MICA

MICA

Functions

- Support System Usage
- Support Info Acquisition/ Decision Making
- Support Learning
- Support Collaboration
- Support Entertainment

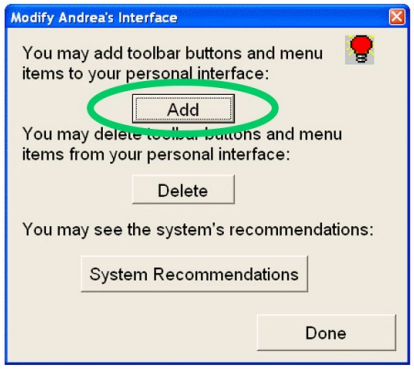
Forms of Adaptation

- Take Over Routine Tasks
- Adapt the Interface
- Advice on System Usage
- Retrieve Info/ Recommend Objects
- Tailor Info Presentation
- Advice on task

Inference/Learning

:

Forms of adaptation



User Model

-

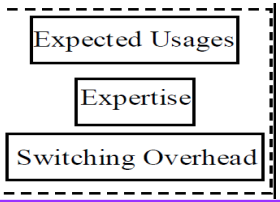
Inference/Learning:

System Framework

Two-Interface Model/ Customization Mechanism

Assesses performance given a PI

User Model



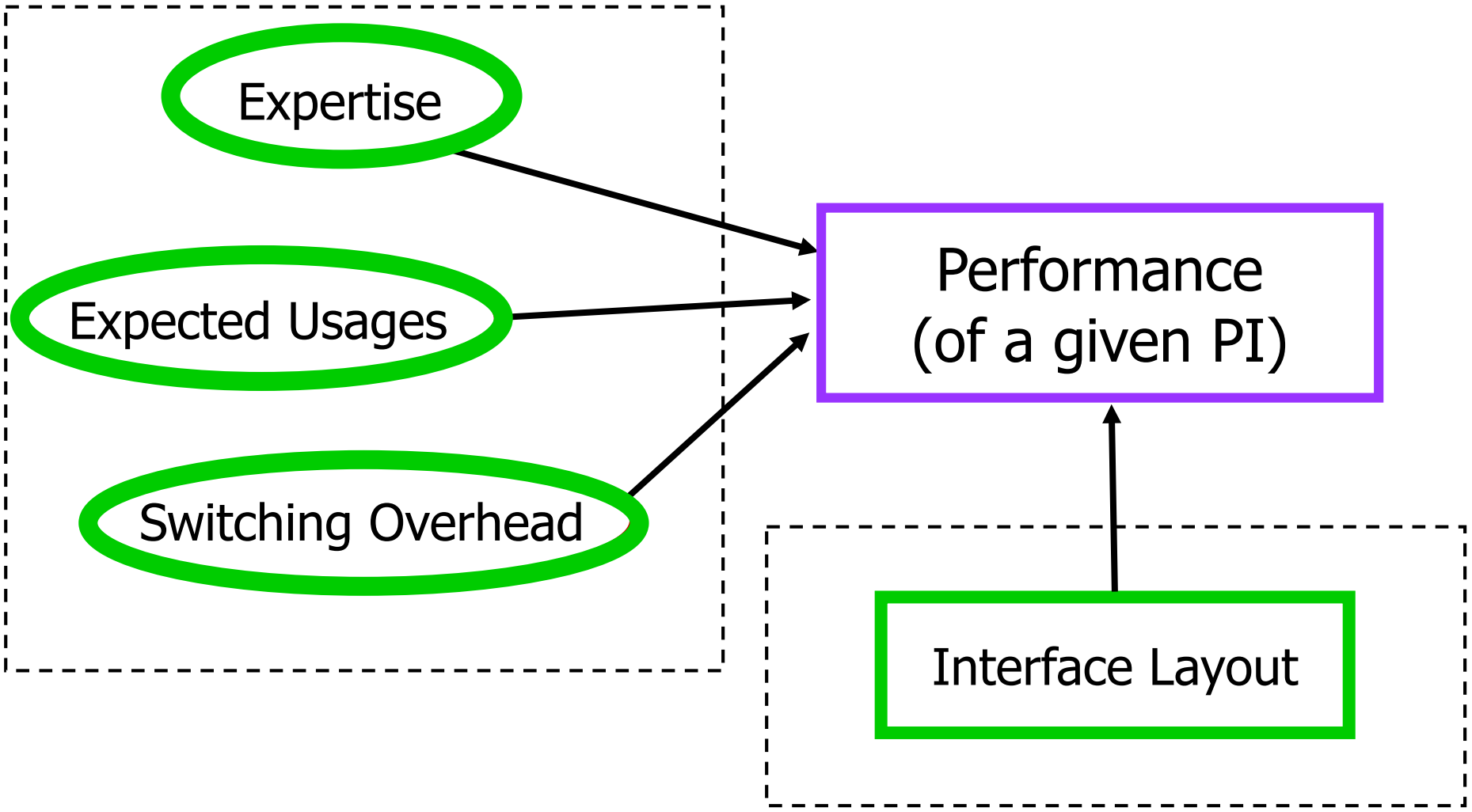
Customization Support Module (CSM)

Knowledge Base

- Searches space of potential PIs
- Generates customization suggestions based on optimal PI

- Stores GOMS methods
- Extended GLEAN (Kieras et al. 1995)

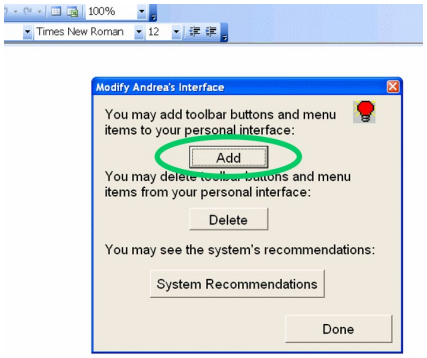
User Model


Expertise
Expected Usages
Switching Overhead
Performance
(of a given PI)
Interface Layout

Inference/Learning

:

Forms of adaptation



User Model

Expected Usages

Expertise

Switching Overhead

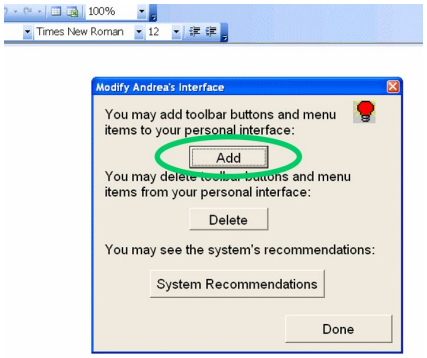
-

Inference/Learning:

