Human Factors for Software Developers

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Summer 2015, CMU

Previously

- We talked about simulations and data visualisation.
- Understanding and seeing what is going on is important.

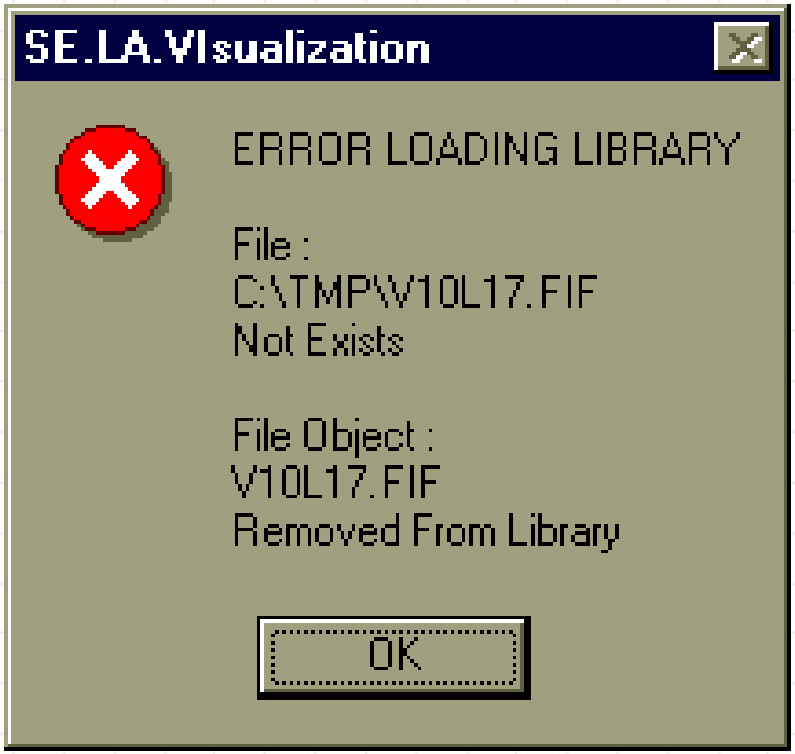
What would you do?

- You are writing a program.
- In your program, you need to use a file (named V10L17.FIF) and load it to the library.

  If the file cannot be found

  what kind of message will you give?

What's good and poor about the design of this error box?



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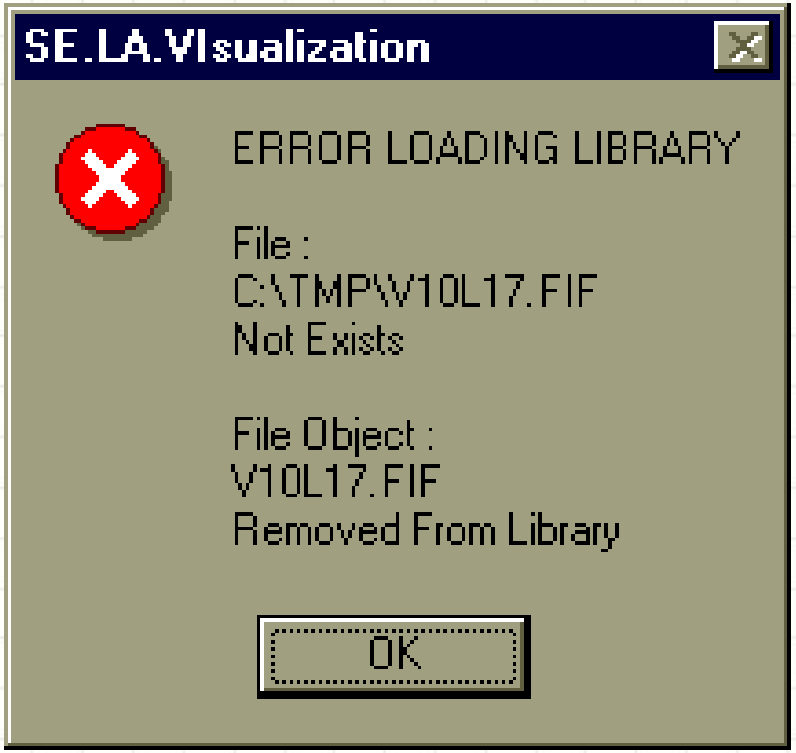


Good:

- There is a message
- The user knows there is an error

Poor:

- Discouraging
- Not enough information
- No way to *resolve* the problem (instructions or contact info)

Until Now

- Computation
- Algorithms
- Data Structures
- Simulations
- ...

- Problem Solving
- Performance
- Data Visualisation
- ...

And you tested your programs

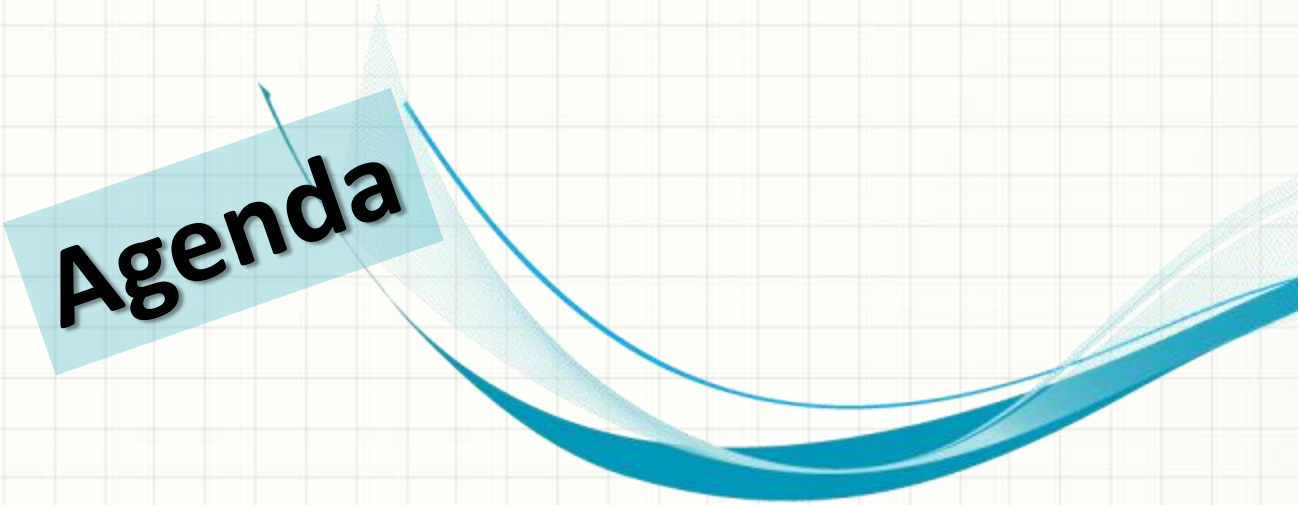
Bug fixing, tuning, ...

What about the USE of programs?

How to test and fix errors

those are made by human

(which may not be their fault)?

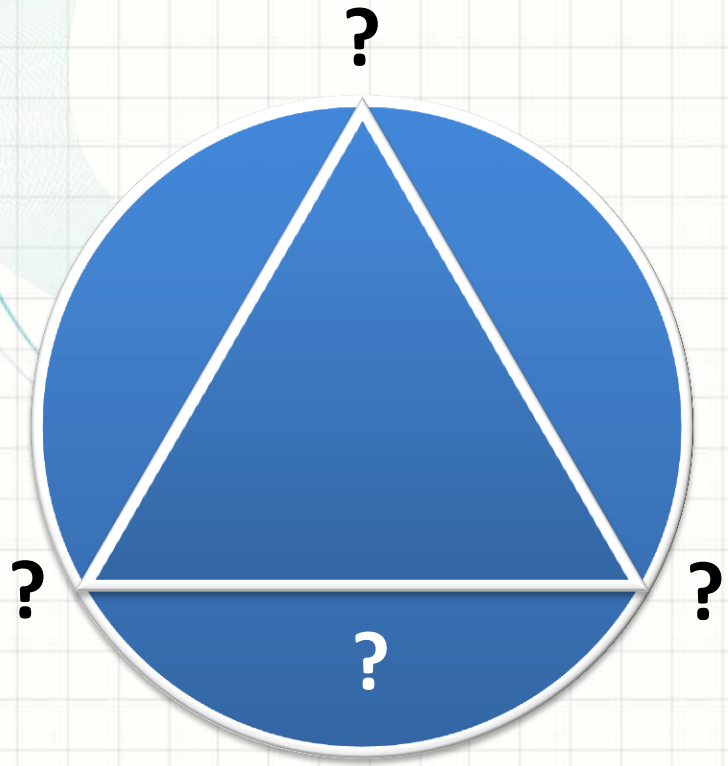


User Interfaces And Interaction

Understanding Users / Human

Major principles and suggestions

Let’s start



Four Components of HCI

Different Focuses in a SW project

- Requirement collection
- Expected features
- Classes, methods, attributes
- Data gathering
- Place to store the data
- How to store/retrieve the data
- The forms or screens needed to develop
- Delivery, implementation and testing
- may be Content (especially for web/mobile)

