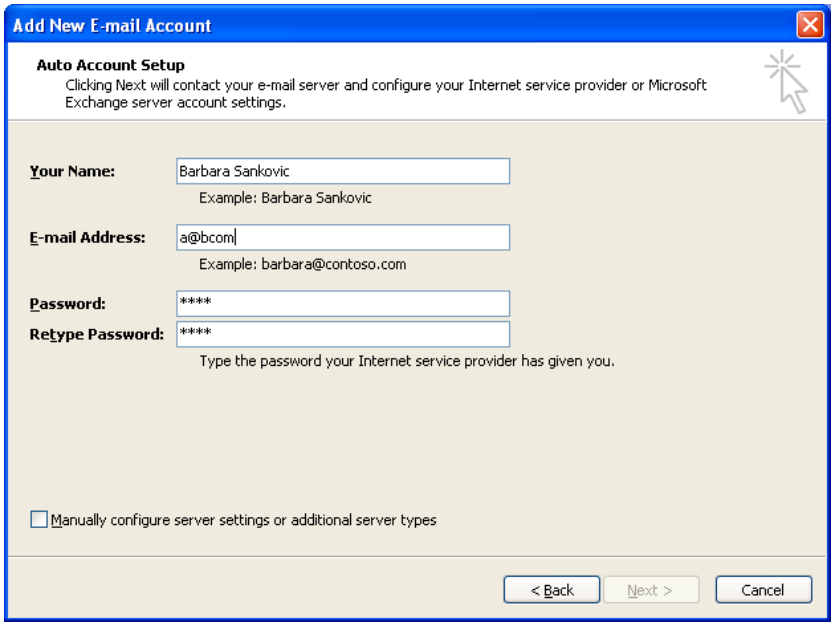
(Arbitrary) Example: MS Outlook 2007



Looking Back

- Types of design rules
  - Style guides
  - Design patterns
  - Standards
  - Golden rules and heuristics
  - Principles
- Basic HCI principles
  - **Learnability + Flexibility + Robustness**
    Predictability, Synthesizability, Familiarity, Generalizability, Consistency
    Dialogue Initiative, Multithreading, Task Migratability, Substitutivity, Customizability
    Observability, Recoverability, Responsiveness, Task Conformance
  - **Recognize User Diversity + 8 Golden Rules + Prevent Errors**
    Consistency, Shortcuts, Feedback, Closure,
    Prevent Errors, Reversal, Control, Memory Load

Principle 3: Prevent Errors - Classical Techniques

(Note: golden rule number 5 discusses the same topic on higher level…)

A few classical “tricks” to prevent errors (Source: Shneiderman)

- Correct matching pairs
  - Examples: { } in program text, <B>**bold**</B> in HTML
  - Prevention: insert both brackets in one action; or remind of missing bracket
- Complete sequences
  - Assistance to complete a sequence of actions to perform a task
    - » For advanced users: planning and editing the sequence
  - Examples: log-on sequences, wizards, scripts
- Command correction
  - Aim: Trying to prevent users entering incorrect commands
    - » Examples: file completion on Unix / helpful error messages / menus instead of commands

What is an “error” after all?

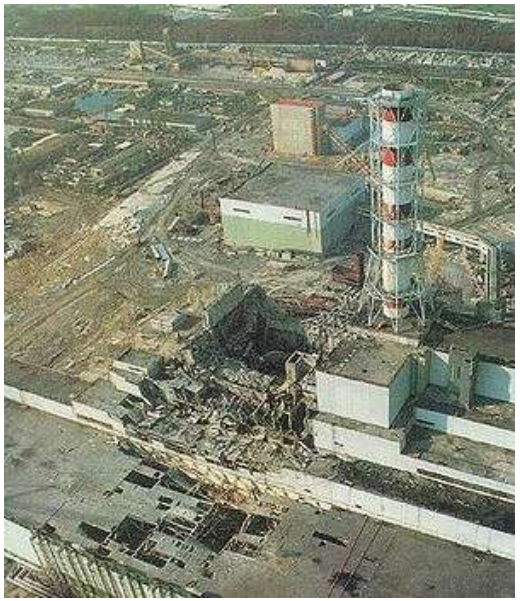
Human Errors, 1986

Space Shuttle Challenger accident

- NASA overrode safety warnings from engineers about the seals of the solid rocket boosters. Engineers warned that the O-ring seals failed repeated tests under the cold conditions the morning of the Challenger launch, but NASA ignored the red flags and went ahead anyway. What seemed like a small part eventually turned catastrophic.

Chernobyl nuclear reactor accident

- At Chernobyl, a group of scientists intentionally deactivated several safety systems in order to test a cooling system at reactor 4 and led to the worst nuclear accident in history.



