

# Output Processes, User Interfaces, DB's

23 December 2009  
Lecture 10

## Topics for Today

- Designing Inputs
  - Guidelines for Designing Inputs and Screens
  - Process of Designing Inputs
- Designing Outputs
  - Goals in Designing Outputs
  - Output Media Types
  - Reasons for Choosing an Output Technology
  - Rules for Designing Reports and Screens
  - Process for Designing Outputs
- User Interfaces
  - Importance of User Interfaces?
  - Usability issues
- Source: PS98 7.2, 8.3

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## Guidelines for Designing Input Forms and Screens

- Inputs are done by
  - Workers
  - Data entry technicians
  - Customers
- Keep in mind how they will be processed

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## Designing Input Forms

- How will they be processed?
  - A good form makes entry easier
- How long will they be stored?
  - Physical marks – signatures, contracts
  - Auditing – tracking what was done and when
  - Error Control – data entry can introduce errors

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## Good Input Design

- Give a consistent look and feel
  - Put fields in similar areas
  - If it's based on a paper form, copy it
- Make it easy to move around
  - Tabs, scrolling
  - "More" and "Advanced" to hide some settings
  - Shortcuts
- Give feedback
  - Users want to be told when there is an error
  - Echo commands
  - "OK", "Failed", "Continue?", "Done"
  - Be specific "Must be four characters and four numbers" vs. "parse error"
  - Use progress bars for more than 10 seconds
- Divide into zones
- Do several iterations of design and testing
- Keep the design simple
  - Better 5 simple forms/screens than 1 giant one
- Give feedback on allowed values, ranges
- Give default options
- Indicate which are mandatory
- Don't do things behind the user's back - Ask first
- Don't let the user see unhandled exceptions – log them
- Make it beautiful
  - Get a designer for the important screens
  - Visible fonts, colors

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## How to Design Inputs

- Based on
  - The data
  - The method
  - The type of the transaction
- Look at the data dictionary
- Tools
  - Manual design – sketches, mockups
  - Word processor – can make screens and forms
  - Scripting languages (HTML, TCL, JavaScript) – easy graphical and web design
  - Data Application mockups (Access) – form automation
  - IDE interface design (Java or .NET) – buttons, frames, controls

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## Input Data Dictionary

- Update the data flows and data elements dictionary
  - Which screen and how
- Contains
  - Input Id
  - Input medium
  - Screen shot
  - Notes
  - Source (where does the data come from)
  - Arrival / Gathering medium (mail, fax, phone)
  - Size
  - Input time
- Update the transaction dictionary
  - Identify which screens fit which "input data" lines
  - Calculate the total time
- Time is a first step towards how long the whole transaction will take

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## Goals in Designing Outputs

- Outputs
  - Already noted in the DFDs
  - May be to people, machines, data sources
  - Usually need some processing
  - They are the face of the system to the outside world
- Can be
  - Hard copy (physical/paper)
  - On screen
  - Micro form
  - Audio / Video

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## Kinds of Outputs

- External Reports or Documents
  - Better quality to send to customers or clients
  - Can be turned around and used as inputs elsewhere
  - Filter to remove internal/secret/incomplete data
- Internal Reports and Documents
  - May be reports, summaries, informational updates
  - May be short/summarized or long/detailed
  - May include historical information
  - Some may be ad hoc (enable this with user query/report design features)
  - Raw reports might be just SQL queries

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## Reports vs Queries

- Reports
  - Well structured
  - Do not change often
  - Planned the code, fill in the data
- Queries
  - Written in SQL
  - Written ad hoc, by semi-experts
- There isn't necessarily a clear division

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## Points to Consider

- Practicality & Tuning
- Quantity
- Timeliness & Delivery
- Media

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## Practicality & Tuning

- Practicality
  - What is the goal?
  - Find out what the users want to know
    - The programmer is not always right
- Tuning
  - Know your users
  - Talk to them, what are they used to?
  - Don't make them miss the old system

