Usability and visual attention distribution with complex, dynamic computer systems: Application to financial trading software

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FUNCTIONS FOR THE MARKET
APPS CYCLE


S&P 1194.54 -7.80 DOW 11043.38 -81.54 NAS 2486.62 -17.99
LIVE
NEW YORK
BREAKING NEWS
Mohawk Industries (MHK)
103.11
0.56

Previous work on financial decision making

- Behavioral economics: decision making under uncertainty

  (Tversky & Kahneman, 1974; Kahneman, 2011)

- Financial decision-making and heuristics

  (Monti, Martignon, Gigerenzer, & Berg, 2009)

- The influence of risk taking and stress on physiology

  (Coates, 2012)

- Nassim Nicolas Taleb: Various publications on market risks, quantitative finance in general and heuristics

PhD plans

1. Sensitivity of eye movement measures to demands of various task difficulties.
2. Screen layout and its impact on gaze variability in complex systems.
3. Influence of experts' scan path on novice financial system users.

1. Task difficulty & attention distribution

Goals

- Eye movement patterns, task difficulty, trading performance
  - Which eye tracking measurement especially sensitive for complex tasks in financial systems?
  - Relationship between trading performance and task difficulty?

1. Data and Methods

Lab
Financial Trading simulator

Equipment
SMI mobile eye tracking glasses

Participants
Banking & Finance students

1. Data and Methods: Variables

- Independent variables:
  - 3 different tasks
  - 3 task difficulties
- Dependent variables:
  - Eye tracking measurements
  - Task performance: profit & loss statement (P&L)

1. Data and Methods: Variables

Usability satisfaction:

After-Scenario questionnaire (ASQ)

(Lewis, 1991)

1. Overall, I am satisfied with the ease of completing the tasks in this scenario.

strongly agree <=========> strongly disagree not applicable

1 2 3 4 5 6 7 N/A

Comments:

2. Overall, I am satisfied with the amount of time it took to complete the tasks in this scenario.

strongly agree <=========> strongly disagree not applicable

1 2 3 4 5 6 7 N/A

Comments:

3. Overall, I am satisfied with the support information (on-line help, messages, documentation) when completing the tasks?

