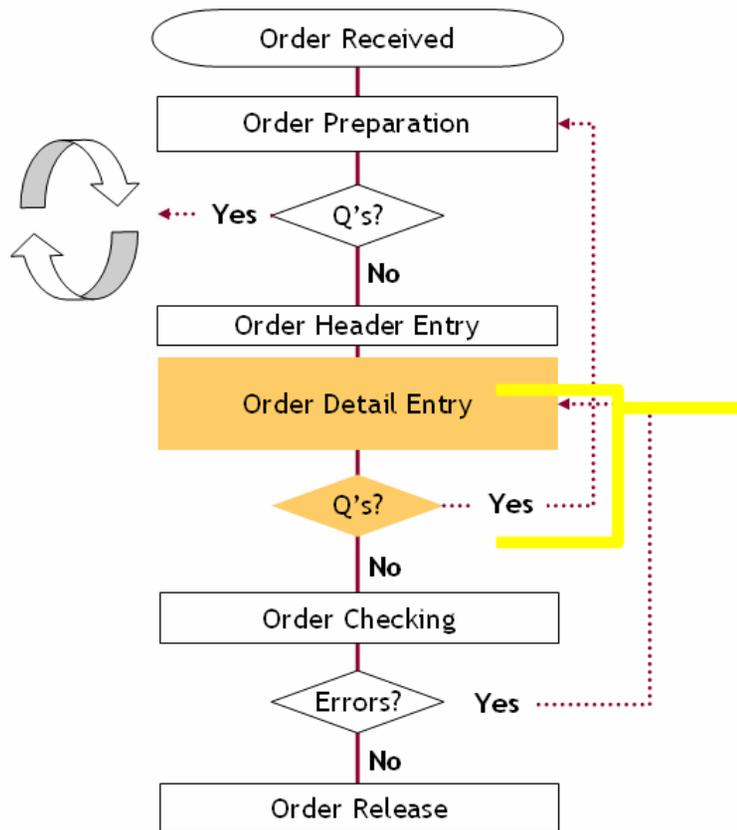
Order Processing by the Clerk:



- A “Clerk” is responsible for entering, checking and releasing orders
 - A colleague who sits nearby does the order prep, which usually involves assigning an order number and recording the salesperson and commission rate
 - Since the products are not highly customized, there are generally few questions that arise as this user type enters orders, and few opportunities for error

Step 3: Qualitative Segmentation

Order Processing by the Cog:



- A “Cog” is responsible for entering items and options within orders
 - In a highly distributed process, as many as 6 individuals participate in the entry of a single order
 - If an option is unclear from the order itself, this type of user will route it back to the order prep individual for clarification
 - If a change needs to be made to a global option, this user will ask their manager to make the change
 - When this type of user is finished entering the line items and options, the order is handed to the order checker, who will return it for corrections if mistakes are found



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Design Implications & Outcome



Working Group Topics

- What are some potential implications of the segmentation data for design?
- What kind of solution do our users need?
- Can one design meet all their needs?

Design Implications

Designing for “Consultants”:

- Speed of entry into the system is less important than accuracy
 - Limit free text entry
 - Help me identify errors asap
- Users need help wading through numerous and overly long option lists
 - Explore filtering and conditional display options
- Need to facilitate checking of orders after entry
 - Provide printable acknowledgement
 - Consider confirmation screens
- Facilitate entry in the absence of complete data

Design Implications

Designing for “Clerks”:

- Above all else, make it fast
 - Avoid mouse
 - Avoid endless tabbing through form fields
- Only show these users what they need to see
 - Use expanded views to hide less-frequently used fields
 - Enable user form customizations
 - Use headings to promote efficient scanning of groups of form elements
- Did we say make it fast?



Design Implications

Designing for “Cogs” :

- Facilitate flow of orders between multiple employees
- Users must be able to enter at any point in the process
- Speed and accuracy are equally important
- Work saving strategies such as copying line items are crucial to maintain order volume
- Facilitate checking of orders after entry

Screenshots from the Solution

Order Header Entry

- User types a customer name into the header text box to load default customer data
- Certain data fields may be pre-filled
- Speed enhancements
 - Lateral layout to minimize need for scrolling
 - User can jump directly between different areas of the screen using access keys (e.g., ALT-r for Order Information)
- Display simplification
 - Use headers, group related fields
 - Allow users to customize views, hiding fields they don't use

Screenshots from the Solution

Order Detail Entry

- The user can enter multiple line items, then hit “load” to populate the associated data
- For less complex configuration, option selections can be entered without leaving the main screen
 - A keyable “in line” options table expands under each item
- For more complex configurations, a separate pop-up window
 - Progressive filtering of options to simplify the selection process



Outcome

Within 6 months of unveiling the new software, our client had a waiting list of existing customers asking to be transitioned to the new system.

They have described this initiative as a "complete success," and have continued to incorporate user-centered design into their product development process.



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Thank you!

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