


## Expanding Our Toolkit: From Descriptive to In-depth Analyses

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## This Session

- General Context
- Focus on Link Analysis
  - Links and the need for Link Analysis
  - On Link Analysis
  - Hands-on Link Analysis
  - Discussion: The efficacy of Link Analysis

In-depth Analyses

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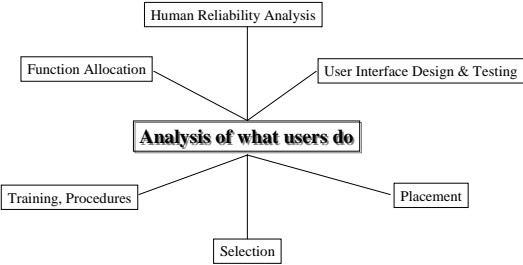
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## Objectives of User Analyses



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Kirwan, A Guide to Practical Human Reliability Assessment, 1994, p. 51

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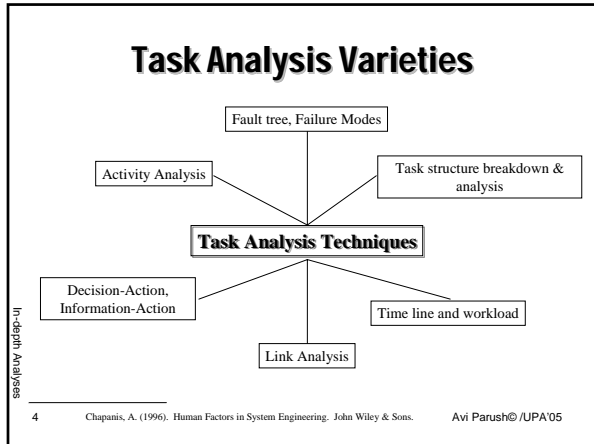
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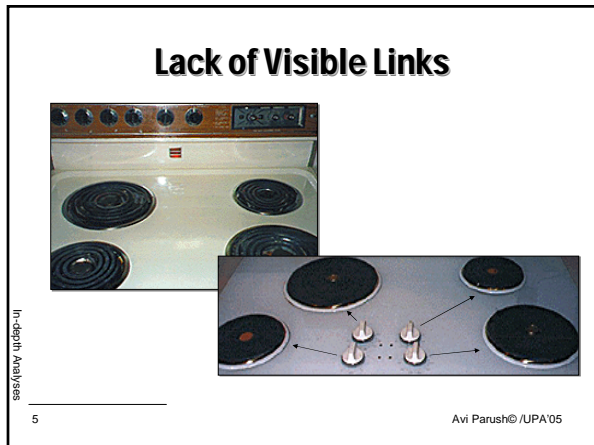
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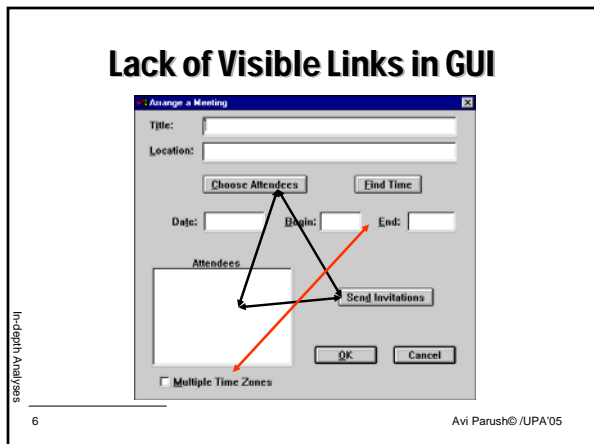
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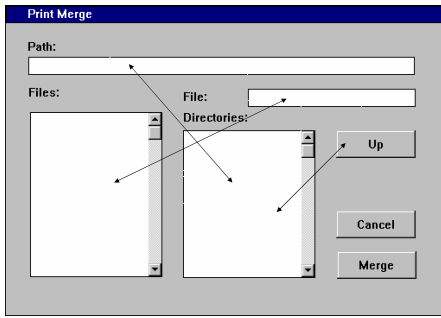
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## Lack of Visible Links in GUI



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Galitz, 1997, Essential Guide to User Interface Design, p.194

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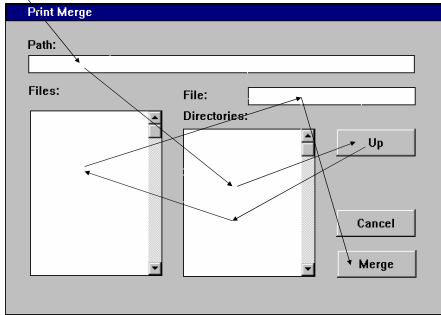
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## Impact on Work Flow



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Galitz, 1997, Essential Guide to User Interface Design, p.194

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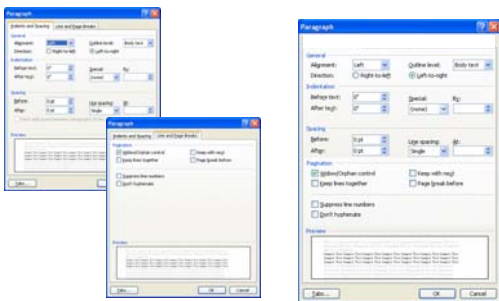
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## A Design Problem



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## The Questions

- What does the user need to see concurrently?
- What does the user need to do concurrently, sequentially, or in close temporal proximity?