strongly agree <=========> strongly disagree not applicable

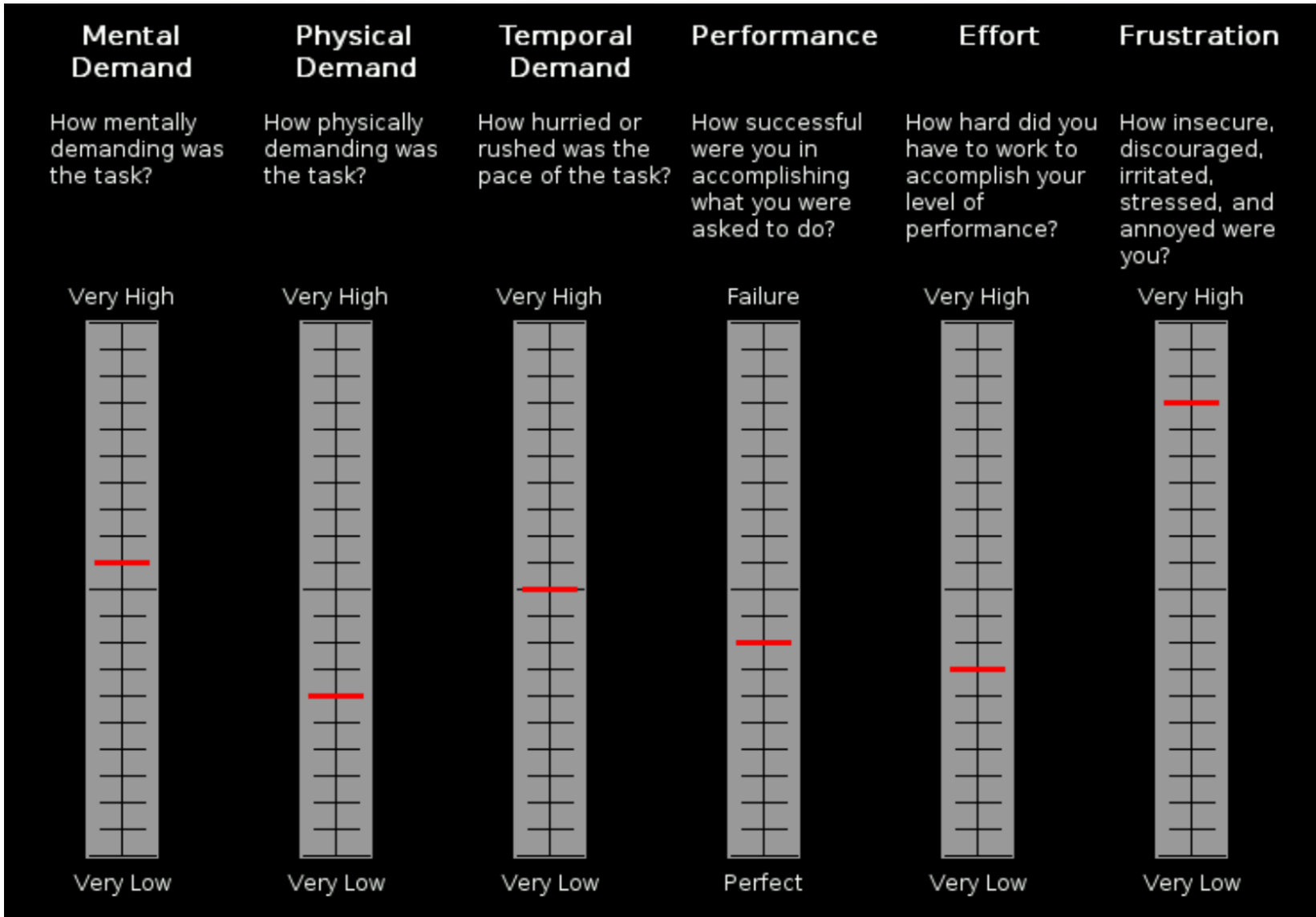
1 2 3 4 5 6 7 N/A

Comments:

1. Data and Methods: Variables

Cognitive Load: NASA-TLX

(Hart & Staveland, 1988)