Human Error as the Ultimate Explanation

Deadly crash on German monorail

Twenty-three people died and 10 were injured when an elevated magnetic train ploughed into a maintenance vehicle in north-western Germany.

Rescuers had to use ladders and cranes to reach the train

The train, which floats on a monorail via a magnetic levitation system called maglev, was going at nearly 200km/h (120 mph) when it crashed near Lathen.

Damaged carriages were left balancing on track 5m (16ft) in the air, hampering rescue efforts.

'Human error'

The maintenance vehicle hit by the train had two crew members.

A spokesman for IABG, the company which operates the train, said the accident had been caused by human error, rather than a technical fault.

http://news.bbc.co.uk/1/hi/world/europe/5370564.stm

Bei der Analyse der Unfallursachen stützt sich der Bericht laut «Nordwest-Zeitung» auf zwei Gutachten zu dem Unglück: Nach Ansicht der Gutachter verstieß der Fahrdienstleiter gegen die Betriebsvorschriften, weil er die elektronische Streckensperre nicht setzte. Als weitere Ursache wird die Missachtung des Vier-Augen-Prinzips im Leitstand der Teststrecke genannt.

http://www.netzeitung.de/politik/deutschland/720674.html

Human Errors and Management

TAIPEI TIMES

Published on TaipeiTimes
http://www.taipeitimes.com/News/taiwan/archives/2003/10/18/2003072381

Fighter pilots find panic button at last

MISTAKE MANAGEMENT: Two crashes blamed on human error have prompted the developers of the IDF to remind the air force about a built-in emergency function

By Brian Hsu
STAFF REPORTER
Saturday, Oct 18, 2003, Page 4

Although Taiwan's Indigenous Defense Fighter (IDF) has an emergency function that minimizes the chance of a plane crash due to human error, pilots have only now found out about it.

The previous two accidents involving IDFs this year were caused by human error, defense sources said yesterday.

"The crash was also caused by the negative G-force which the flight instructor created

…In an attempt to prevent similar accidents in future, the air force has asked the AIDC to help teach pilots how to use the fighter's emergency function.

Human Errors

The Official Google Blog

Insights from Googlers into our products, technology, and the Google culture.

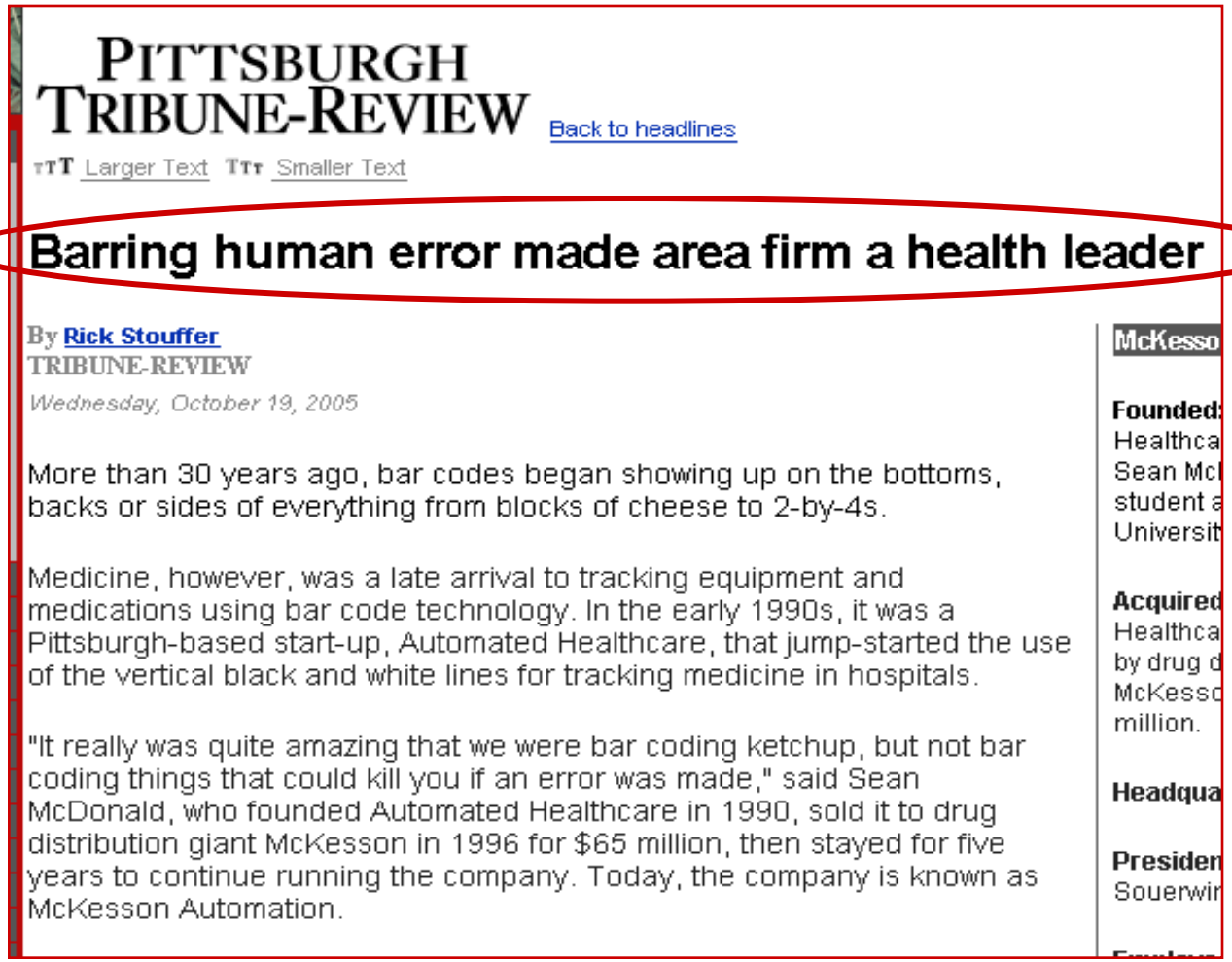
'This site may harm your computer" on every search result?!?!