Inference/Learning

:

Forms of adaptation



User Model

Expected Usages

Expertise

Switching Overhead

User natural interaction with the interface
(but in the study: self-reports on expertise and frequencies where known from task

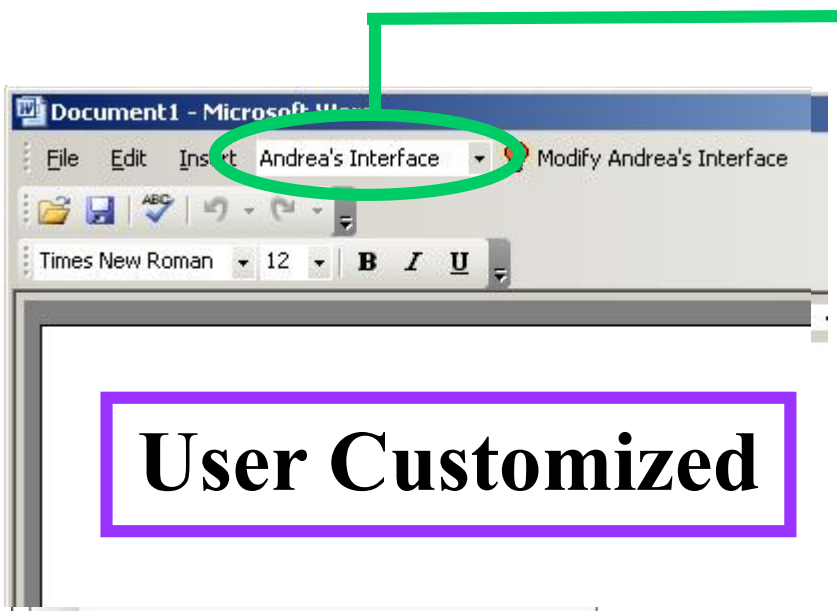
Inference/Learning:
Any method to predict expertise and usage frequency from observation of interface usage
None used in the study

Adaptable: Example

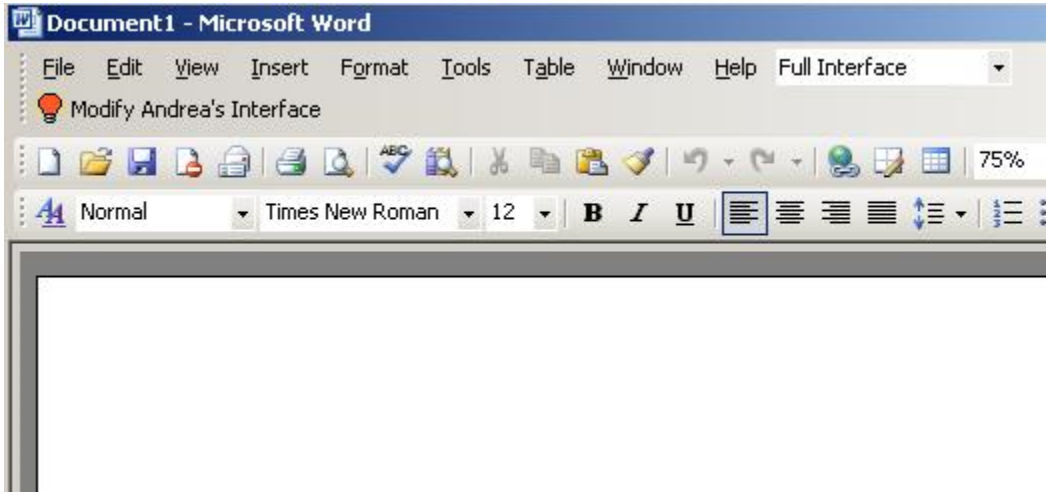
- Personalization facility for MSWord (McGrenere, Baecker and Booth 2002)
- Two-interface model

Personal Interface (PI)

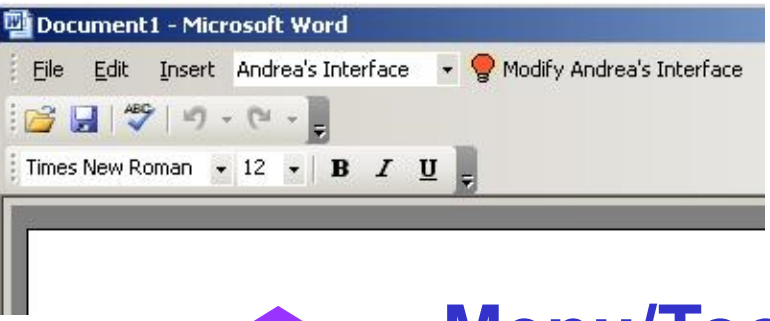
Full Interface (FI)

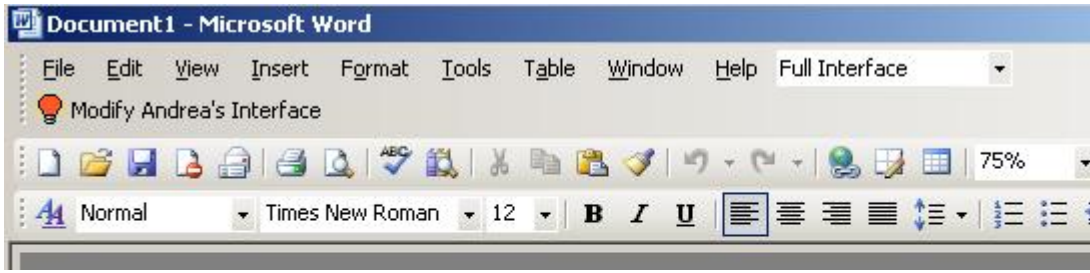


User Customized



CSM: Which Features to Recommend?





Menu/Toolbar Feature X

Time to select Feature X ↓

PI complexity ↑

Time to select Feature X ↑

PI complexity: no increase

User's input in MICA?