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## Quantity

- How much to output?
- Too much and the user will get lost
- Too little and users will be frustrated
- Know the types of users
  - Managers and directors
  - Workers and engineers
- Report only exceptions?
  - Smart logging of exceptions can help track mistakes, errors, and bugs

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## Timeliness & Delivery

- Timeliness
  - Don't be late
  - If the report takes too long, no one will see it
- Delivery
  - How does it get to the recipient?
  - Electronically?
  - Manual?
  - Access control too

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## Output Media

- Affects how the output is perceived
- If it must last a long time (decades), use paper or universally recognized formats
  - Or put a "Save as PDF" or "Save as JPEG" button
- What is the format?
  - Text
  - Graphs
  - Graphics
  - Tables
- This is not necessarily straight forward

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## Output Media Types

- Printers
- Screen Output
- Audio / Video
- Micro
- Optical Disk (CD/DVD)

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## Printers

- Modern
  - Laser
  - Inkjet
  - Thermal

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## Laser Printers

- Laser writes against a wheel
  - Toner sticks where the laser hit
- Dot matrix idea
  - Much denser
  - Fonts much more flexible
- Color possible
  - Graphics and graphs easily
- Post script printers

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## Inkjet Printers

- Squirts small jets of ink in a dot matrix
- Cheaper color
- Slower than laser
  - More common for low volume business or household use

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## Thermal Printers

- Specialized paper has ink bound inside
  - When heated, the ink changes and binds with the paper
- No ink, so the printer is simpler
  - Just change the paper
  - Shorter down times
- Mobile printing

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## Screen Output

- Common Technologies
  - CRT – the cheapest and (sometimes the best). Heavy
  - LCD – more popular since they are smaller, lighter, and can provide quality equivalent to CRTs
  - Plasma – usually larger screens for TV like displays

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## Audio Output

- Useful for talking over the phone
- Or the blind
- Text to Speech systems can make reports into audio
  - The technology for this is fairly mature

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## Micro Forms

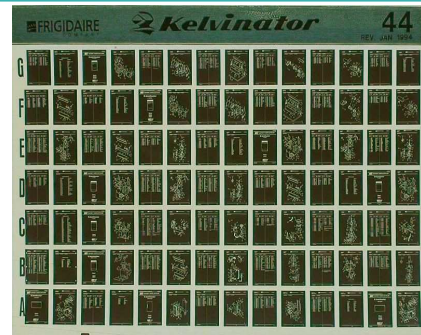
- Specialized (outdated)
- Images and text written to a special device which miniaturizes
- Image stored directly in the media

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## Microfiche



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## Microfilm



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## Optical Disk

- CD/DVD
  - Write once, write many
- Resilient and can store lots of data
- Needs encoding
- Burning a CD or DVD can store a lot of data
  - Must be transferred to the recipient
- Commonly used for backups

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## Choosing Output Technology (1/2)

### Transaction Type

- If there is no user or user trigger, probably use printing
- User transactions probably want on screen
  - Give an option to 'save'

### Users and goals

- The content and format depend on who will see it
  - If the users aren't skilled, too much data will just confuse
- Higher up managers usually need
  - More summaries
  - Less time pressure since it's not being provided in real time
- Regular workers or group leads usually need
  - More detailed
  - More time pressure since it's daily or real time

### Target of the Output

- Who will see it?
  - Outsiders?
  - Insiders?
- Internal reports can be simpler
- External report should have dates, names, logos

### Speed of performing the output

- How fast does it need to get done?
  - For workers, time is of the essence in output
- For senior managers, output time isn't as important
  - It's worth it to invest the time is getting it clear and right

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## Choosing Output Technology (2/2)

### Period of access - How often?

- Very often → digital
- Not too often → paper to archive it and refer to it later

### Retention Period

- How long do you need to keep it around?
  - CD/DVD good for longer term
  - Paper ok if it's high quality
- Some organizations have imposed retention rules (short or long)
- For digital storage, think about encodings
  - Will MS Word files still be readable in 100 years?