1/31/2009 09:02:00 AM

What happened? Very simply, human error. Google flags search results with the message "This site may harm your computer" if the site is known to install malicious software in the background or otherwise surreptitiously. We do this to protect our users against visiting sites that could harm their computers. We maintain a list of such sites through both manual and automated methods. We work with a non-profit called StopBadware.org to come up with criteria for maintaining this list, and to provide simple processes for webmasters to remove their site from the list.

We periodically update that list and released one such update to the site this morning. Unfortunately (and here's the human error), the URL of '/' was mistakenly checked in as a value to the file and '/' expands to all URLs.

Human Error and Commercial Success



PITTSBURGH TRIBUNE-REVIEW Back to headlines

TT Larger Text Tt Smaller Text

Barring human error made area firm a health leader

By Rick Stouffer
TRIBUNE-REVIEW
Wednesday, October 19, 2005

More than 30 years ago, bar codes began showing up on the bottoms, backs or sides of everything from blocks of cheese to 2-by-4s.

Medicine, however, was a late arrival to tracking equipment and medications using bar code technology. In the early 1990s, it was a Pittsburgh-based start-up, Automated Healthcare, that jump-started the use of the vertical black and white lines for tracking medicine in hospitals.

"It really was quite amazing that we were bar coding ketchup, but not bar coding things that could kill you if an error was made," said Sean McDonald, who founded Automated Healthcare in 1990, sold it to drug distribution giant McKesson in 1996 for $65 million, then stayed for five years to continue running the company. Today, the company is known as McKesson Automation.

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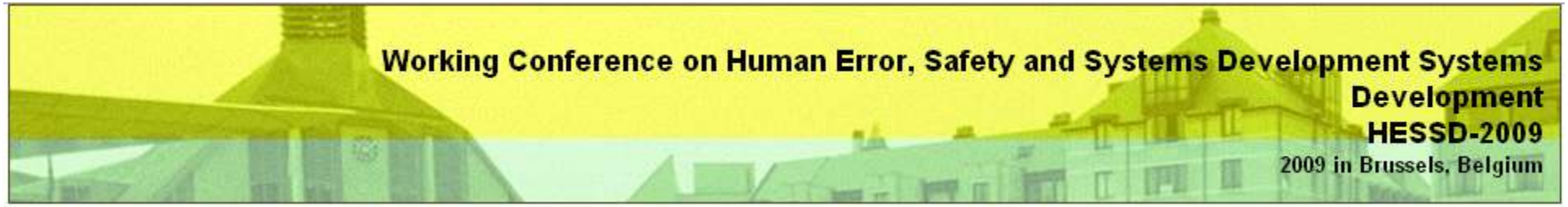
- http://pittsburghlive.com/x/tribune-review/business/s_385507.html