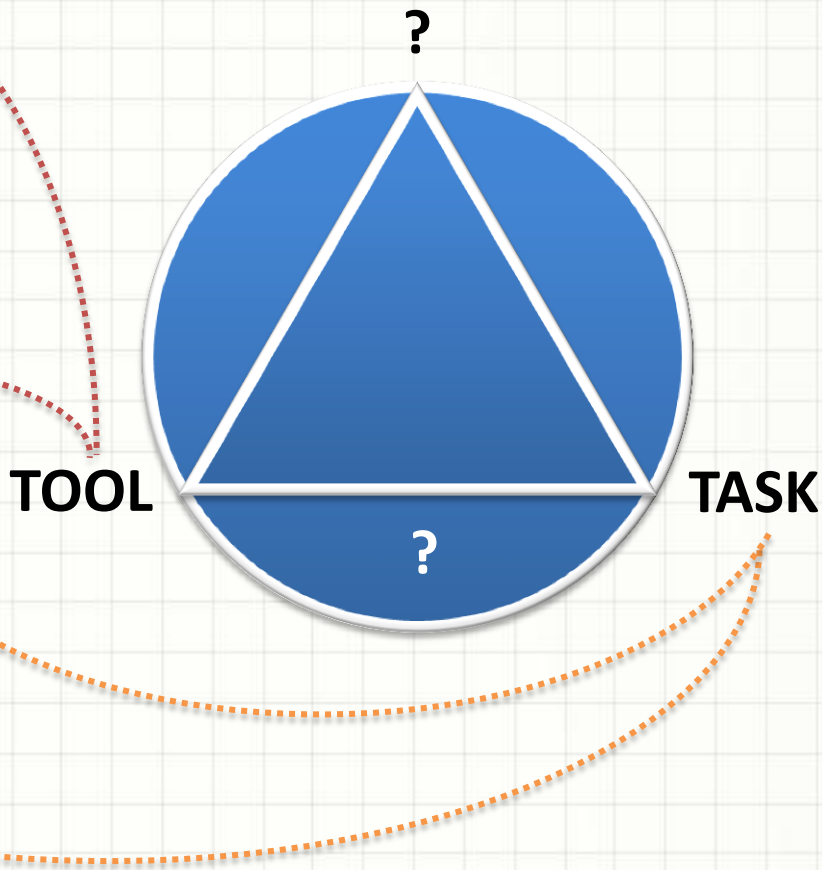
Different Focuses in a SW project

TOOLS

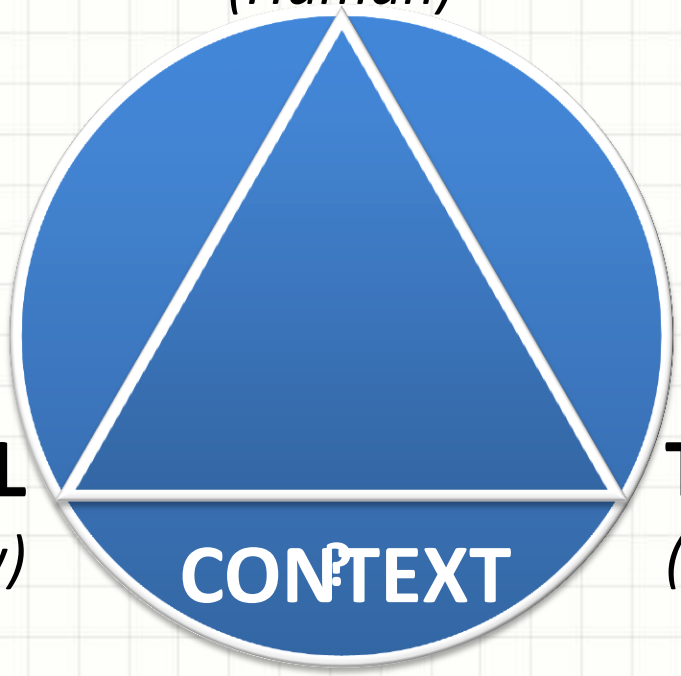
- Computer
- Screens
- SW Libraries, IDE
- Buttons, form elements
- Images used

TASKS

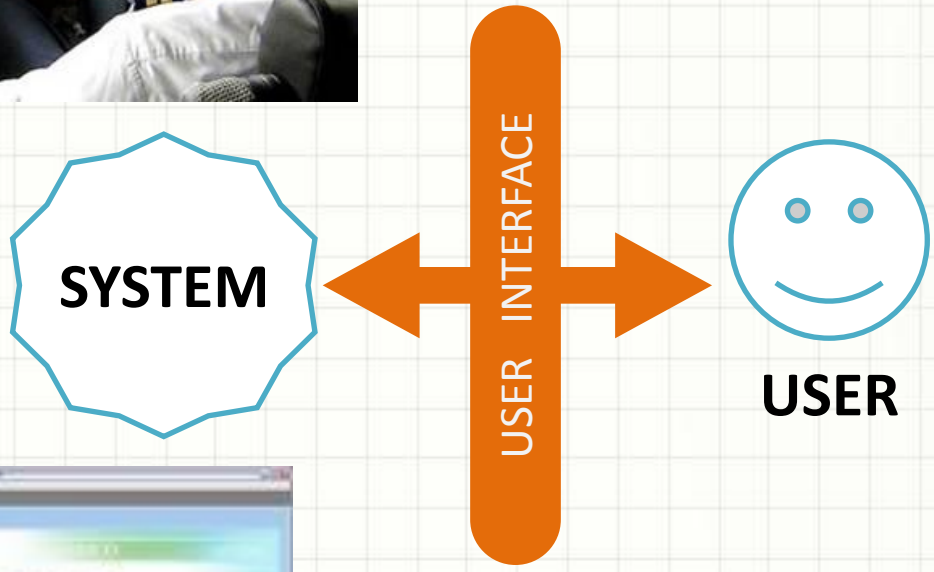
- What to do
- Target tasks
- Menu items
- Task analysis
- Feature lists