### Output costs

- How much does it cost to print or design the screen?
- Consider quantity, total cost of output

### Rules about the output

- What external or internal obligations are there about the output or report?
  - Ex. Form 106 has a fixed format
- Company policies affect it too

### Output technology's effects on the environment and users

- The format greatly affects how the users view it
- Presentation can have a strong effect on graphics, graphs, and figures
- Pay attention to how users interpret outputs
- Use iterative design, evaluation, and feedback

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## Rules for Designing Reports and Screens

- Consider the Excel examples

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## Simple Report

Area	Store Code	Store Name from Sales	Other Income	Regular Income	Total Income	Expenses	Gross Profit from Income	Expense %
North	12	Kochav Hatzaon	1,250.00	233.00	1,483.00	(960.00)	523.00	36%
	14	Hamaazlach	950.00	145.00	1,095.00	(349.00)	746.00	32%
	17	Hachachar	1,145.00	350.00	1,495.00	(443.00)	1,052.00	30%
	25	Haknyot	950.00	120.00	1,070.00	(356.00)	714.00	33%
	29	Mikot Tuv	1,355.00	234.00	1,589.00	(754.00)	835.00	47%
		<b>Area Total</b>	<b>5,650.00</b>	<b>1,082.00</b>	<b>6,732.00</b>	<b>(2,462.00)</b>	<b>4,270.00</b>	<b>37%</b>
Center	4	Mercat Hamicholot	1,587.00	452.00	2,039.00	(763.00)	1,256.00	38%
	13	Hachanot Hamecazot	1,789.00	641.00	2,430.00	(952.00)	1,478.00	39%
	19	Tov Li	2,341.00	437.00	2,778.00	(865.00)	1,913.00	31%
	24	Lev Harehet	2,567.00	539.00	3,106.00	(1,043.00)	2,063.00	34%
	27	Tov Taam	3,057.00	768.00	3,825.00	(1,253.00)	2,572.00	33%
		<b>Area Total</b>	<b>15,881.00</b>	<b>3,434.00</b>	<b>19,315.00</b>	<b>(6,527.00)</b>	<b>12,778.00</b>	<b>34%</b>
South	5	Lev Haazro	1,563.00	340.00	1,903.00	(756.00)	1,147.00	40%
	9	Tiv Lakot	1,769.00	255.00	2,024.00	(458.00)	1,566.00	23%
	22	Mercat Hanegev	2,546.00	675.00	3,221.00	(865.00)	2,556.00	21%
	45	Milratz Hadromi	2,174.00	770.00	2,944.00	(897.00)	2,047.00	30%
			<b>Area Total</b>	<b>8,052.00</b>	<b>2,040.00</b>	<b>10,092.00</b>	<b>(2,776.00)</b>	<b>7,316.00</b>
		<b>Total</b>	<b>29,583.00</b>	<b>6,546.00</b>	<b>36,129.00</b>	<b>(11,765.00)</b>	<b>24,364.00</b>	<b>33%</b>

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## Better Report

Area	Store Code	Store Name from Sales	Other Income	Regular Income	Total Income	Expenses	Gross Profit from Income	Expense %
North	12	Kochav Hatzaon	1,250.00	233.00	1,483.00	(960.00)	523.00	36%
	14	Hamaazlach	950.00	145.00	1,095.00	(349.00)	746.00	32%
	17	Hachachar	1,145.00	350.00	1,495.00	(443.00)	1,052.00	30%
	25	Haknyot	950.00	120.00	1,070.00	(356.00)	714.00	33%
	29	Mikot Tuv	1,355.00	234.00	1,589.00	(754.00)	835.00	47%
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## Some Lessons for Reports

- Paper size and quality
  - For specialized reports
  - For every day reports
- Practicalities
  - Pay attention to which parts are fixed, which are variable
  - Note place holders in the middle and header
  - Draw attention to important numbers
  - Print page numbers
  - Make page breaks logical
  - Associated columns should be nearby
- Aesthetic Qualities
  - Use line spacing, columns, good spacing
  - Colors, extra space around the gutter
  - Print positive and negative clearly
  - Use standard colors
  - Ensure column widths are sufficient

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## Rules for Designing Output Screens