Tackling Errors

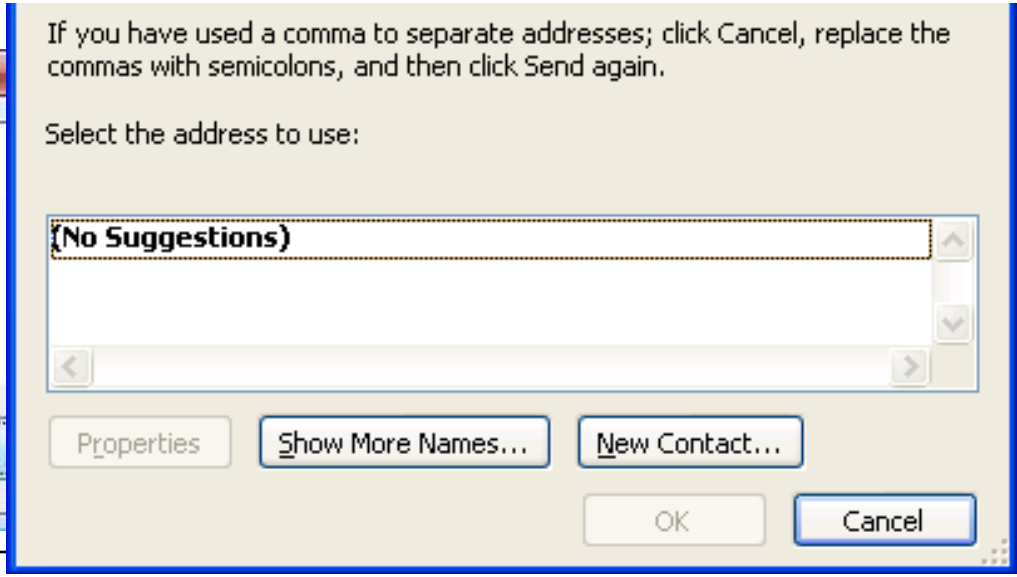


Our intention is to focus the working conference upon techniques that can be easily integrated into existing systems engineering practices. With this in mind, we hope to address a number of different themes:

- techniques for incident and accident analysis;
- empirical studies of operator
- behaviour in safety-critical systems
- observational studies of safety-critical systems
- risk assessment techniques for interactive systems
- safety-related interface design
- development and testing

About (Human) Errors…

- “If an error is possible, someone will make it” (Norman)
- Human errors may be a starting point to look for design problems
- Design implications
  - Assume all possible errors will be made
  - Minimize the chance to make errors (constraints)
  - Minimize the effect that errors have (is difficult!)
  - Include mechanism to detect errors
  - Make actions reversible



Understanding Errors

- Errors are routinely made
  - Communication and language is used between people to clarify – more often than one imagines
  - Common understanding of goals and intentions between people helps to overcome errors
- Two fundamental categories
  - Mistakes
    - » overgeneralization
    - » wrong conclusions
    - » wrong goal
  - Slips
    - » Result of “automatic” behaviour
    - » Appropriate goal but performance/action is wrong

Norman, Chapter 5

Understanding the Types of Slips Users Make

- Capture errors
  - Two actions with common start point, the more familiar one captures the unusual (driving to work on Saturday instead of the supermarket)
- Description errors
  - Performing an action that is close to the action that one wanted to perform (putting the cutlery in the bin instead of the sink)
- Data driven errors
  - Using data that is visible in a particular moment instead of the data that is well-known (calling the room number you see instead of the phone number you know by heart)
- Associate action errors
  - You think of something and that influences your action (e.g. saying come in after picking up the phone)
- Loss-of-Activation error (~ forgetting)
  - In a given environment you decided to do something but when leaving then you forgot what you wanted to do. Going back to the start place helps you remember
- Mode error
  - You forget that you are in a mode that does not allow a certain action or where a action has a different effect

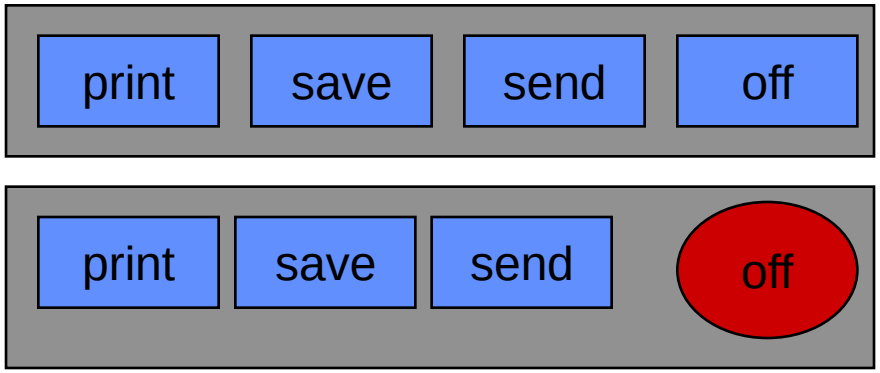
Norman, Chapter 5

Preventing Description Errors

- Related to Gestalt theory

- Example Car
  - Different openings for fluids, e.g. oil, water, break, …
  - Openings differ in
    - » Size
    - » Position
    - » Mechanism to open
    - » Color

- Design recommendations
  - Make controls for different actions look different



Preventing Mode Errors

- Why use modes in the first place?
  - User interface trade-off (e.g. number of buttons needed can be reduced, actions within a mode can be speeded up)
- Design recommendations
  - Minimize number of modes
  - Make modes always visible
- Example alarm clock
  - Mode vs. mode free
  - Visualization of mode