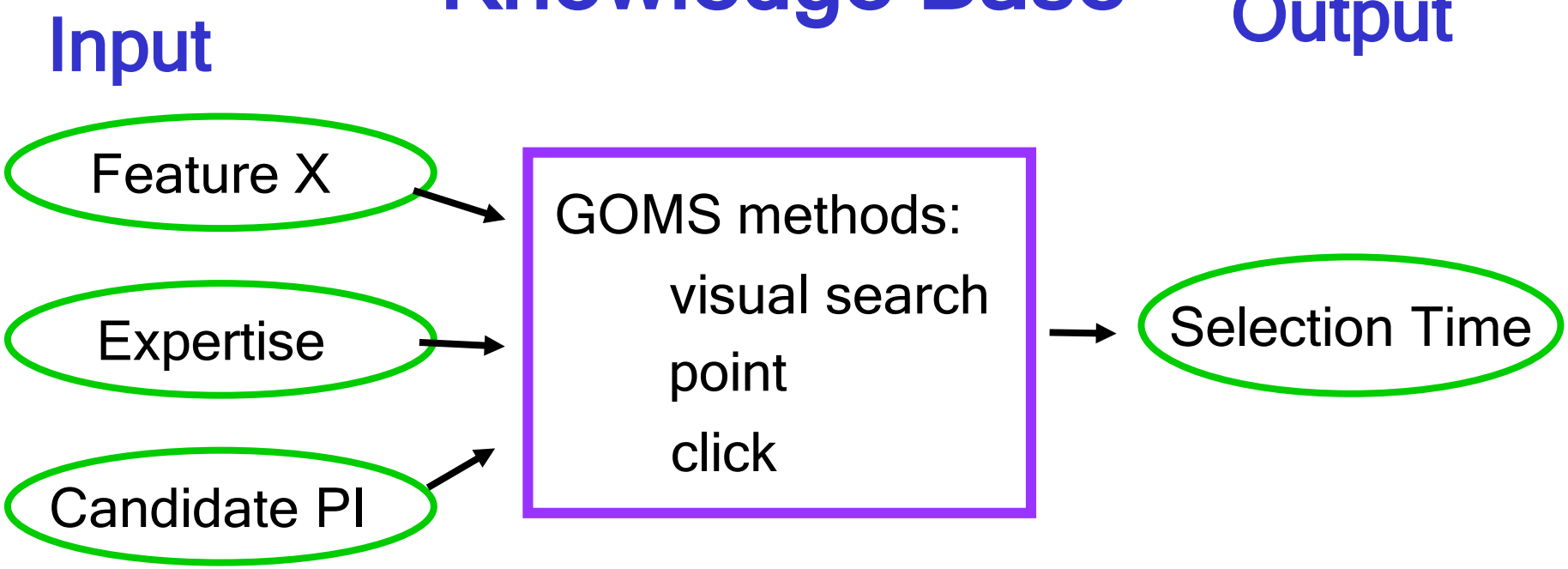
- Explicit

- Non Explicit

Assessing Performance Using GOMS

- **G**oals, **O**perators, **M**ethods, **S**election Rules (Card et al. 1983)
  - Low-cost cognitive modelling technique
  - Models human performance with interfaces
  - Good for comparing interfaces (Gong and Kieras 1994)
  - GLEAN: automated computation (Kieras et al.1995)

Knowledge Base

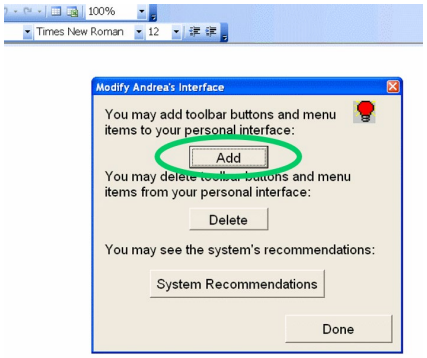


- Extension of the GLEAN tool (Kieras et al. 95)
  - Visual Search:
    - Different levels of expertise (Bunt et al. 2004)
    - Probabilistic assessment

Inference/Learning

:

Forms of adaptation



User Model

Expected Usages

Expertise

Switching Overhead

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Inference/Learning Model for Adaptation

•Time to perform all selections of feature X in interface FI

•Time saving over all selections of feature X if it is moved there

$$SelectTime(f_x, FI) - SelectTime(f_x, PI + f_x) > \sum_{i \in EA - f_x} SelectTime(f_i, PI + f_x) - \sum_{i \in EA - f_x} SelectTime(f_i, PI - f_x)$$

•All features expected to be accessed during the interaction

•Time increase over all selections of other features in PI if F_x is moved there

Forms of adaptation

Inference/Learning

$$SelectTime(fx, FI) - SelectTime(fx, PI + fx) > \sum_{i \in EA - fx} SelectTime(fi, PI + fx) - \sum_{i \in EA - fx} SelectTime(fi, PI - fx) \cdot$$

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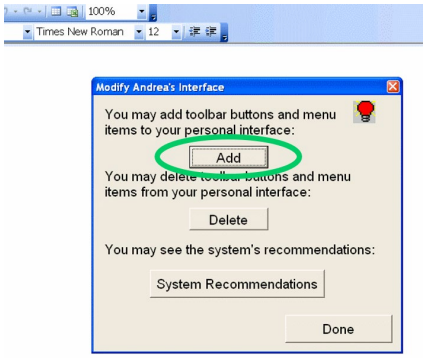