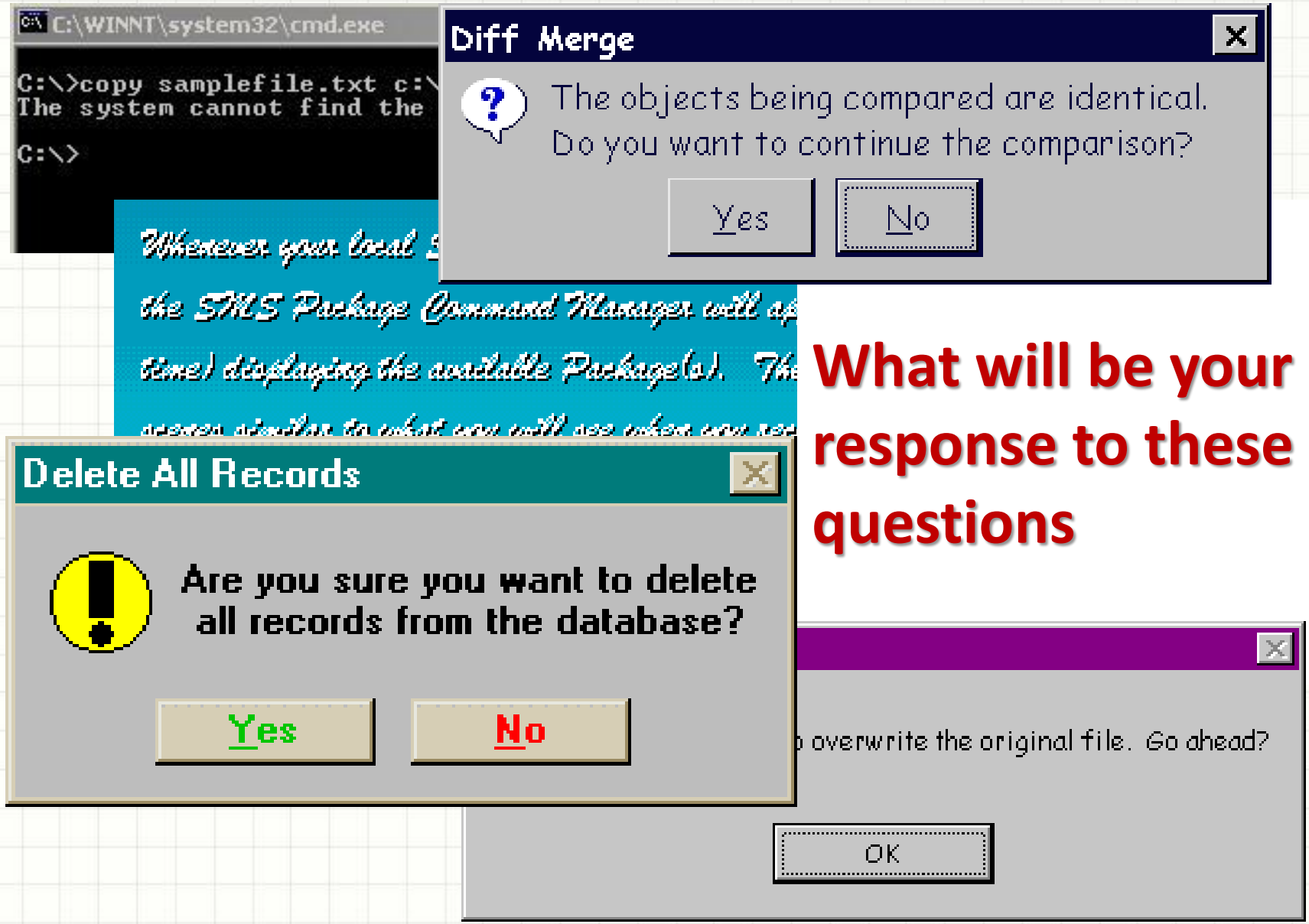


What are the other components?

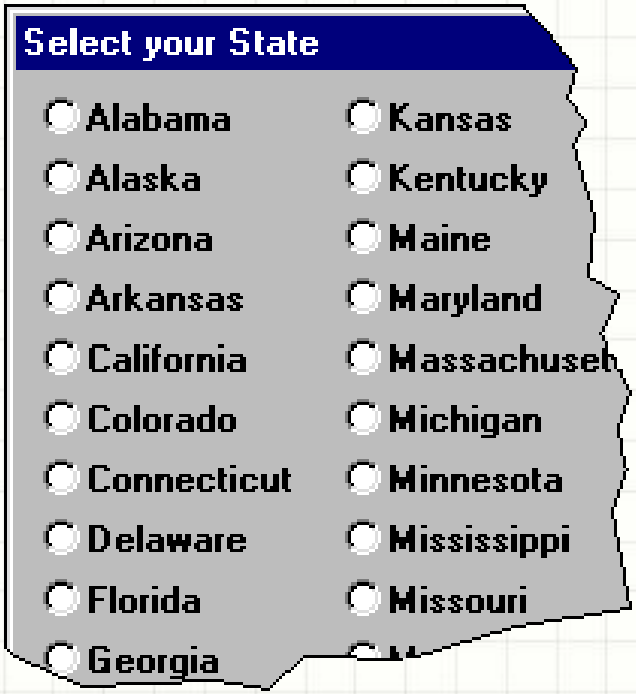


User interface





What will be your response to these questions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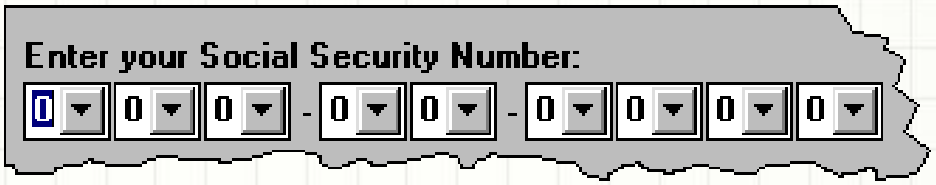
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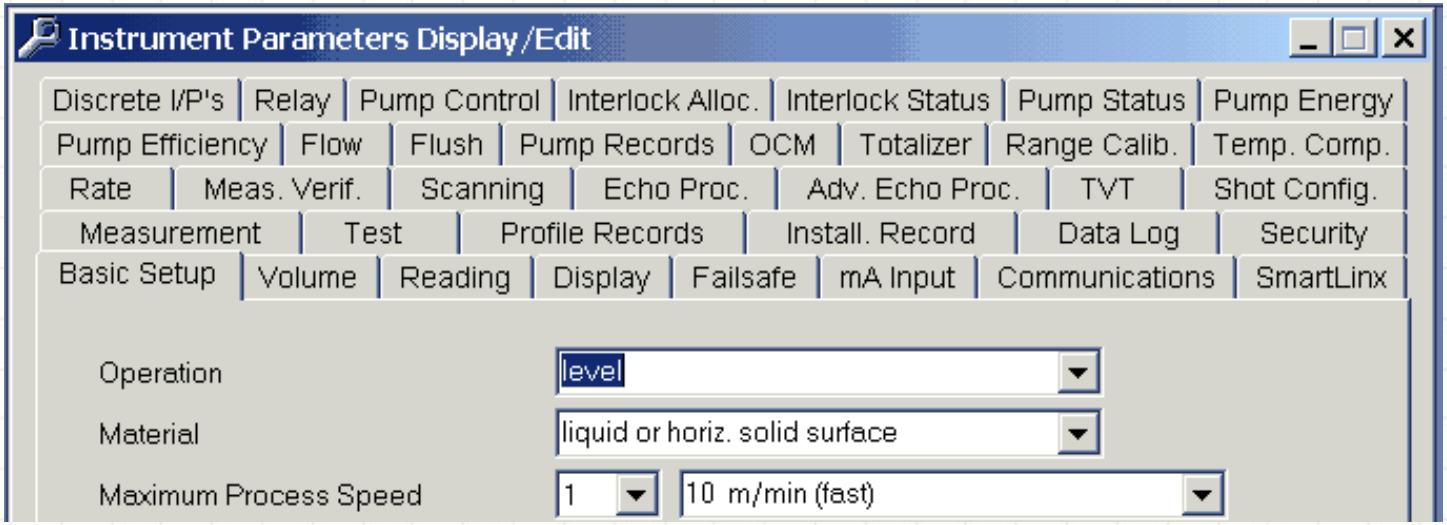
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OCM
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Echo Proc.
Adv. Echo Proc.
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Measurement
Test
Profile Records
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Data Log
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Basic Setup
Volume
Reading
Display
Failsafe
mA Input
Communications
SmartLinx
Operation
level
Material
liquid or horiz. solid surface
Maximum Process Speed
1
10 m/min (fast)

Is it possible to design for an unknown person whose needs are not understood?

The User

- As an individual (User of an IS):
  - An employee or customer of the organization who will be directly or indirectly affected by the system
- As a representation of a group.
  - Average user: 80% of target user with similar needs, a typical user.

Who are the users?

- Identify them
  - NOT you
  - Probably NOT like you
- Understand them
  - Talk to them, ask to them
  - Watch them
  - Use your imagination (risky)

Ask / Watch them

- Only the users know what they need and what they want.
  - “Don't listen them” (J. Nielsen)
    (http://www.nngroup.com/articles/first-rule-of-usability-dont-listen-to-users/)

- Are you talking with the right users?
- Why watch them in addition to asking them?

Don’t forget

Testing your designs and getting feedback from a variety of users is the best way to see whether your design ideas are giving them what they want from your project/web site/...

Human

What do we know about them?