1. Expected results

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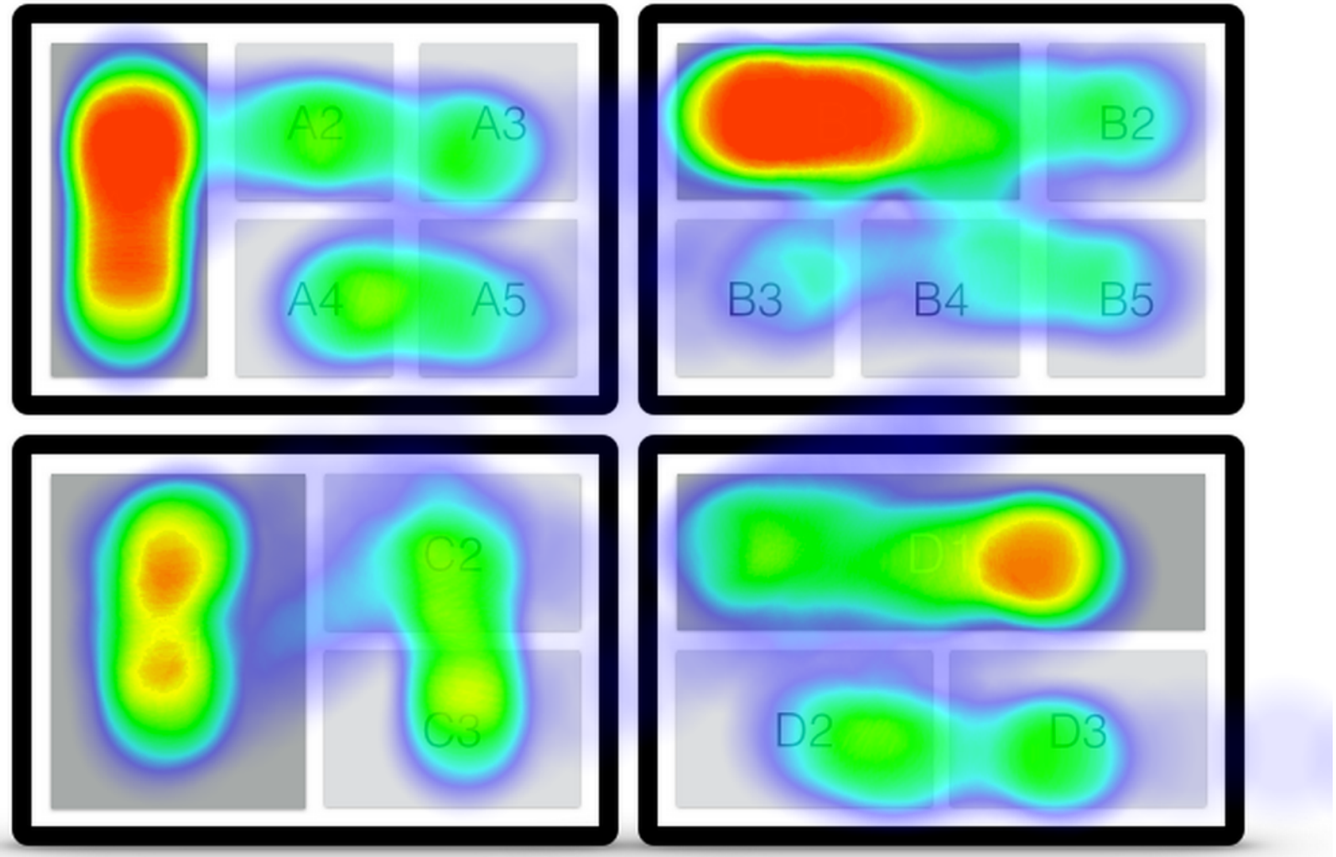
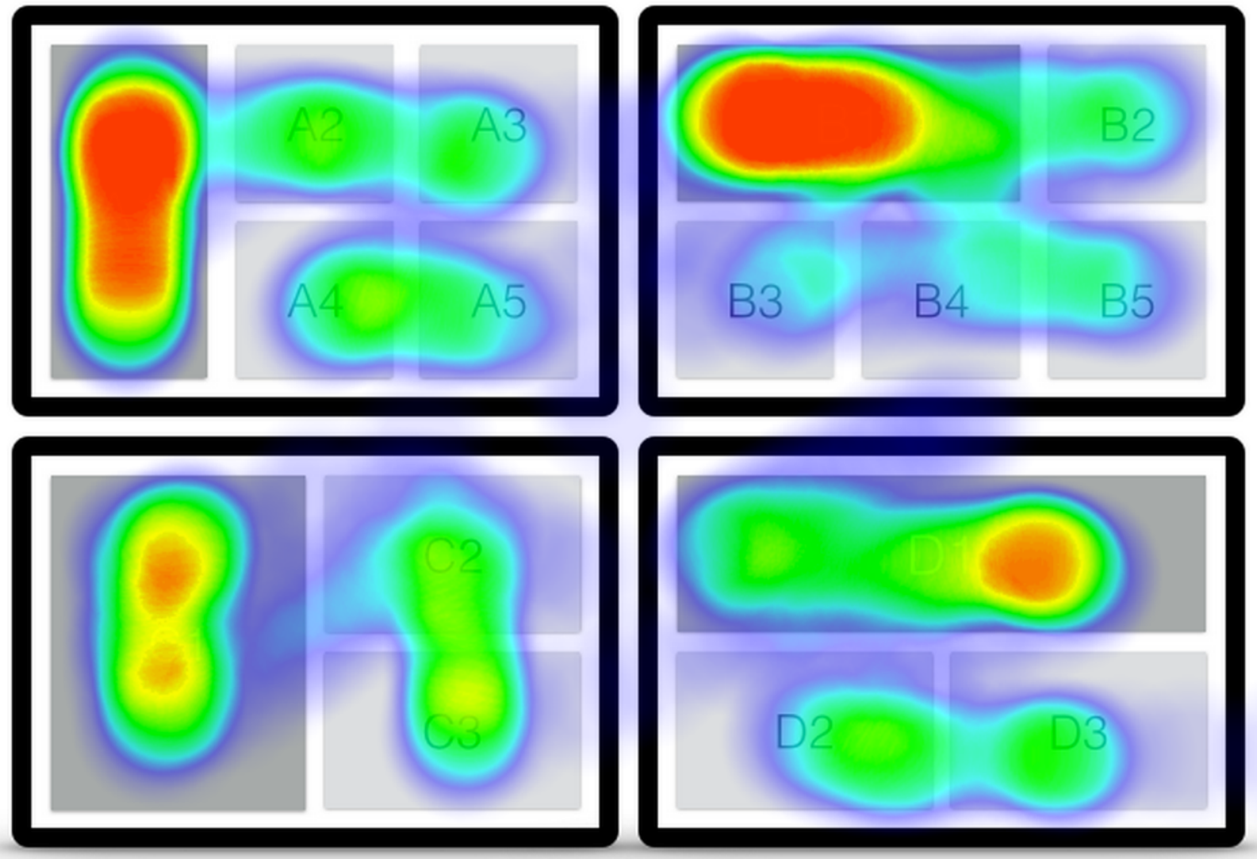