User Model

Expected Usages

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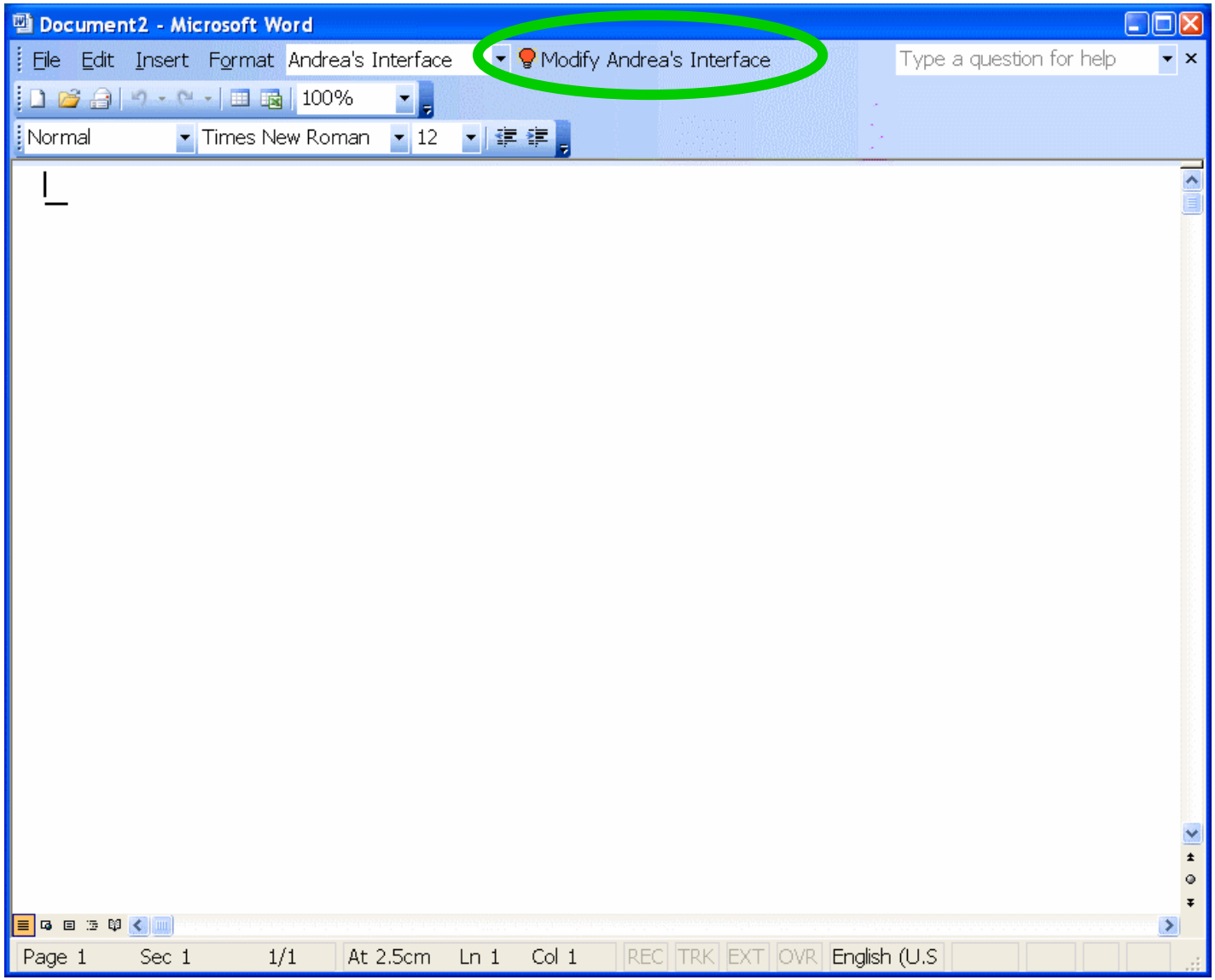