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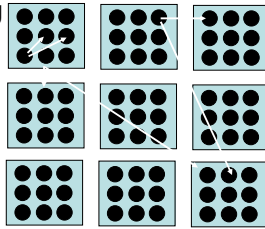
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## The Design Problem

- Multi-level Grouping and relationships
- Within-group relationships
- Between-group relationships
  - Elements
  - Groups
- Layout and workflow



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## The Need

- Techniques to support:
  - Grouping actions, objects
  - Determining relationships
  - Placing actions, objects in the UI
  - Designing a workflow

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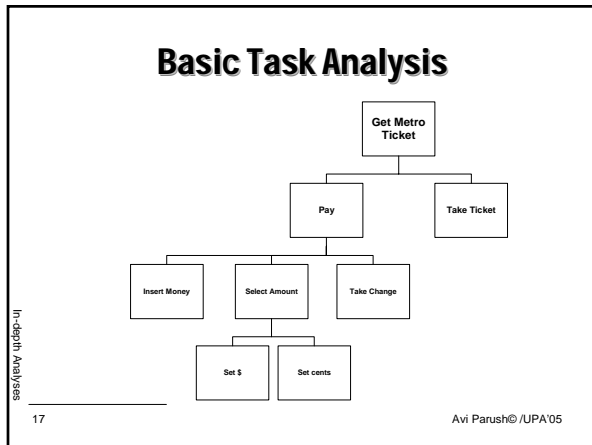
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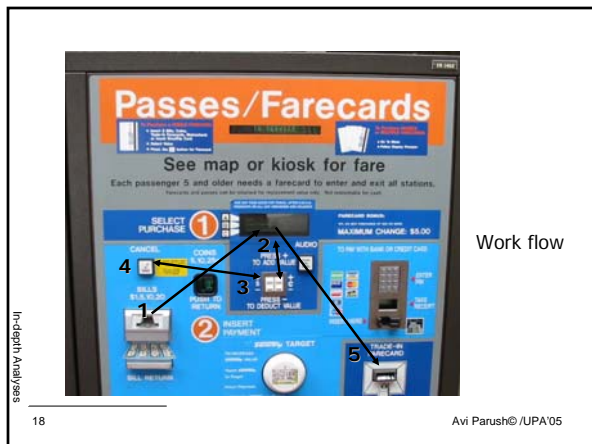
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Work flow

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Frequency

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In-depth Analysis

### Example of a Link Matrix

	1	2	3	4	5	6	7
1 Insert money		5	1	1	5	1	1
2 See display			5	3	5	3	3
3 Change amount				3	5	1	1
4 Pay Credit					5	1	1
5 Cancel						1	1
6 Get change							3
7 Get ticket							

1 = Low frequency; 3 = Medium frequency; 5 = High frequency

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In-depth Analysis

### Example of a Link Matrix

	1	2	3	4	5	6	7
1 Insert money		5	1	1	5	1	1
2 See display	5		5	3	5	3	3
3 Change amount	1	5		3	5	1	1
4 Pay Credit	1	3	3		5	1	1
5 Cancel	5	5	5	5		1	1
6 Get change	1	3	1	1	1		3
7 Get ticket	1	3	1	1	1	3	

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## Example of a Link Matrix

	1	2	3	4	5	6	7
1 See display	1	5	5	5	3	3	3
2 Cancel	5	1	5	5	5	1	1
3 Change amount	5	5	1	1	3	1	1
4 Insert money	5	5	1	1	1	1	1
5 Pay credit	3	5	3	1	1	1	1
6 Get change	3	1	1	1	1	1	1
7 Get ticket	3	1	1	1	1	1	1

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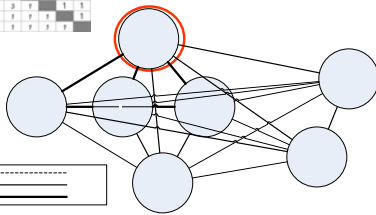
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## Example of a Link Diagram