1. Expected results

Trading performance is expected to suffer when task difficulty increases

(e.g. Topi et al., 2005; Rice et al., 2012)

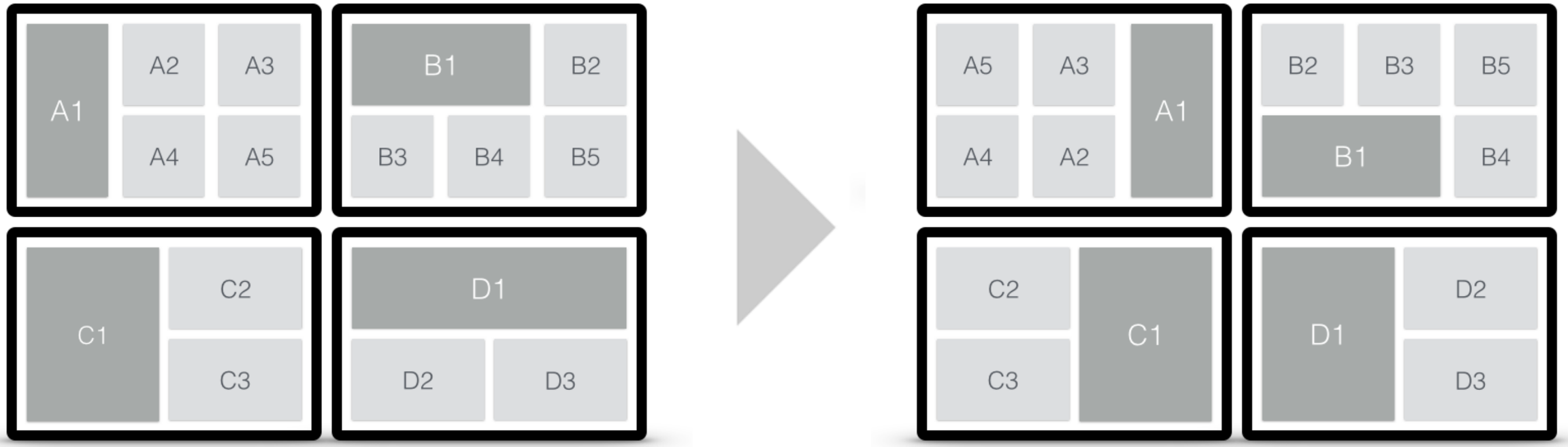


2. Effect of screen layout

Goals

- To investigate the influence of the screen layout on users' gaze variability, cognitive load and performance
- Findings from previous study to inform the layout variability
  - Move relevant areas of interest (AOIs) to the center according to task proximity
  - 3 screen layouts

2. Effect of screen layout



2. Data and Methods

2. Data and Methods: Variables

- Independent variables:
  - 3 different tasks
  - 3 screen layouts

    Original from study 1, central positioning with 4 screens, central positioning with 6 screens.

2. Data and Methods: Variables

- Dependent variables:
  - Eye tracking measurements
  - Task performance: profit and loss statement
  - Usability: After-Scenario questionnaire (ASQ)