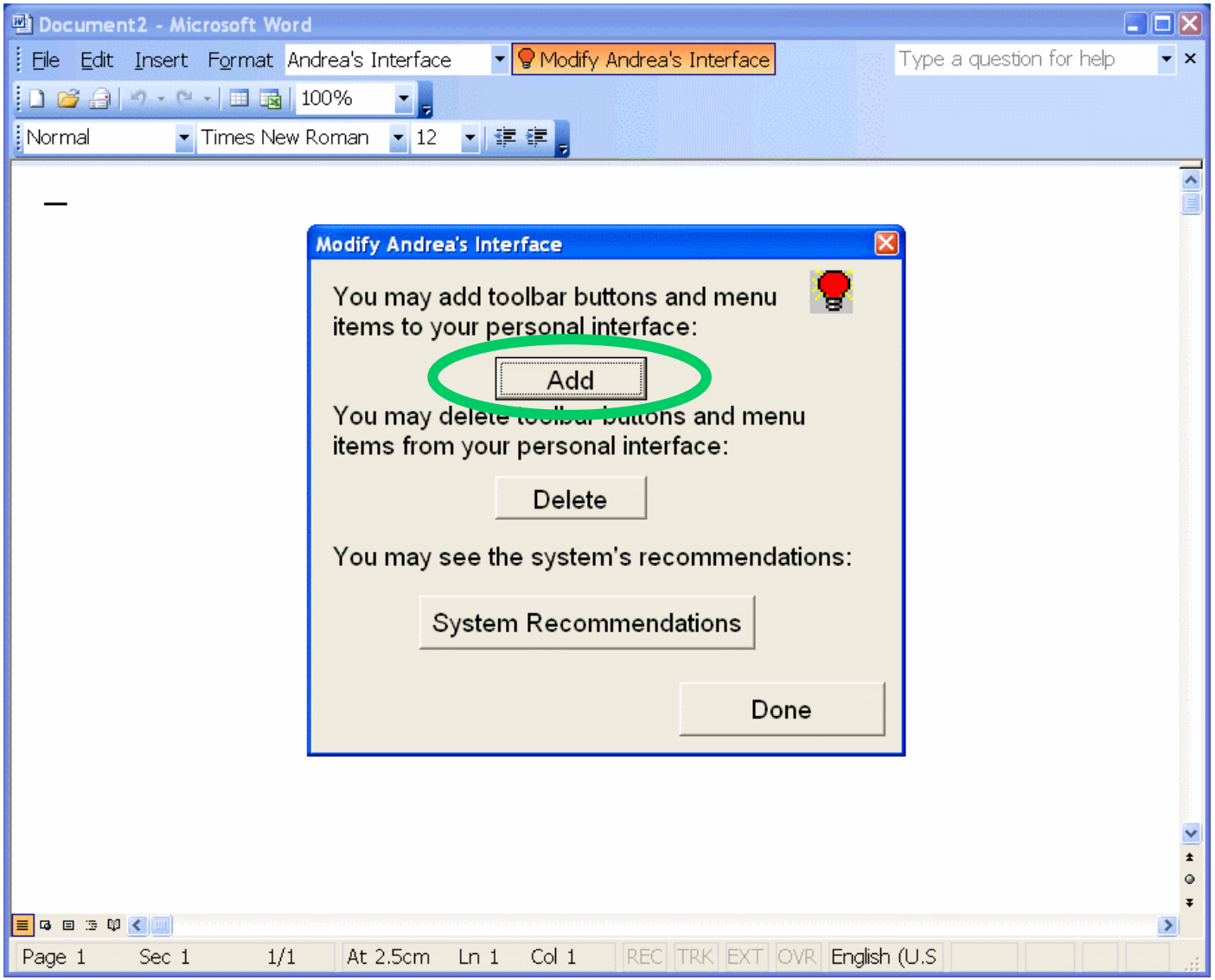
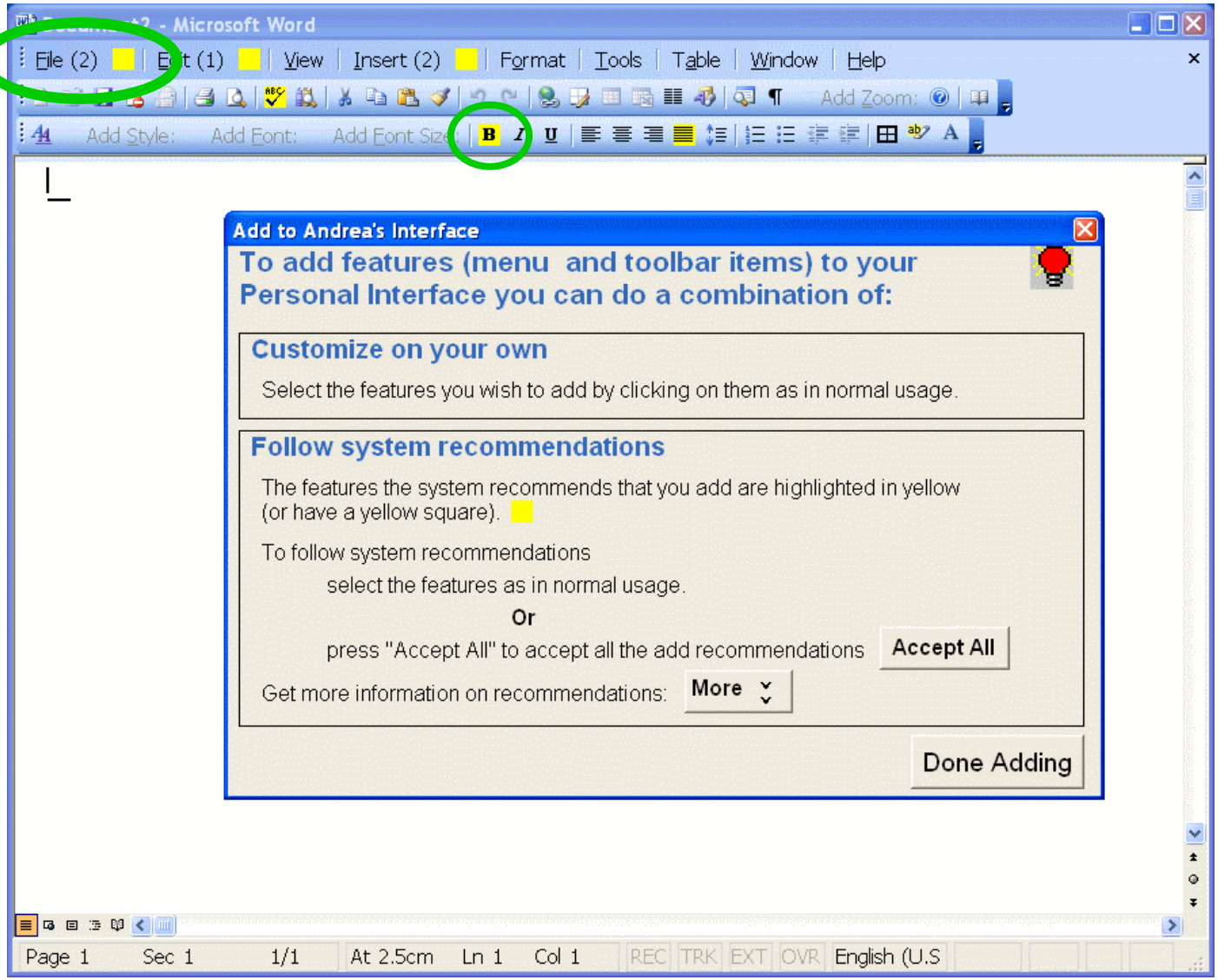
Delivering the Adaptive Support