Human Beings

- Limited in capacity to process information
- Info. through i/o channel
  - Stored in memory
  - Processed and applied
    (reasoning, problem solving, skill, error)
- Emotion influences human capabilities
- Each person is different

Our expectations affect the way an image is perceived

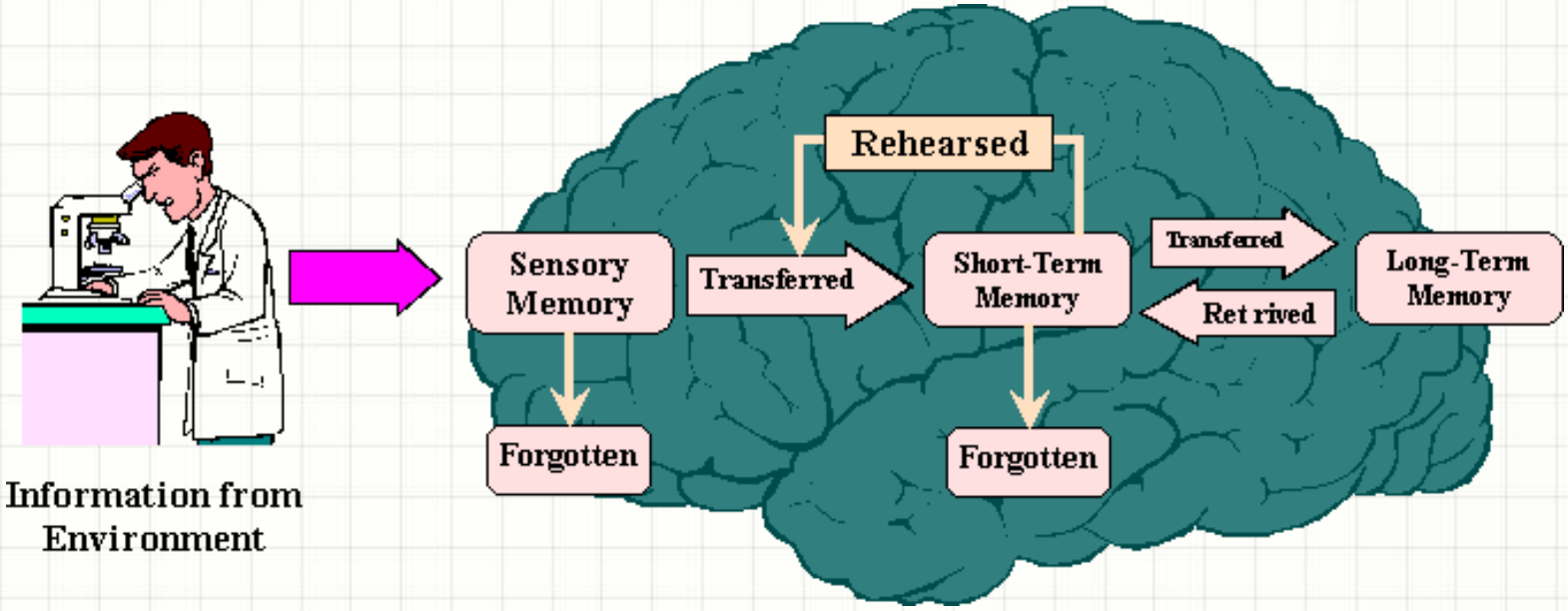
Our expectations affect the way an image is perceived

Our expectations affect the way an image is perceived

Read the phrase aloud quickly

The effect of context on perception
Selfridge 1955, from Preece *et al*, p78.

Information Processing Model



information is passed from sensory memory to working memory through *attention*

Short term memory is limited.

02134142626

0213 414 2626

Short term memory is limited

HEC ATR ANU PTH ETR EET

THE CAT RAN UP THE TREE

What about thinking skills?

- **Reasoning:** is the process we use the knowledge we have to draw conclusions.
- **Problem Solving:** Process of finding solution to unfamiliar task using knowledge.
    - Useful but may be unreliable

What about thinking skills?

- If it is Friday then she will go to work
  It is Friday
  → Therefore she will go to work

- If it is raining then the ground is dry
  It is raining
  → Therefore the ground is dry

What about thinking skills?

Some people are babies
Some babies cry

Some people cry **(INVALID)**

If the crying babies were animals then it will be invalid.

- Each card has a number on one side and a letter on the other side.
- **Rule:** If a card has a vowel on one side it has an even number on the other side.
- Which cards would you need to pick up to test the truth of this rule?

Most people pick up 4 and E

But the correct choice is E and 7

- **Rule:** If a card has a vowel on one side it has an even number on the other side.

- Which cards would you need to pick up to test the truth of this rule?

Emotion

- The biological response to physical stimuli is called *affect*
- Affect influences how we respond to situations
  - positive → creative problem solving
  - negative → narrow thinking

"Negative affect can make it harder to do even easy tasks; positive affect can make it easier to do difficult tasks" (Donald Norman)

Emotion

- Implications for interface design
  - stress will increase the difficulty of problem solving
  - relaxed users will be more forgiving of shortcomings in design
  - aesthetically pleasing and rewarding interfaces will increase positive affect

Individual differences

- long term
  - sex, physical and intellectual abilities
- short term
  - effect of stress or fatigue
- changing
  - age

Ask yourself: will design decision exclude section of user population?

Managing value

people use something

ONLY IF

it has perceived value

AND

value exceeds cost

BUT NOTE

- exceptions (e.g. habit)
- value **NOT** necessarily personal gain or money

Weighing up value

value

- helps me get my work done
- fun
- good for others

cost

- download time
- money £, $, €
- learning effort

General lesson …

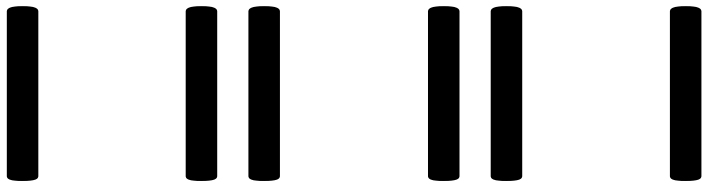
if you want someone to do something …

- make it easy for them!
- understand their values

VISUAL DESIGN & PERCEPTION

– GESTALT PRINCIPLES –
– BASIC DESIGN PRINCIPLES –

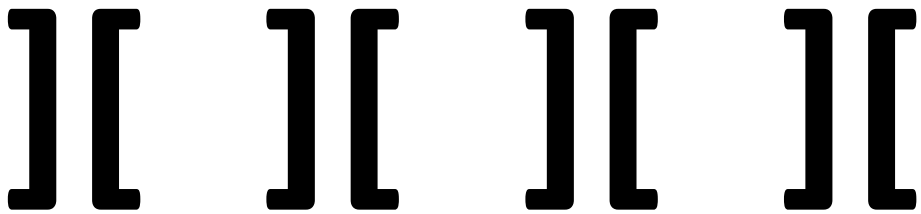
What do you see? How many?



How do you percieve?

[ ][ ][ ]

How do you percieve?



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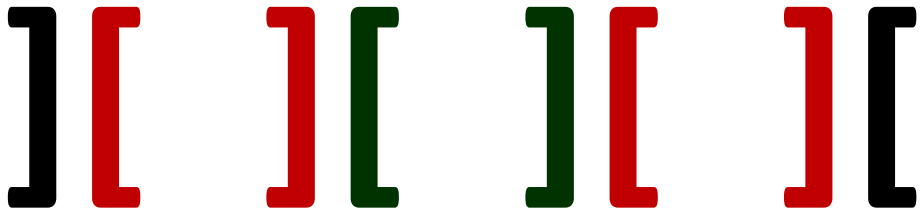