Setting time and alarm with mode

Setting time and alarm without mode

3 Basic HCI Principles and Models

Background: The Psychology of Everyday Action

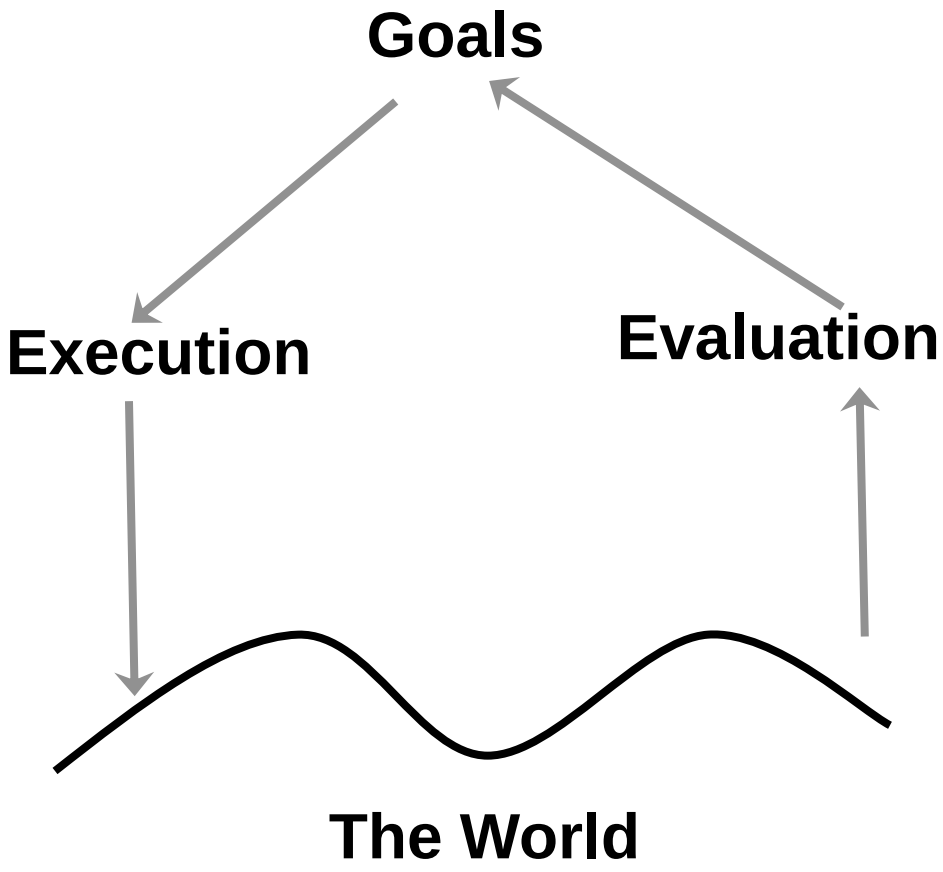
- People are blaming *themselves* for problems caused by design
  - If the system crashes and the user did everything as he is supposed to do the developer/system is blamed
  - If the system crashes and the user operated the system wrongly the user is blamed
- People have misconceptions about their actions
  - The model needs not be fully correct – it must explain the phenomenon
- People always try to explain actions and results
  - Random coincidence may lead to assumptions about causality

(Norman 2002, Chapter 2)

Action Cycle

- The action is goal directed
  - What do we want to happen?
  - What is the desired state?

- Human action has two major aspects
  - Execution:
    what we do to the world
  - Evaluation:
    compare if what happens is what we want