Delivering the Adaptive Support



Delivering the Adaptive Support: Add Recommendations



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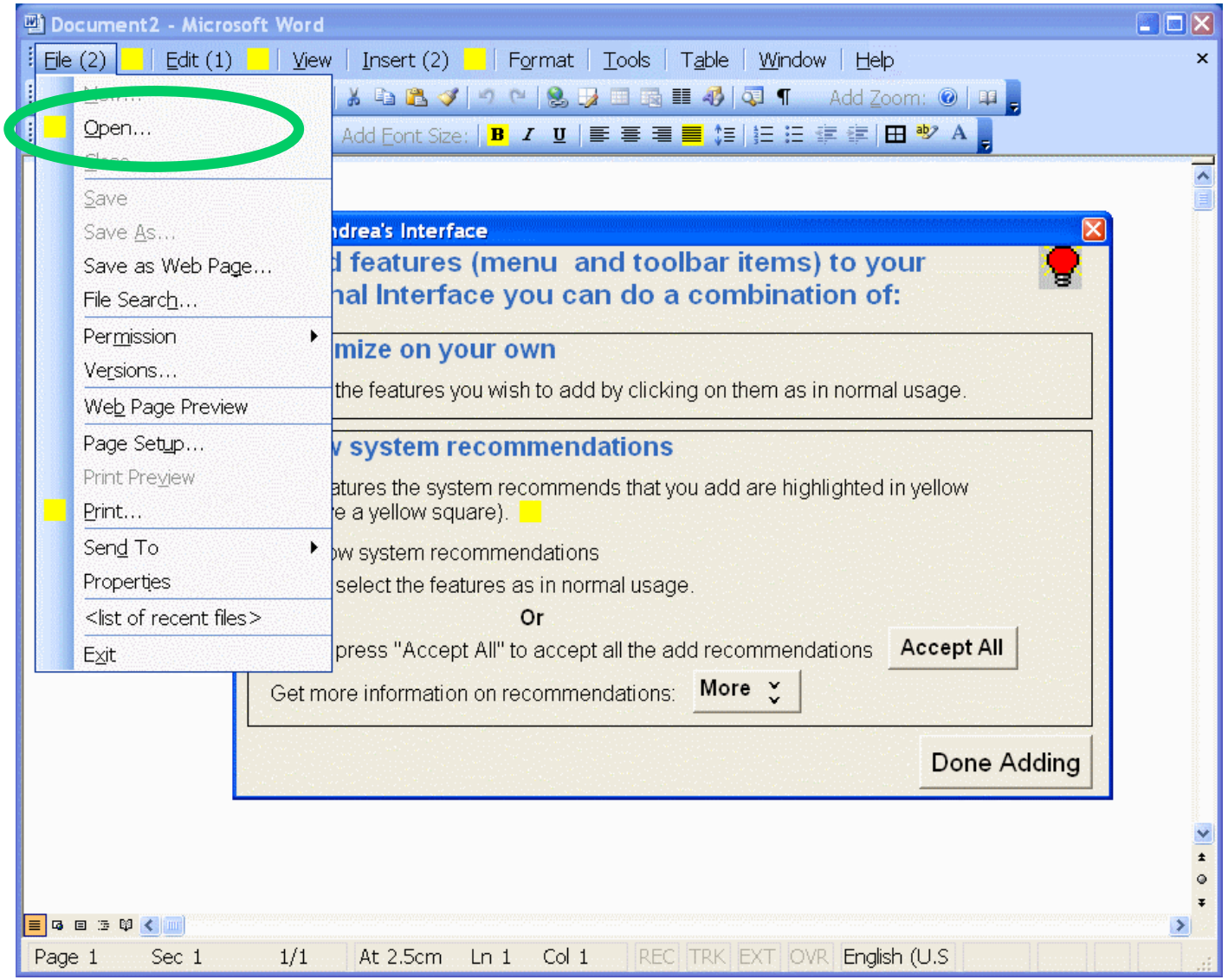