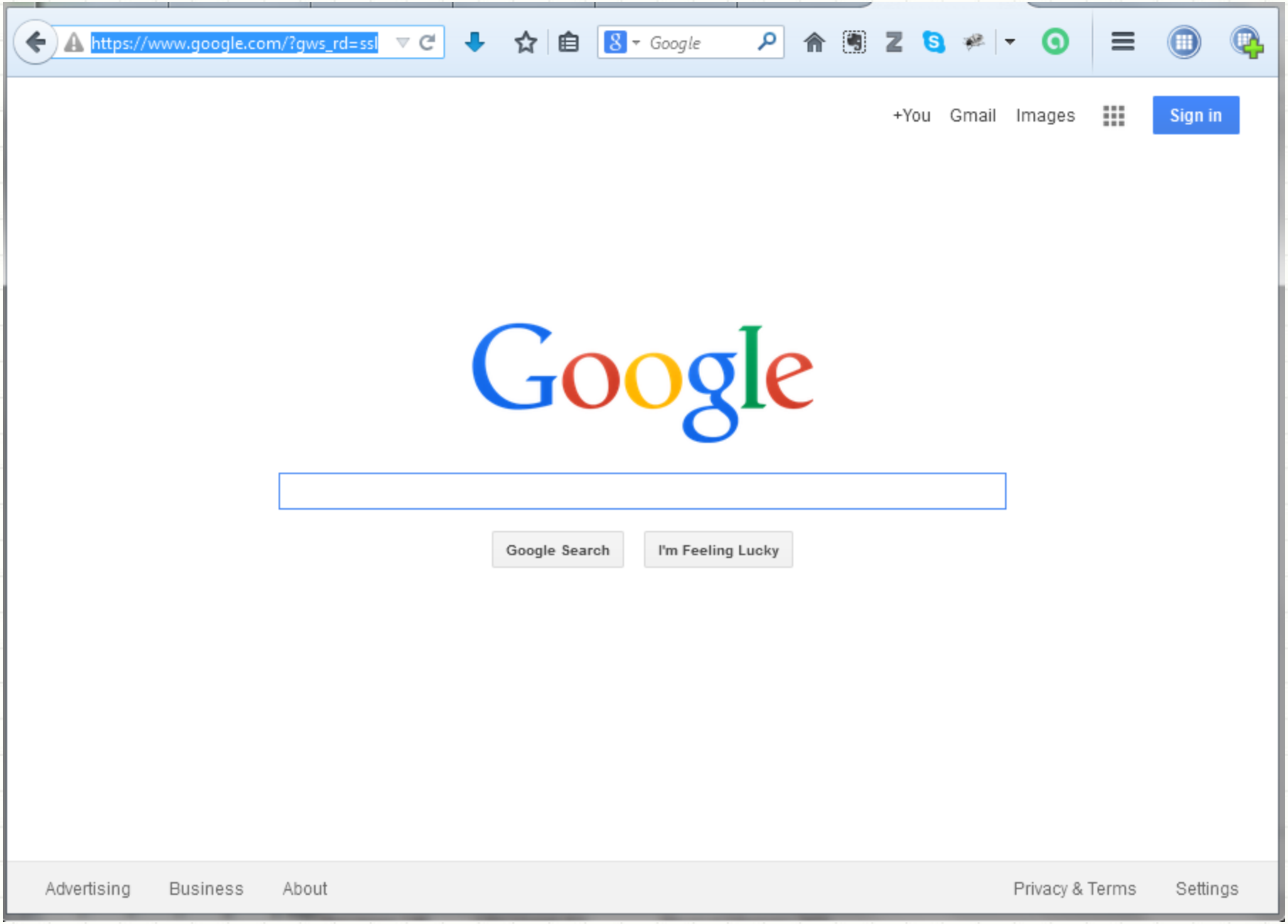
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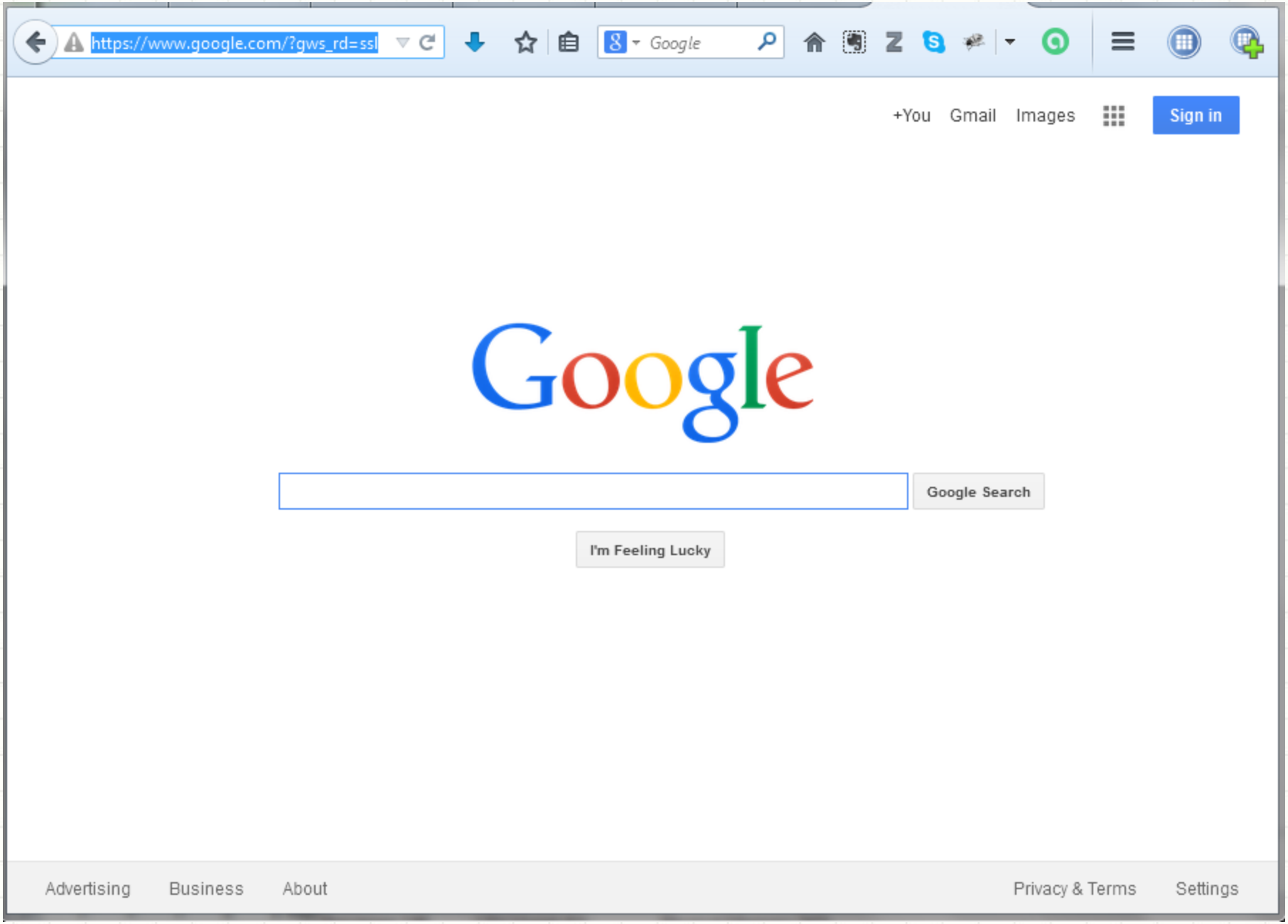
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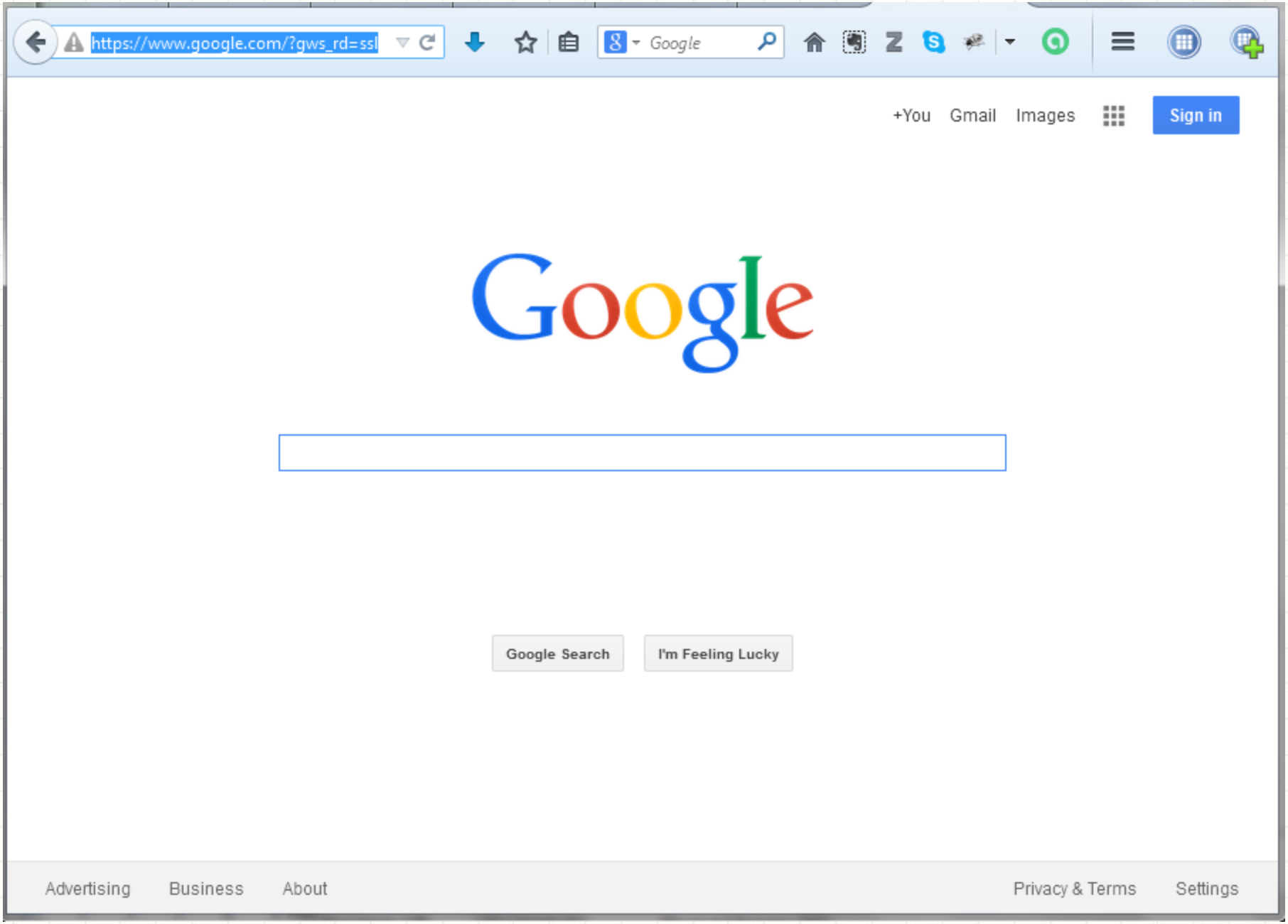