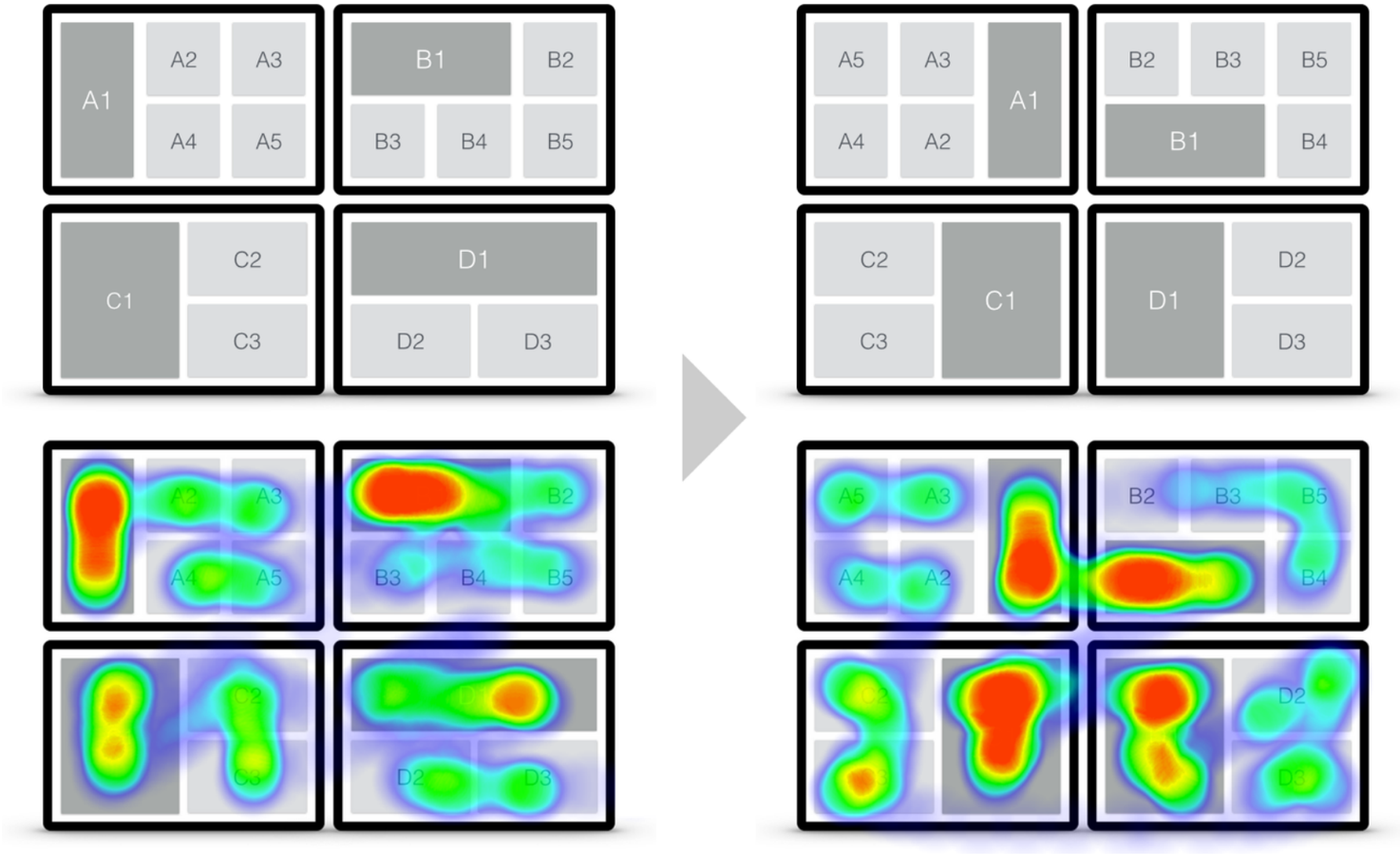
(Lewis, 1991)

  - Cognitive Load: NASA-TLX

(Hart & Staveland, 1988)

  - Retrospective verbal protocols

2. Expected results



3. Novice training with experts' scan path

Goals

- Can the gaze of novice's be guided to by showing them the scan path of an expert system user?
- Influence of experts' scan path video on novices' visual behavior and their respective performance

3. Data and Methods

Expert
Record gaze video and verbal protocols

Novice
Show expert's gaze video and evaluate learning effect

Overview

1. Sensitivity of eye movement measures to demands of various task difficulties.
2. Screen layout and its impact on gaze variability in complex systems.
3. Influence of experts' scan path on novice financial system users.

Questions & Discussion

References

Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. Science, 185, 1124-1131.

Kahneman, D. (2011). Thinking, Fast and Slow. New York: Farrar, Strauss, Giroux.

Coates, J. (2012). The Hour Between Dog and Wolf: Risk Taking. Gut Feelings, and the Biology of Boom and Bust. London: Fourth Estate.

Monti, M., Martignon, L., Gigerenzer, G., & Berg, N. (2009). The impact of simplicity on financial decision-making. In Proc. of CogSci (pp. 1846-1851).

Topi, H., Valacich, J. S., & Hoffer, J. A. (2005). The effects of task complexity and time availability limitations on human performance in database query tasks. International Journal of Human- Computer Studies, 62(3), 349-379.

Rice, S., Geels, K., Hackett, H. R., Trafimow, D., McCarley, J. S., Schwark, J., & Hunt, G. (2012). The harder the task, the more inconsistent the performance: A PPT analysis on task difficulty. The Journal of general psychology, 139(1), 1-18.