Action Cycle
Stages of Execution

- Goal

  translated into

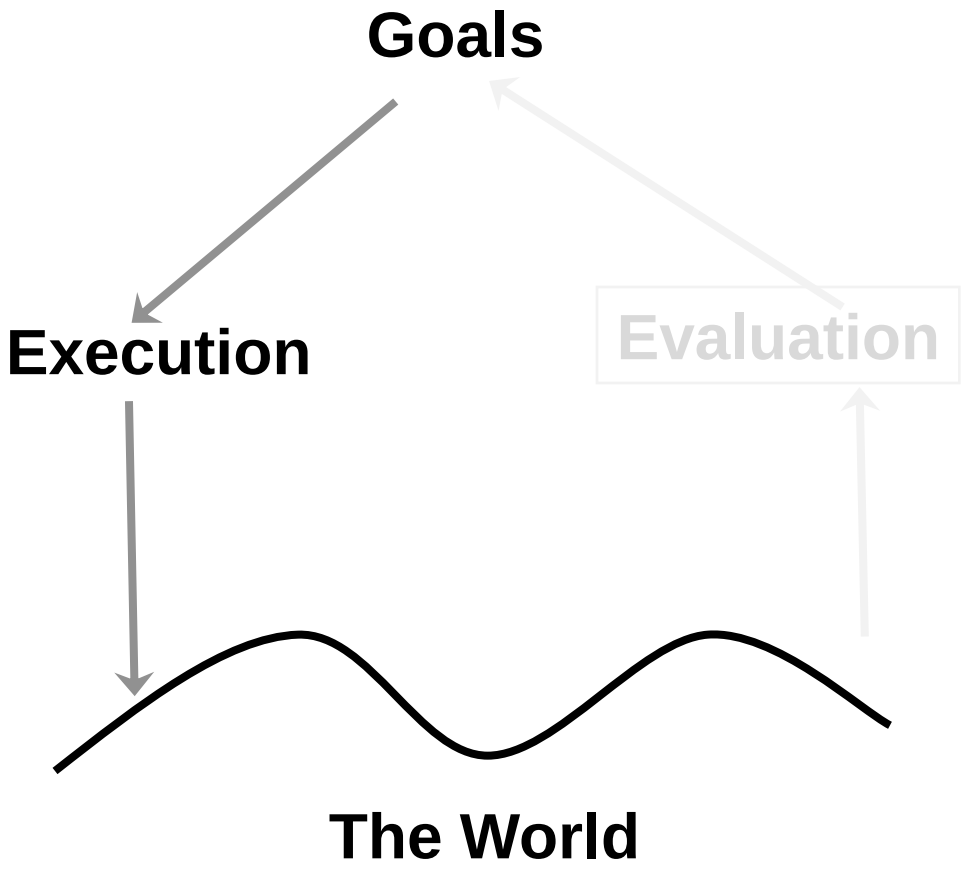
- An intention to act as to achieve the goal

  translated into

- The actual sequence of actions that we plan to do

  translated into

- The physical execution of the action sequence



Action Cycle
Stages of Evaluation

- Perceiving the state of the worlds

  followed by

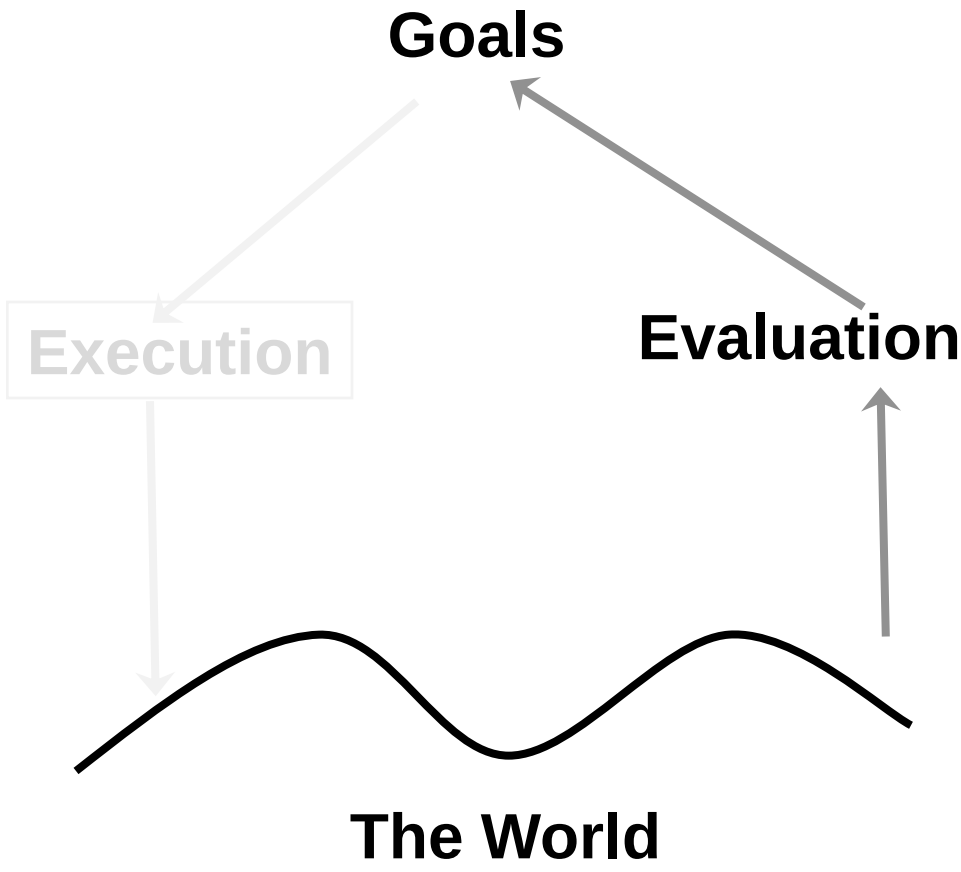
- Interpreting the perception according to our expectations