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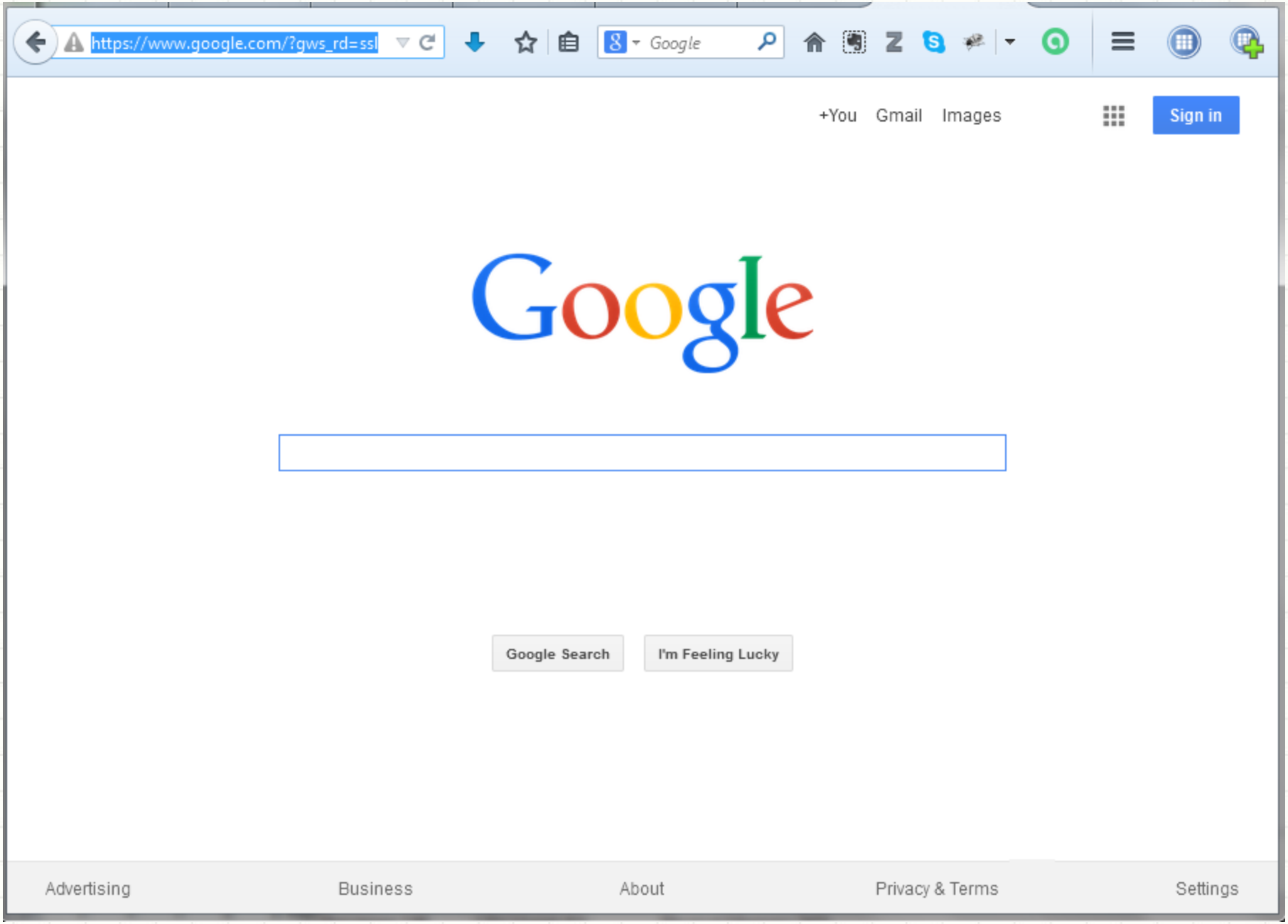
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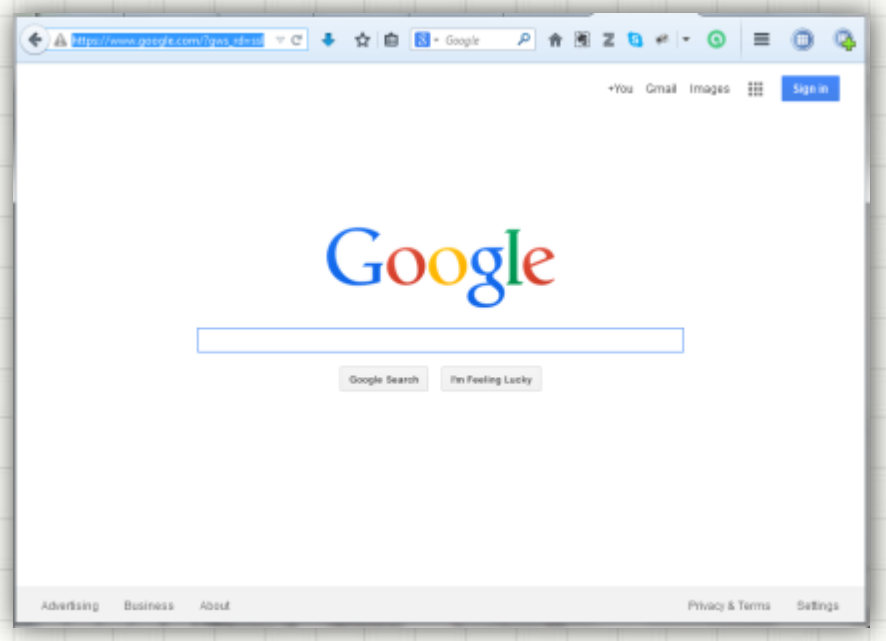
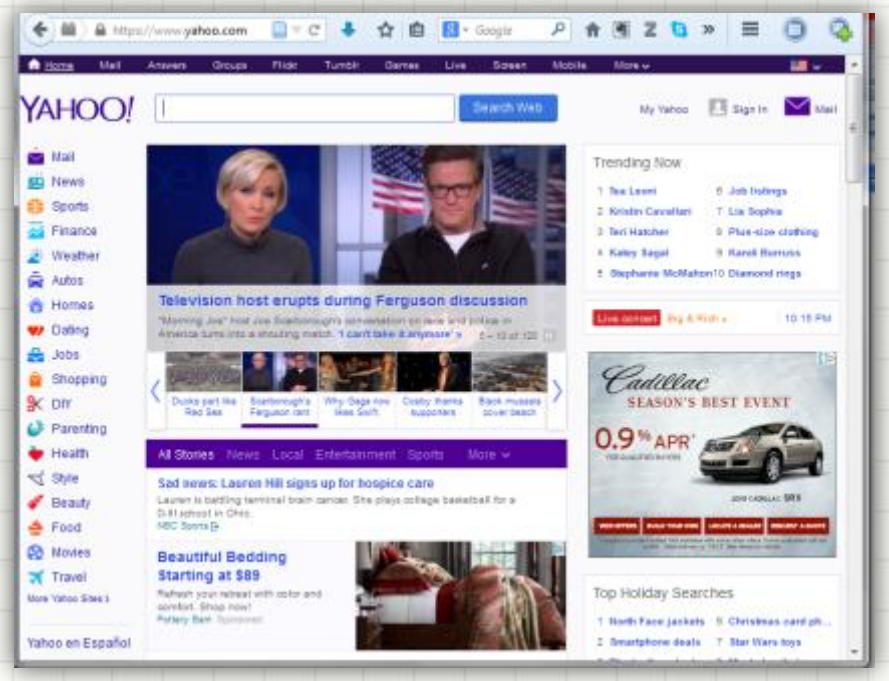
How they talk to their user?