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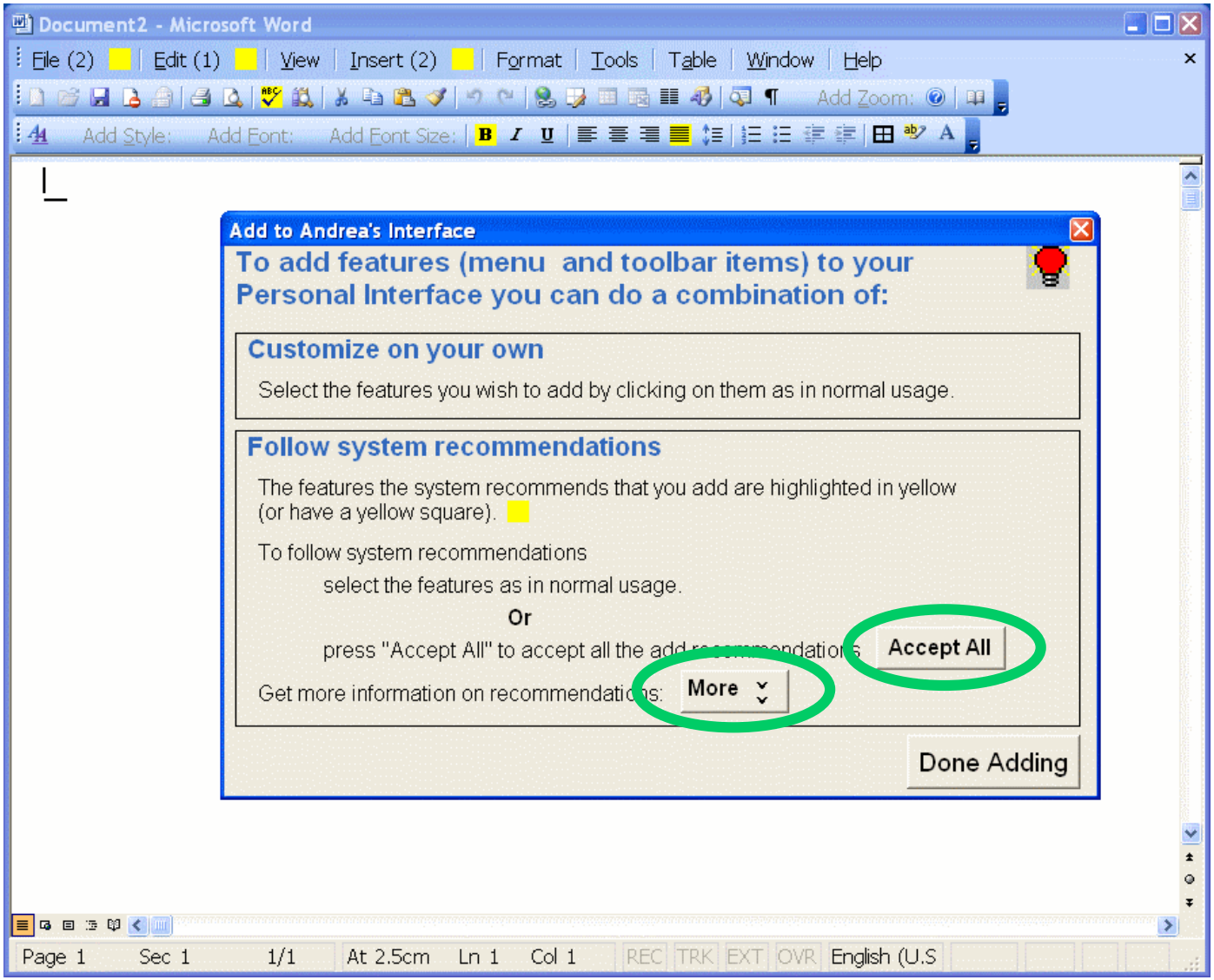


Evaluation of Adaptive IUI

- For performance and user satisfaction
  - Wizard of Oz Studies
  - Simulations using data from a non-adaptive system
  - Controlled studies
  - Field Studies

Evaluation of MICA?

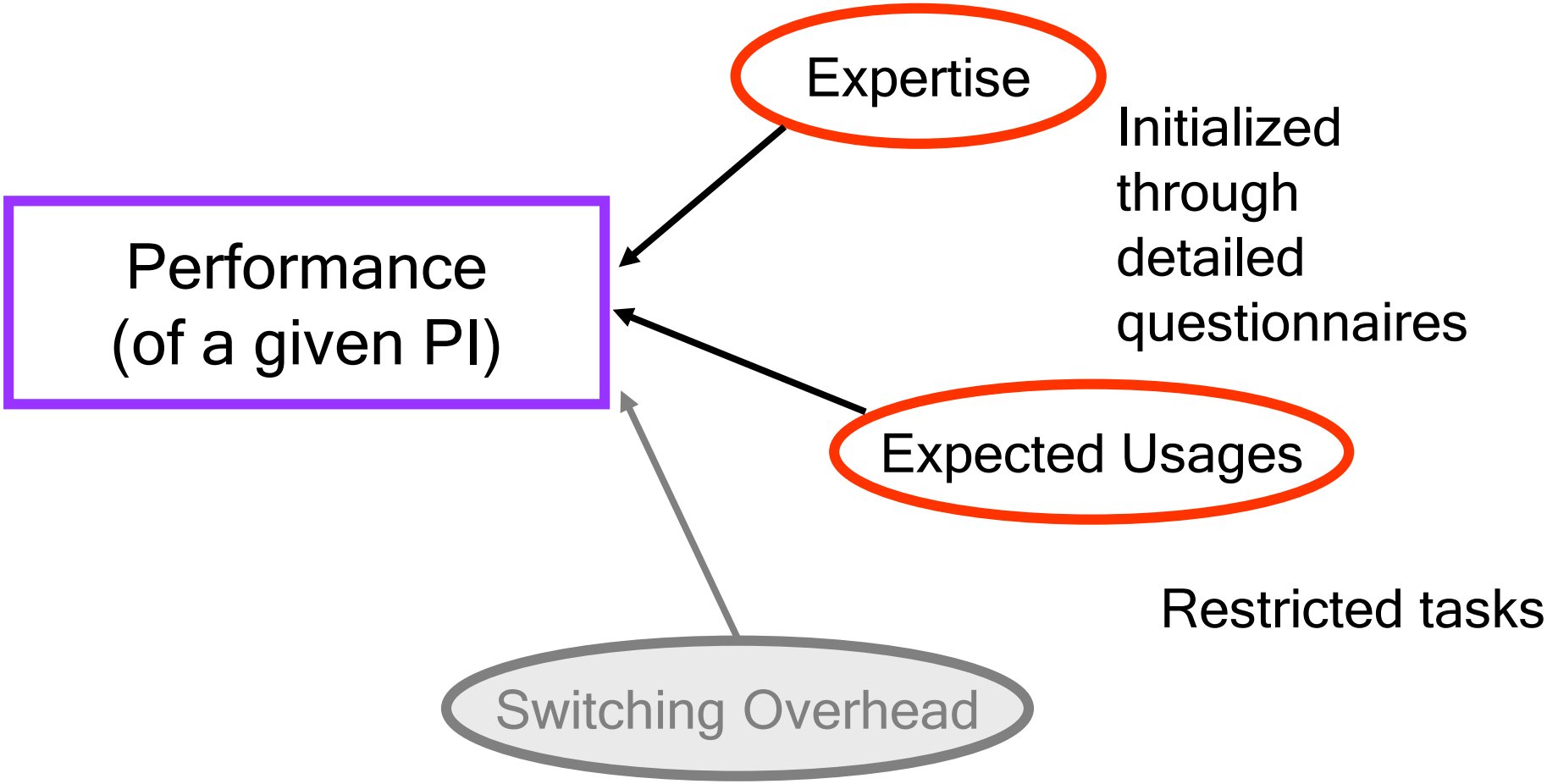
- For performance and user satisfaction
  - Wizard of Oz Studies?
  - Simulations using data from a non-adaptive system?
  - Controlled studies?
  - Field Studies?