  followed by

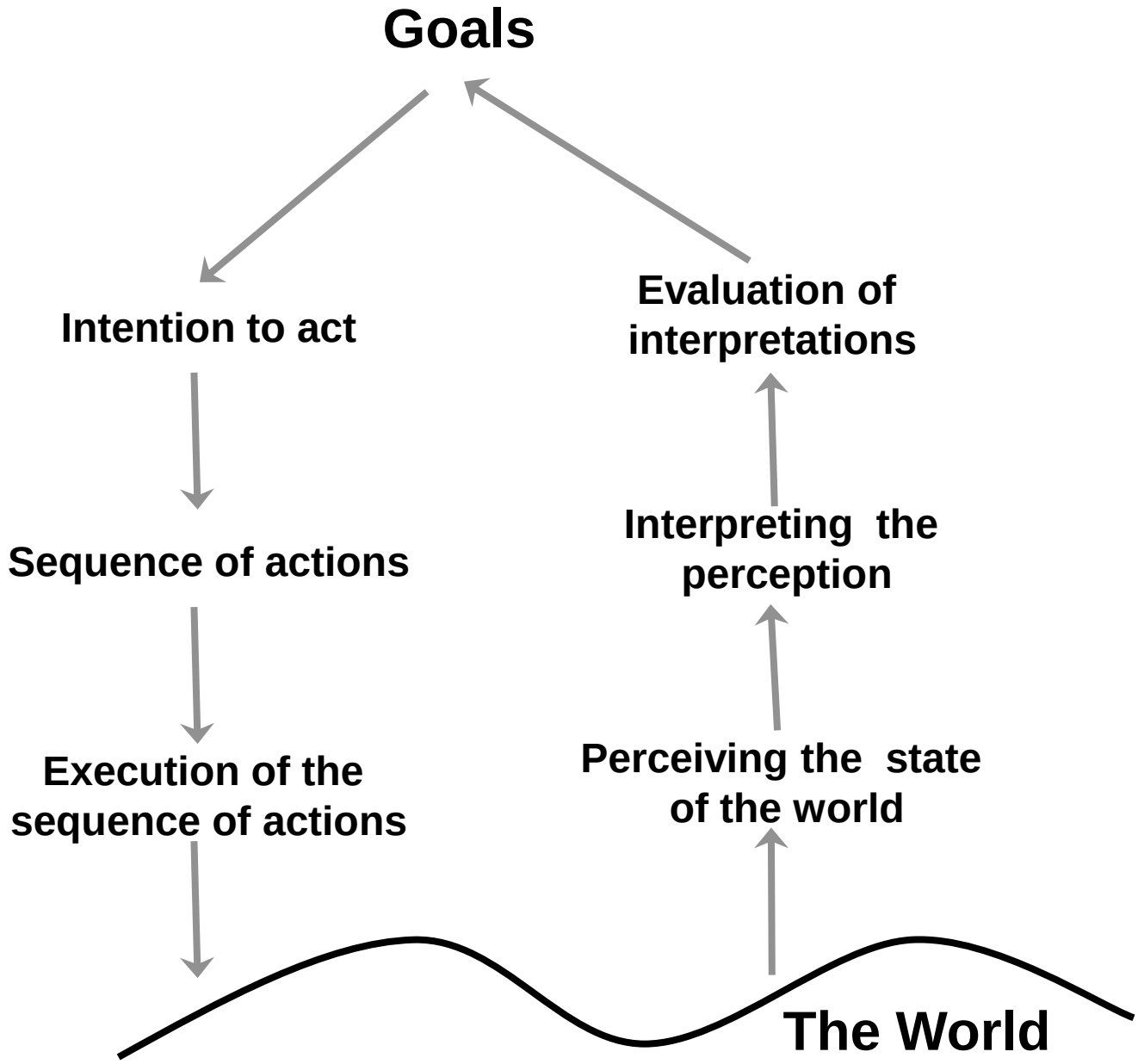
- Evaluation of the interpretations with what we expected to happen (original intentions)