	1	2	3	4	5	6	7
1 See display	1	5	5	5	3	3	3
2 Cancel	5	1	5	5	5	1	1
3 Change amount	5	5	1	1	3	1	1
4 Insert money	5	5	1	1	1	1	1
5 Pay credit	3	5	3	1	1	1	1
6 Get change	3	1	1	1	1	1	1
7 Get ticket	3	1	1	1	1	1	1



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## Use Spatial Proximity



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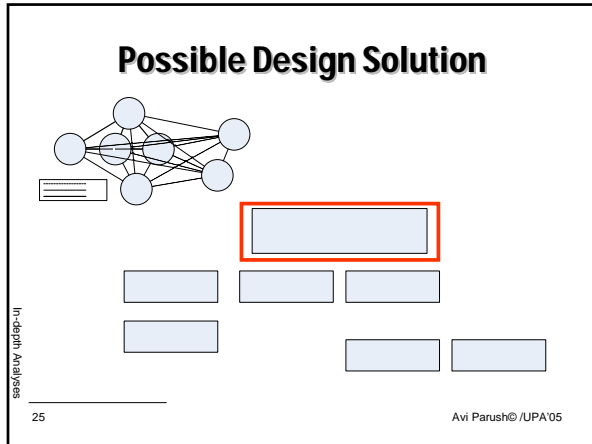
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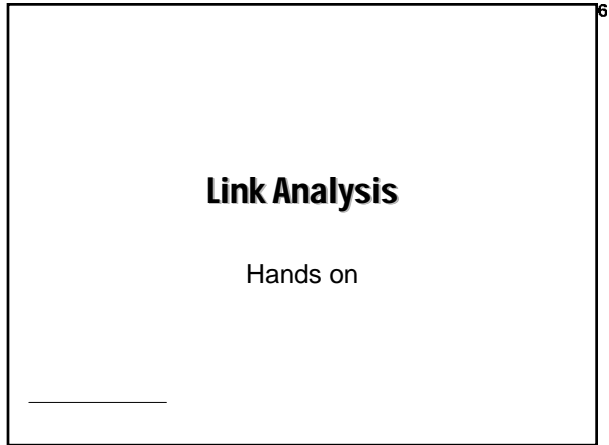
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4      2      3

7




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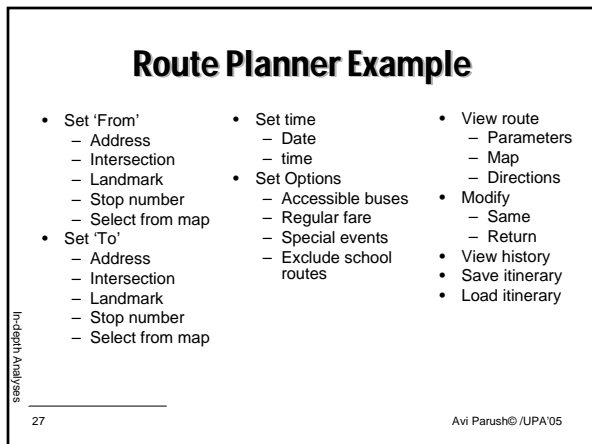
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1 Display

2 Cancel Button      3 Numeric Keypac

6 Change output      7 Ticket output




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## Procedure

- Construct a matrix with the elements
- Determine link types
- Determine link scale
- Perform ratings
- Re-organize matrix
- Produce link diagram

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## Tips

- Identify elements with a higher number of strong links to them
- Minimize crossovers for high-ranked links
  - Easier to do with the diagram

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## Discussion

- Other methods for linking elements?
- Criteria, guidelines for which method to use when

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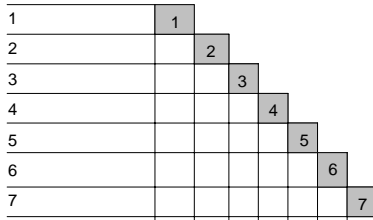
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## Discussion

- Which elements?
- Which Links?



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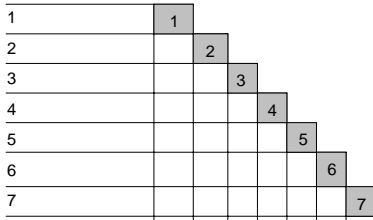
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## Discussion

- When is it worth doing?



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## Linked Elements

- Actions
- Objects
- People
- Groups (actions, objects, people)
- Mixed

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## Link Types

- Perceptual
- Action/control
- Communication
- Any other commonality
- Dependencies
- Mixed

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## Link Metrics

- Time-based (Frequency)
  - Sequential
  - Non-sequential
- Importance

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## Summary and Take Away

- A technique to map all possible links among elements in the application domain
- Tools:
  - Link matrix
  - Link diagram
- Various link types and metrics
- Can be used for both evaluation and design

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