What is their main message?





Gestalt

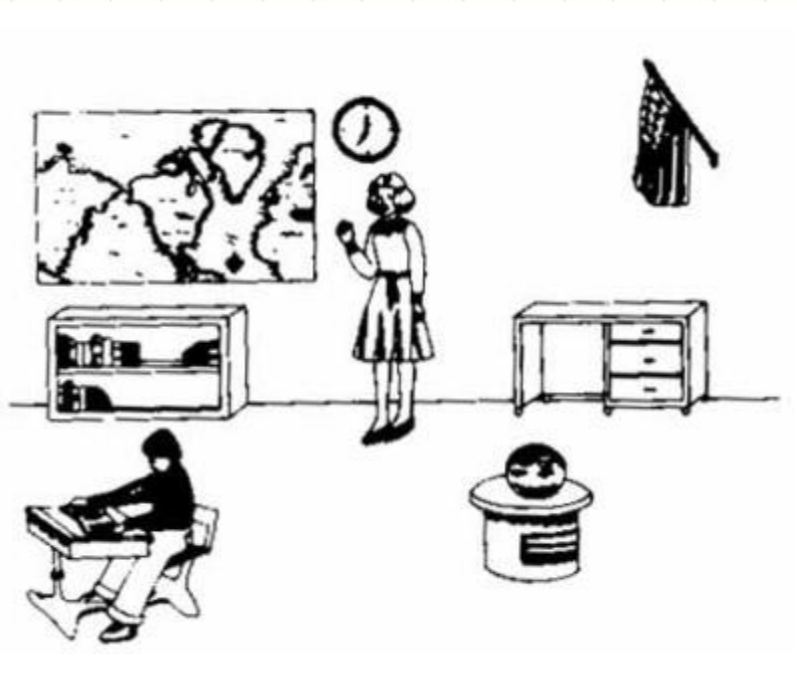
- German word for "**form**"
- In gestalt psychology it means "**unified whole**" or "**configuration**"

Gestalt Principles

a clip
a strip
one identity apart
something entirely different together...

the whole is greater than the sum of it's parts

Which is easier to remember?

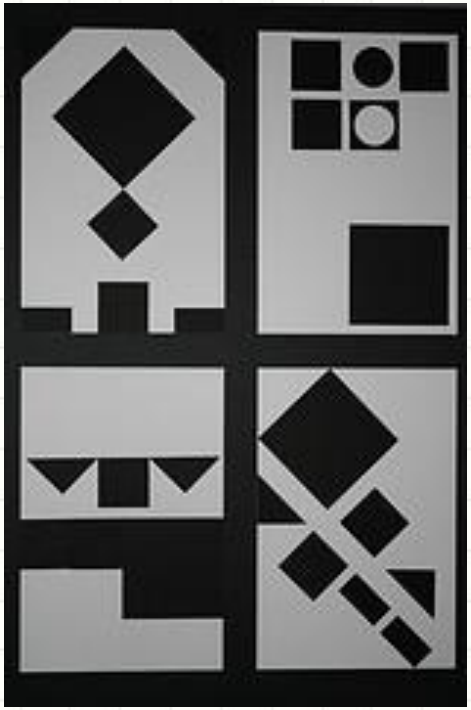


Gestalt Principles

- The **sum of whole** is greater than its **parts**.

- Each part have meaning on their own, but taken together, the meaning may change.

Law of Balance/Symmetry



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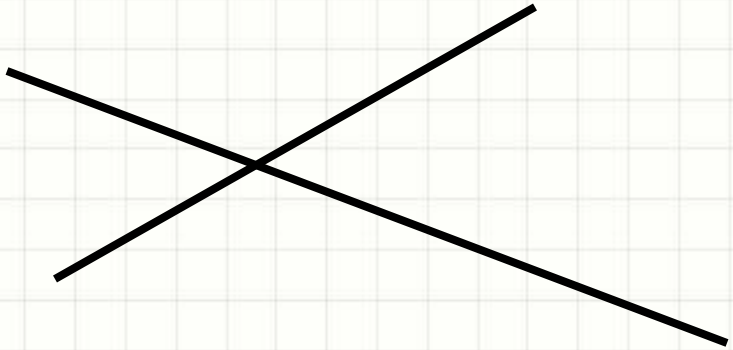
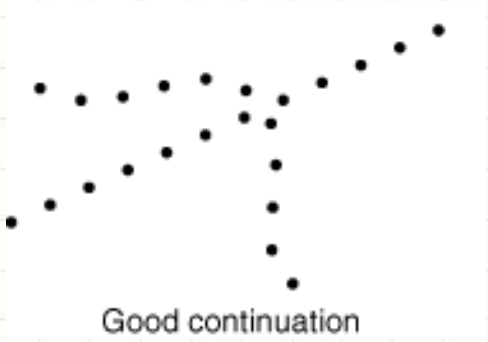
Law of Continuation





People tend to continue contours whenever the elements of a pattern establish an implied direction