  followed by

- Goal

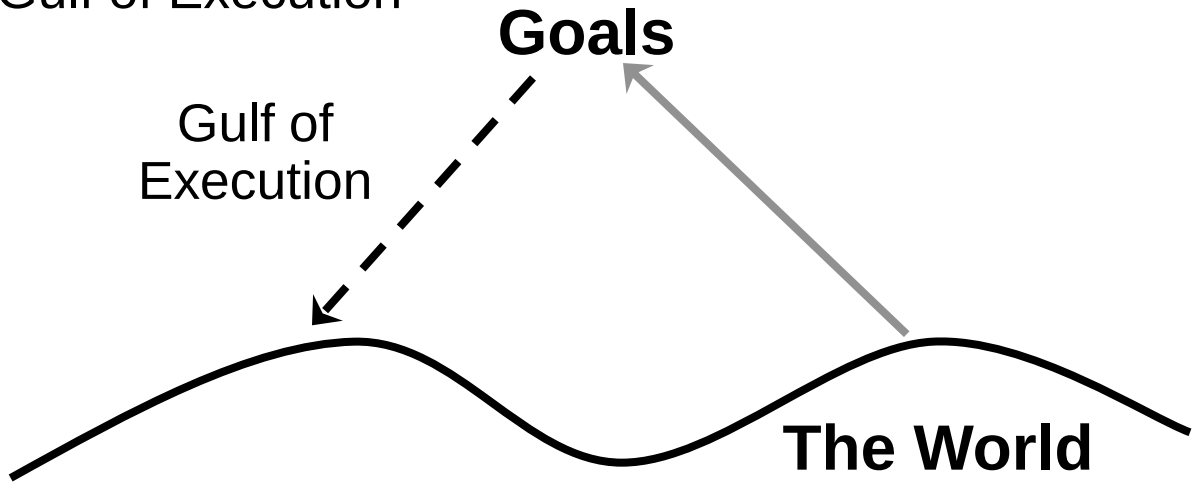


Seven Stages of Action



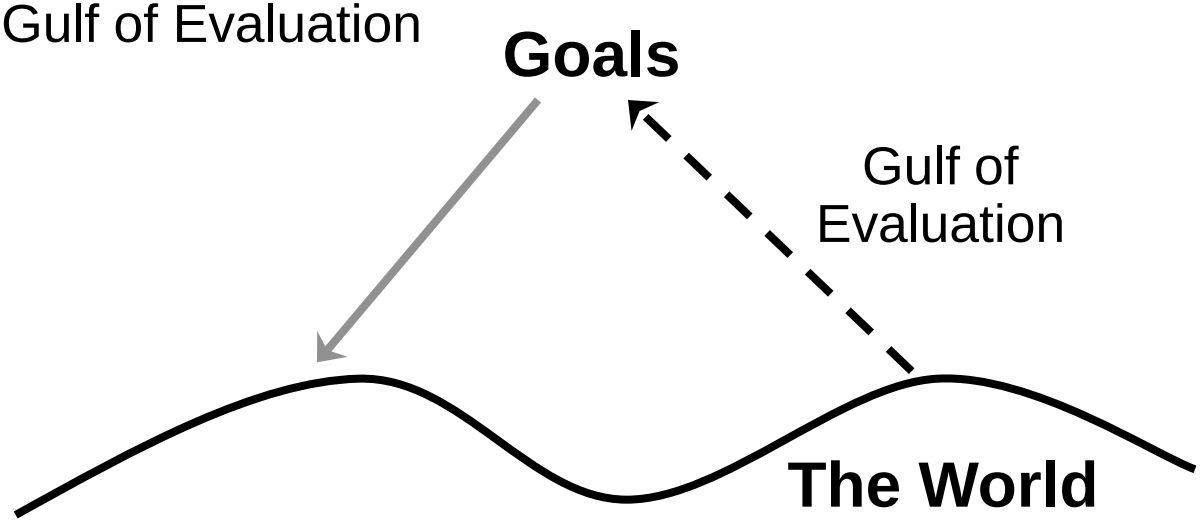
Gulf of Execution

- The difference between the intentions and the allowable actions is the Gulf of Execution
  - How directly can the actions be accomplished?
  - Do the actions that can be taken in the system match the actions intended by the person?
- Example:
  - The user wants a document written on the system in paper (the goal)
  - What actions are permitted by the system to achieve this goal?
- Good design minimizes the Gulf of Execution



Gulf of Evaluation

- The Gulf of Evaluation reflects the amount of effort needed to interpret the state of the system how well this can be compared to the intentions
  - Is the information about state of the system easily accessible?
  - Is it represented to ease matching with intentions?
- Example in GUI
  - The user wants a document written on the system in paper (the goal)
  - Is the process observable? Are intermediate steps visible?
- Good design minimizes the Gulf of Evaluation



Evaluation and Design Questions

- Execution
  - Can the user tell what actions are possible?
  - Does the interface help with mapping from intention to physical movement?
  - Does the device easily support required actions?
- Evaluation
  - Can the user tell if the system is in the desired state?
  - Can the user map from the system state to an interpretation?
  - Can the user tell what state the system is in?

Implications on Design

- Principles of good design (Norman)
  - Stage and action alternatives should be always visible
  - Good conceptual model with a consistent system image
  - Interfaces should include good mappings that show the relationship between stages
  - Continuous feedback to the user

- Critical points/failures
  - Inadequate goal formed by the user
  - User does not find the correct interface / interaction object
  - User many not be able to specify / execute the desired action
  - Inappropriate / mismatching feedback

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