- More transient, but more options
- Like input screens
  - Keep it simple
  - Be consistent
  - Make moving easy
  - Beautiful

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## Some Lessons for Screens

- Top, middle, bottom
- Enable scrolling
- Use a "drill down" approach
- Use graphs
  - Can be automatically generated
  - Can use spreadsheet
  - Can use statistical package
- Use colors
  - Draw attention to important items or information
  - Find out standard ones for figures

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## Process for Designing Outputs

- Similar to Inputs
- Each output line in DFD, transaction dictionaries is an output
  - Combine some – sometimes one output suffices for many
  - Decide what format to use
- Use the data elements dictionary to help decide these

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## Tools for Designing Outputs (1/3)

- Manual (paper, sketches)
  - Good for a first draft, quick
  - Easy to rearrange items quickly
- Word processor
  - Modern ones let you define fields
  - Can make tables, graphs, import images
  - Requires you to open the word processor to look at or use

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## Tools for Designing Outputs (2/3)

- Spread Sheets
  - Structured output with lots of data
  - Can write back end macros or code
  - Can be small databases or full fledged programs
  - Can put forms, equations, scripts
  - Graphics and Graphs
  - Hard to share and coordinate
  - A large number of critical Excels is usually the sign of bad (or no) design

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## Tools for Designing Outputs (3/3)

- Integrated Development Environment
  - Ideal for windows, forms
  - Takes more time to get up and running than a spreadsheet
  - Fast prototyping
- Specialized reporting tools can provide quick, easy to design reports
  - Many are off the shelf and work with established vendors' systems

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## Using Office Productivity

- Using Office programs to design your output formats and documents, consider the output type
  - Will it be shown on screen?
  - Will it be shown on paper?
  - Should the user be able to edit it afterwards?
- Two options to use the design:
  - Translate the form you created into a program, program module, or structured window. Use the program for the output.
  - Use Office as a back end:
    - Leave the form/output in Office
    - Use the Office API to modify the Office file from your program (works well from .NET)
    - Create a new copy of the output template for each report

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## Data Dictionary for Outputs

- Output Id
- Output Medium
- Output Properties
- Screen shot
- Notes
- Target and Distribution Mechanism
- Size
- Time

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## Dictionaries

- Update
  - Transaction dictionary with the output information
  - Data Elements Dictionary for any changes
- Now we can calculate the time per transaction much better
  - Processing is still an issue
- With the updated dictionaries we can get a better picture of
  - How many computers
  - How many data bases
  - How much disk space

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## Importance of Interfaces

- The user interface (UI) may also be called the "Man-Machine Interface"
  - The study of good interface design is an important part of Human-Computer Interaction (HCI) research
- Interfaces are essential because to 99% of the users **the UI is the system**
  - The support staff will of course have their own interfaces

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## HCI Issues

- **Personalization**
  - Letting users make the interface “their own”
- **Usability Testing**
  - Field evaluation of the design
- **Help**
  - Offer intuitive, easily accessible, and non-intrusive help
- **Statefulness**
  - Keeping track of user behavior and past actions to make future interactions faster/better/easier
- **Response Time**
  - Ensure users know when the system is “hung” and when it’s just working
- **Mistakes**
  - Help users discover their own mistakes (and correct them) so they don’t blame the system
- **Consistency**
  - Give a unified look and feel for all parts of the system
- **Learning Curve**
  - Reduce the time it takes users to understand the system

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## Types of Interfaces

- System directed dialogue
- User directed dialogue
- Wizards
- Windows
- Command Line

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## ADISSA: DFDs to Interfaces

1. Each Complex function becomes an entry in the Parent menu
2. Each Simple function
  - Child menu item in the parent menu of the complex
3. Remove duplicates
4. Remove Ts that are time based
5. Remove menus with only one choice

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## HCI

- Read article by Gould and Lewis
  - Read 1 and 3
- Early focus on Users and Tasks
- Empirical Measurements
- Iterative Design
- Do you agree?
- For us
  - Current State – What did we do?

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## Conclusion

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