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Outline
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Tools
View Source
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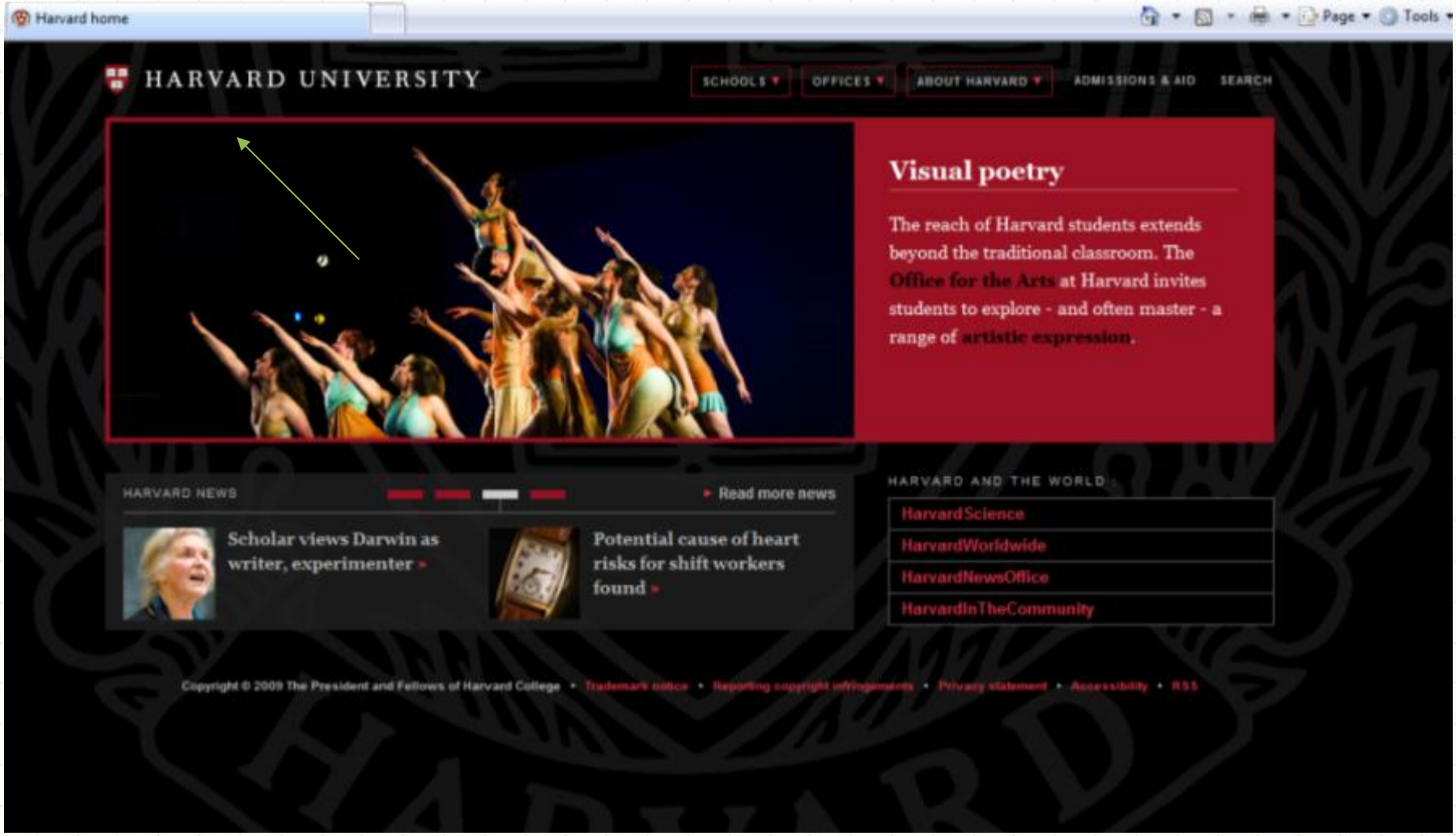
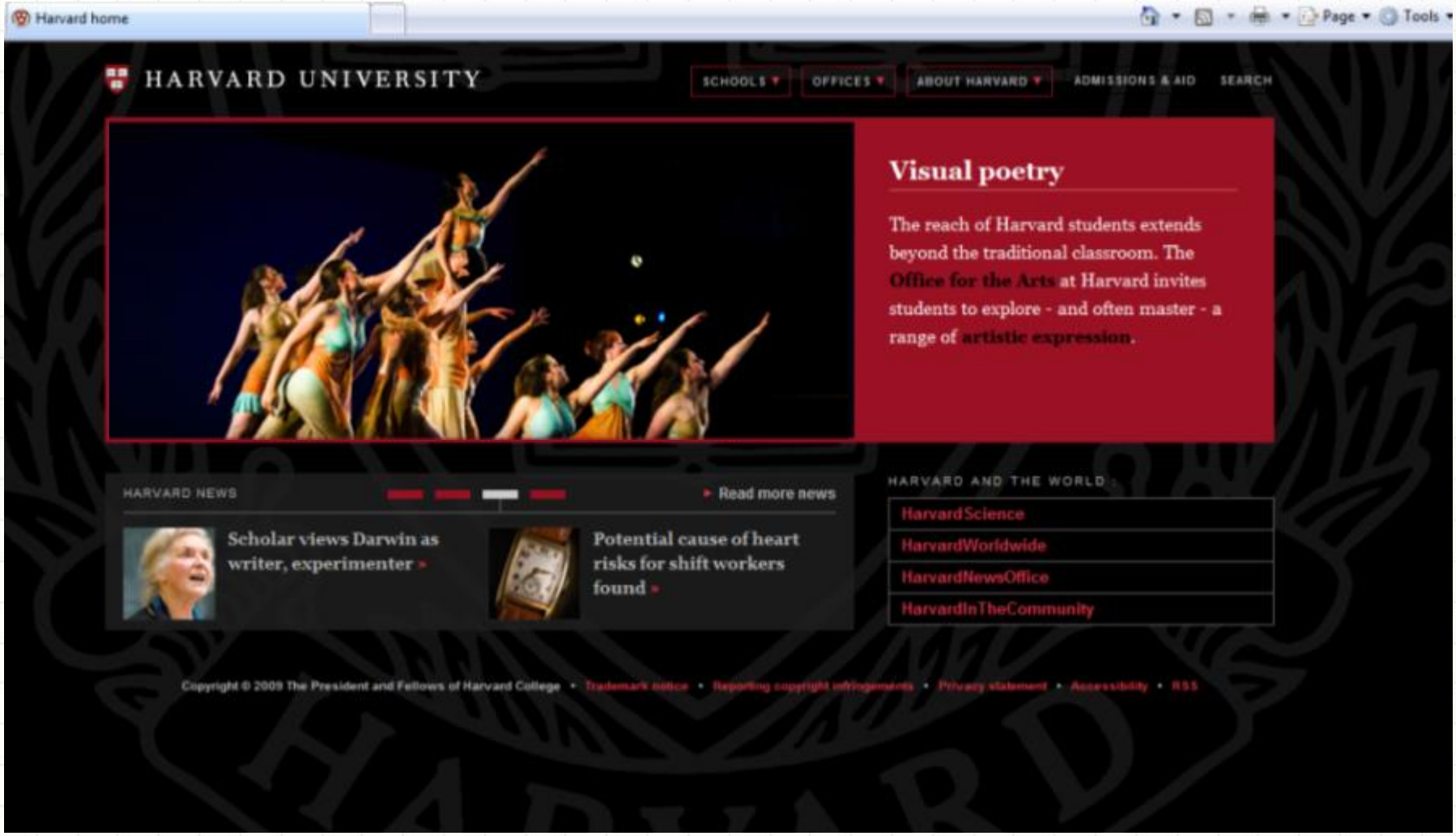


What if we change some lines?



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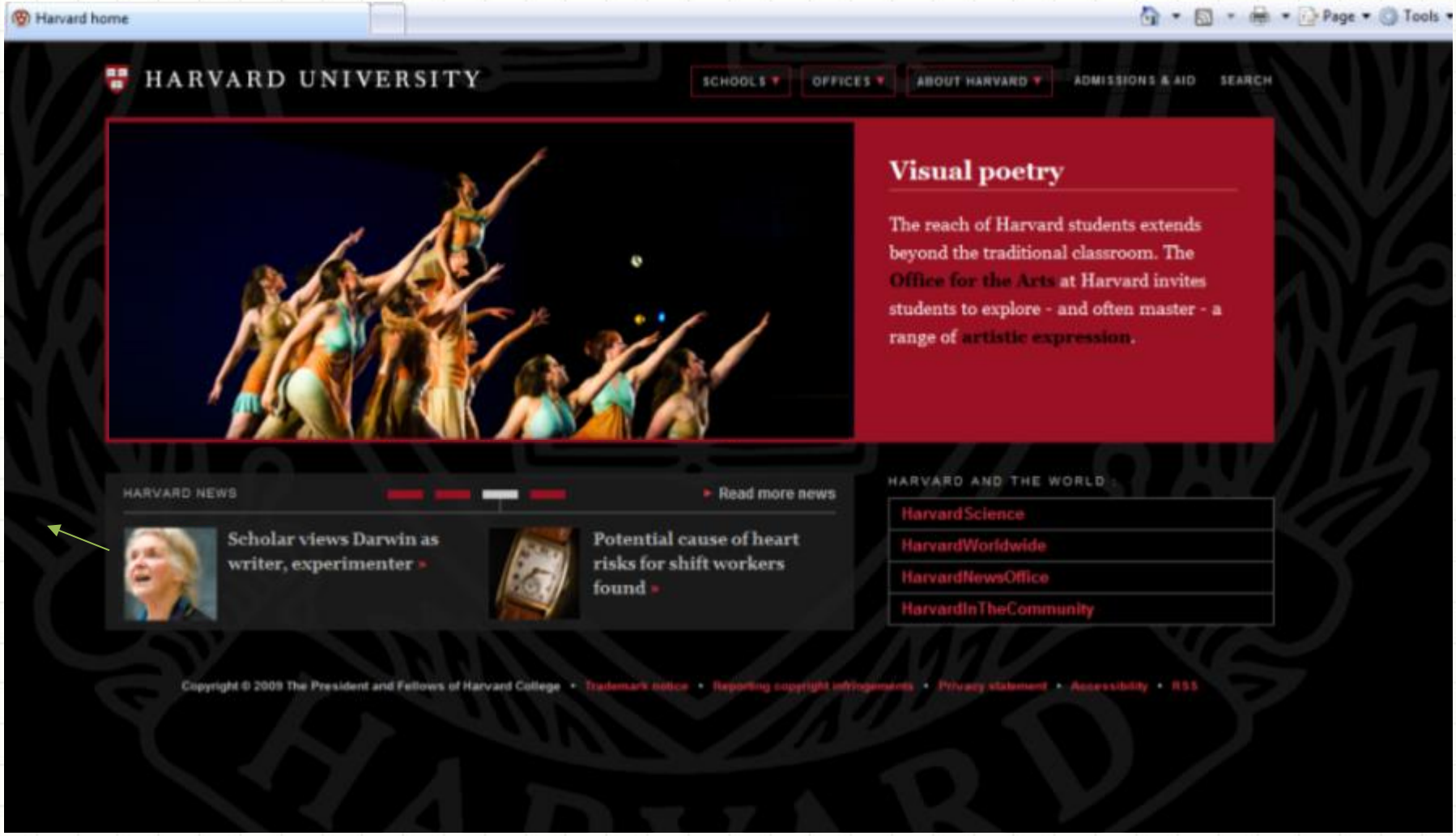

What if we change some lines?

- We will continue

We will continue

Questions?