MICA's Evaluation: Lab Study

- Conditions: Mixed-Initiative, Adaptable
- Main questions:
  1. Preference?
  2. Impact on performance?
  3. Impact on customization behaviour?

User Model Initialization

- Wizard of Oz (sort of) component to the study

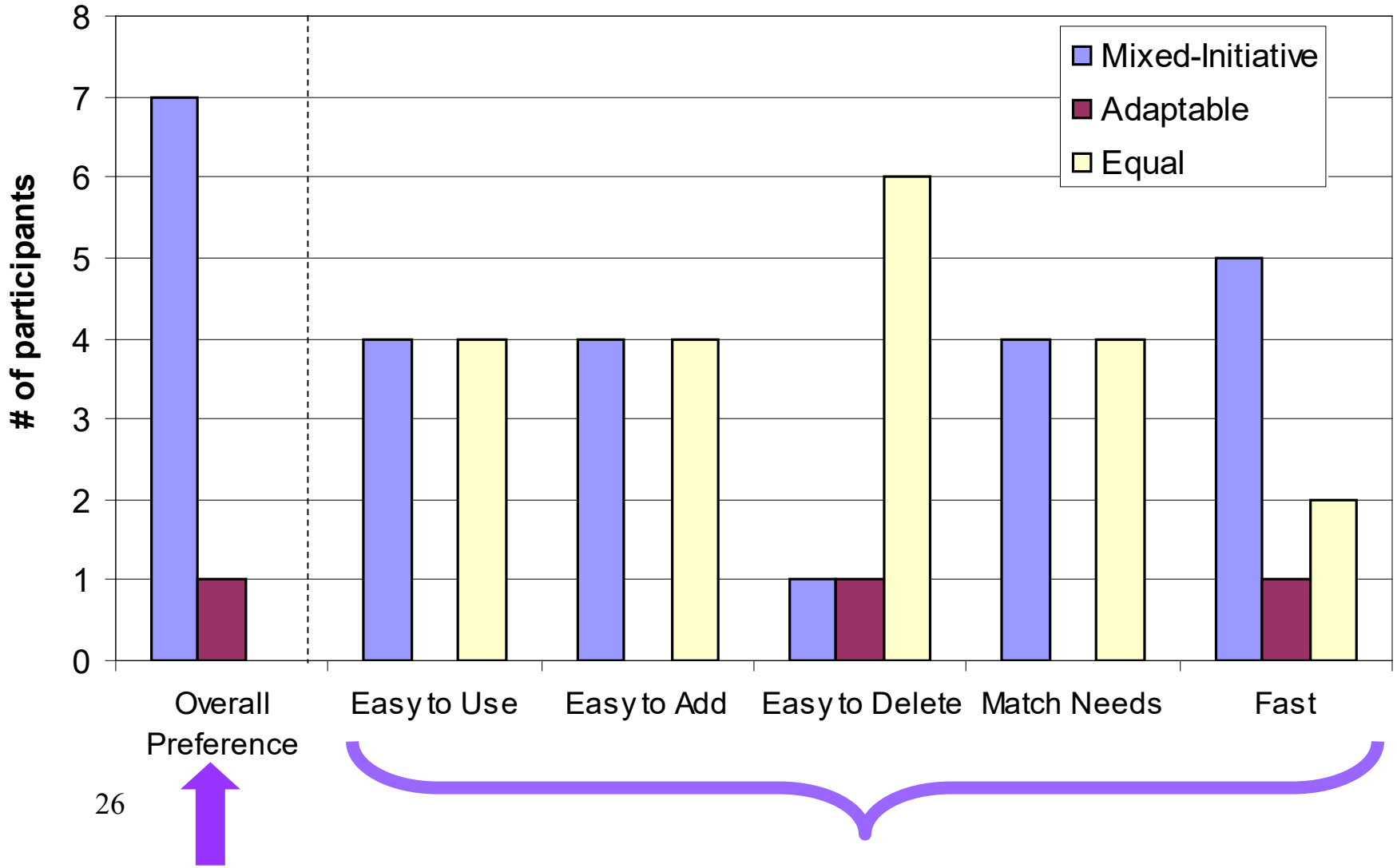


Study 1 (Mixed-Initiative vs. Adaptable): Main Findings

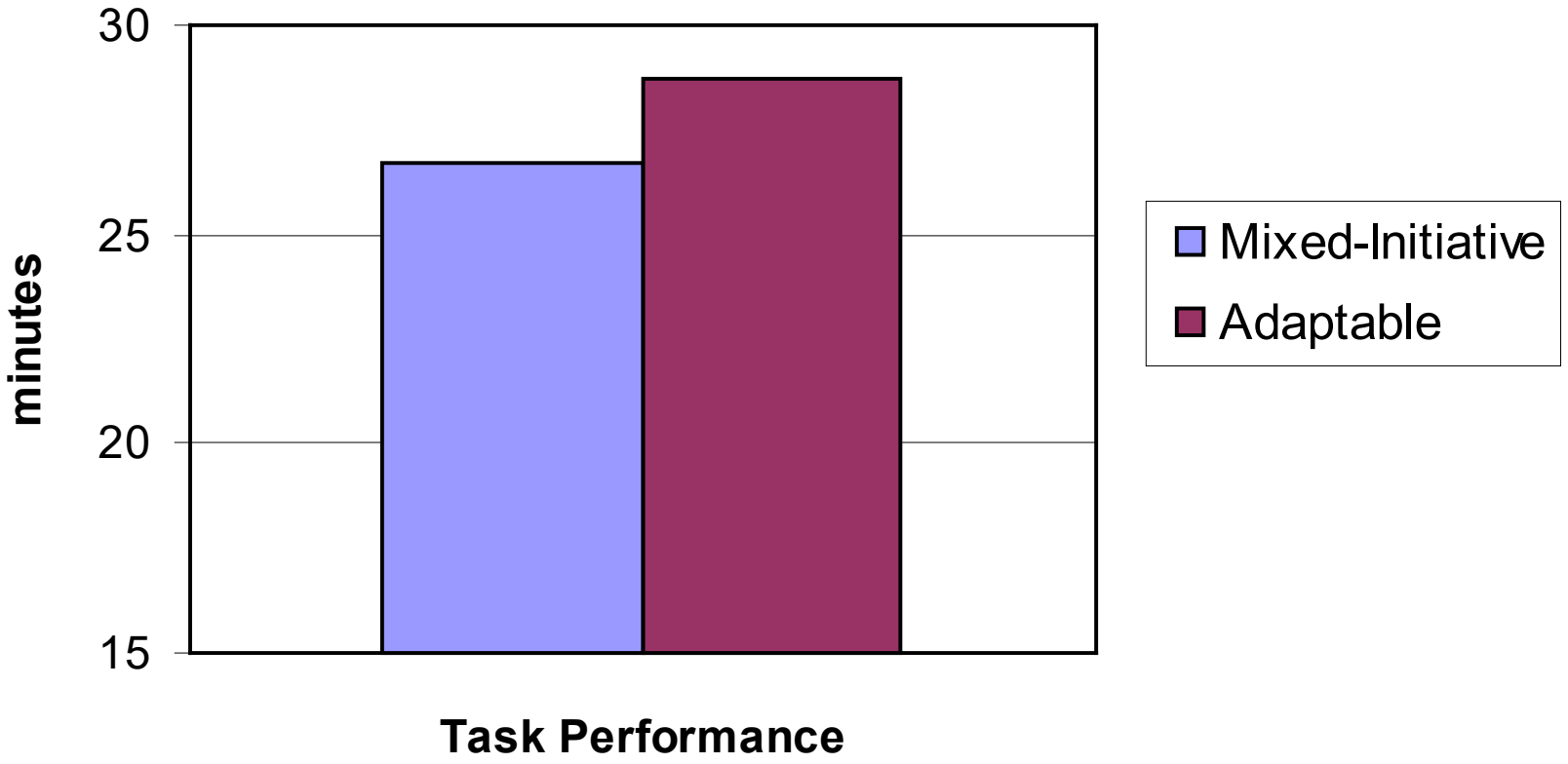
- On Performance: In the mixed-initiative condition, participants
  - Followed most of MICA recommendations (98%)
  - Had better time performance ($p = 0.063$, $\eta^2=0.62$)
- On Preference:
  - The mixed-initiative interface was preferred by 7 out of 8 participants
- Other positive findings
  - Main reason to customize was performance
  - User liked the delivery of adaptive support

1) Preference

- Customization: 8 in both conditions, 4 in only one condition



Performance: Task Time (including customization)



$F(1, 4) = 6.587$, $p = 0.062$, partial $\eta^2 = 0.622$

All performance measures

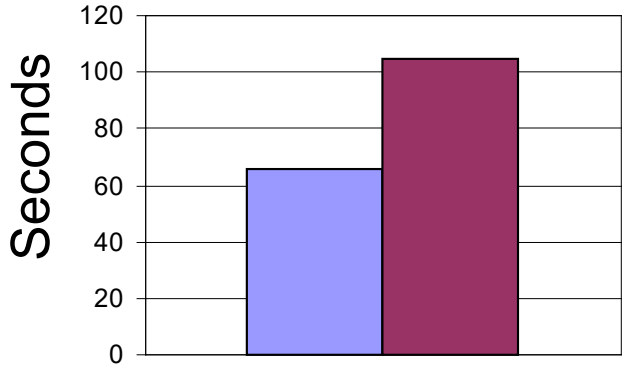
Dependent Variable	Mean (SD) *MI*	*AD*	F(1,4)	p	η^2
Overall Performance (minutes)	28:06 (6:09)	30:19 (5:29)	6.522	0.063	0.620
Task Performance (minutes)	26:40 (5:29)	28:44 (5:05)	6.587	0.062	0.622
Customization Time (minutes)	1:06 (0:33)	1:35 (0:38)	8.170	0.046	0.671
Features Added	6.1 (0.8)	6.8 (1.5)	2.778	0.171	0.410

Table 1: Results for the quantitative within-subjects measures (N = 8) MI=Mixed-Initiative, AD = Adaptable

3) Customization Behaviour

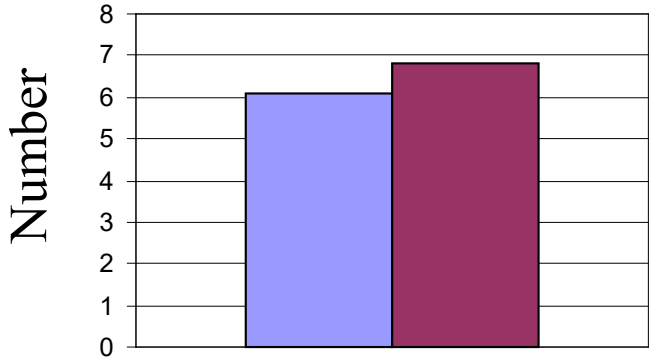
Mixed-Initiative Adaptable

Customization Time



F(1, 4) = 8.170, p = 0.046)

Features Added



F(1, 4)= 2.778, p = 0.171)

"Add" Recommendations followed (Overall):

96%

78%