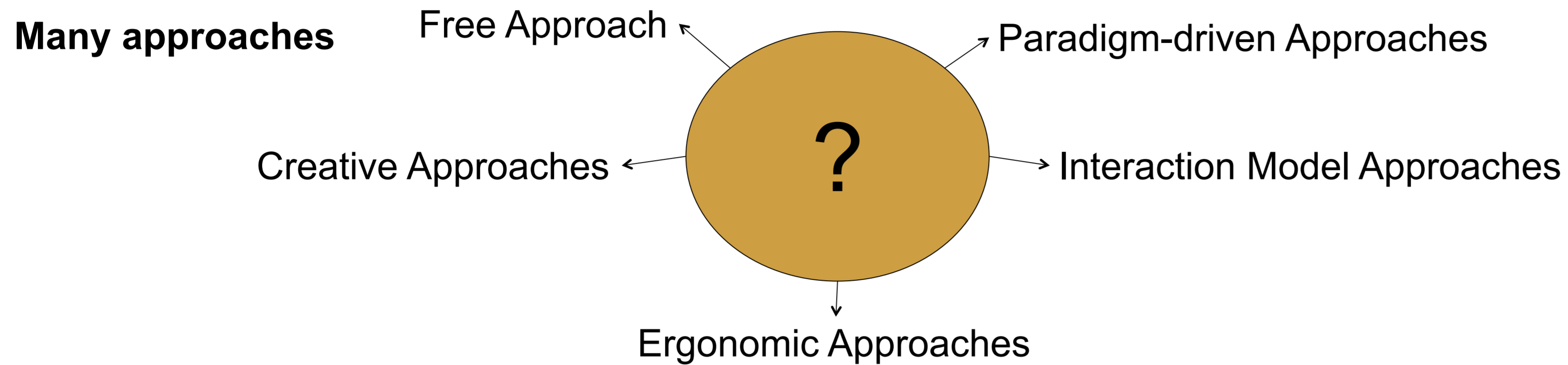


Methods for Designing Tangible UI: A First Comparative Case Study

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Problem: How to find the most appropriate method for designing your Tangible UI?



Many criteria for comparison, e.g.

- Quality of results,
- Ease of understanding by designers,
- Number of alternatives designed,
- Rapidity of use,
- Similarity between results,
- ...

Solution in Progress: Comparative Workshops

Aim: Start to unveil comparative *benefits and drawbacks* of each approach

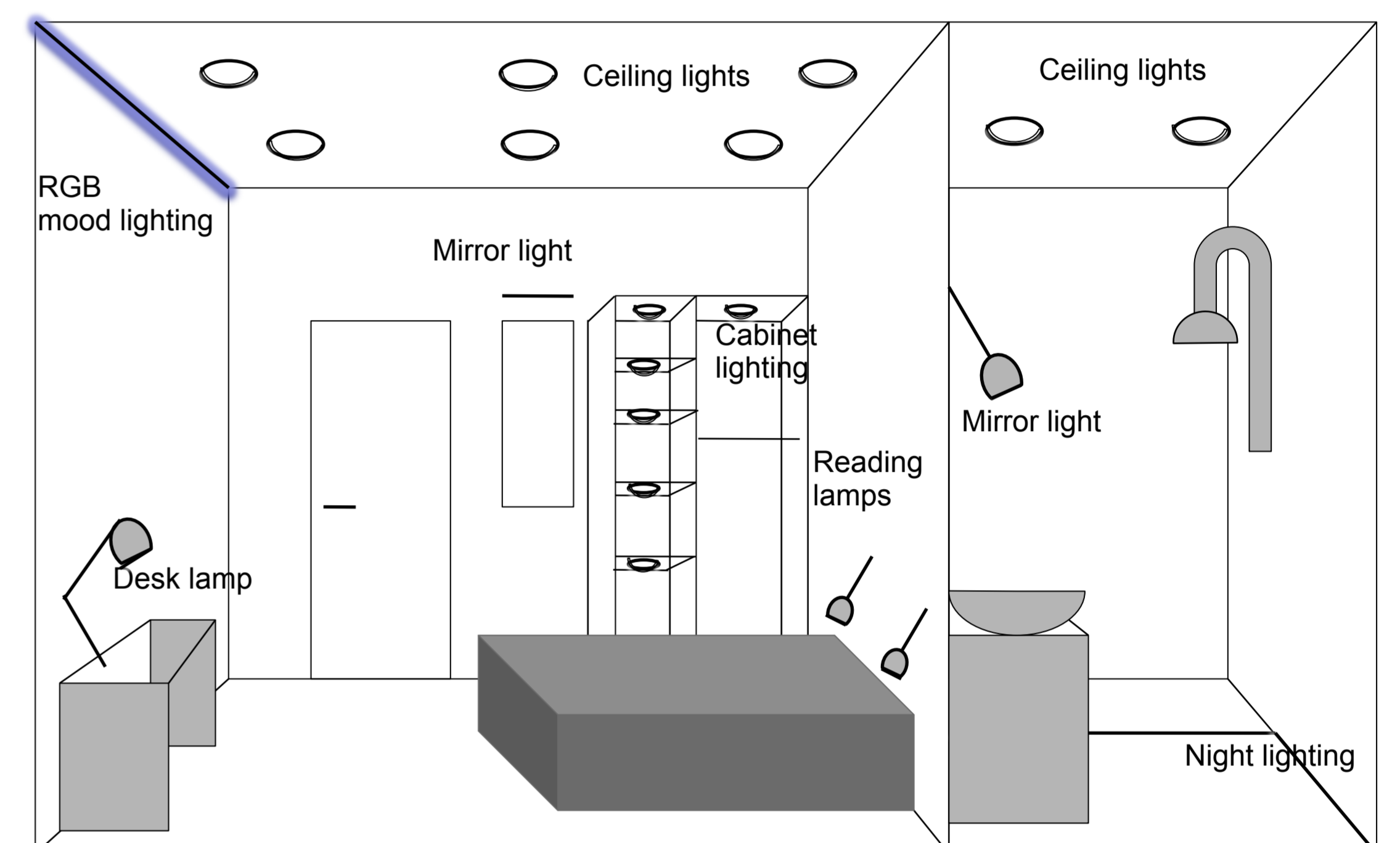
Participants: Senior researchers, PhD students and Post-doctoral researchers, with experience in TUI design or with a long term awareness of TUIs

Process: Each group of 2 or 3 participants used a different method to design a TUI

Workshop Case Study: Designing a TUI for LED Lighting

LEDs are embedded in a hotel room and digitally controlled by a TUI:

- Turn all lights on/off, e.g. when leaving the room
- Choose among predefined scenarios, e.g., arriving, night reading, relaxing, sleeping, etc.
- Choose a particular LED module to vary its heat/color or its intensity. E.g., customize the intensity of a bedside lamp in order to read textual materials.
- Choose a particular area of the room to be illuminated, e.g., desk, cabinet, etc.



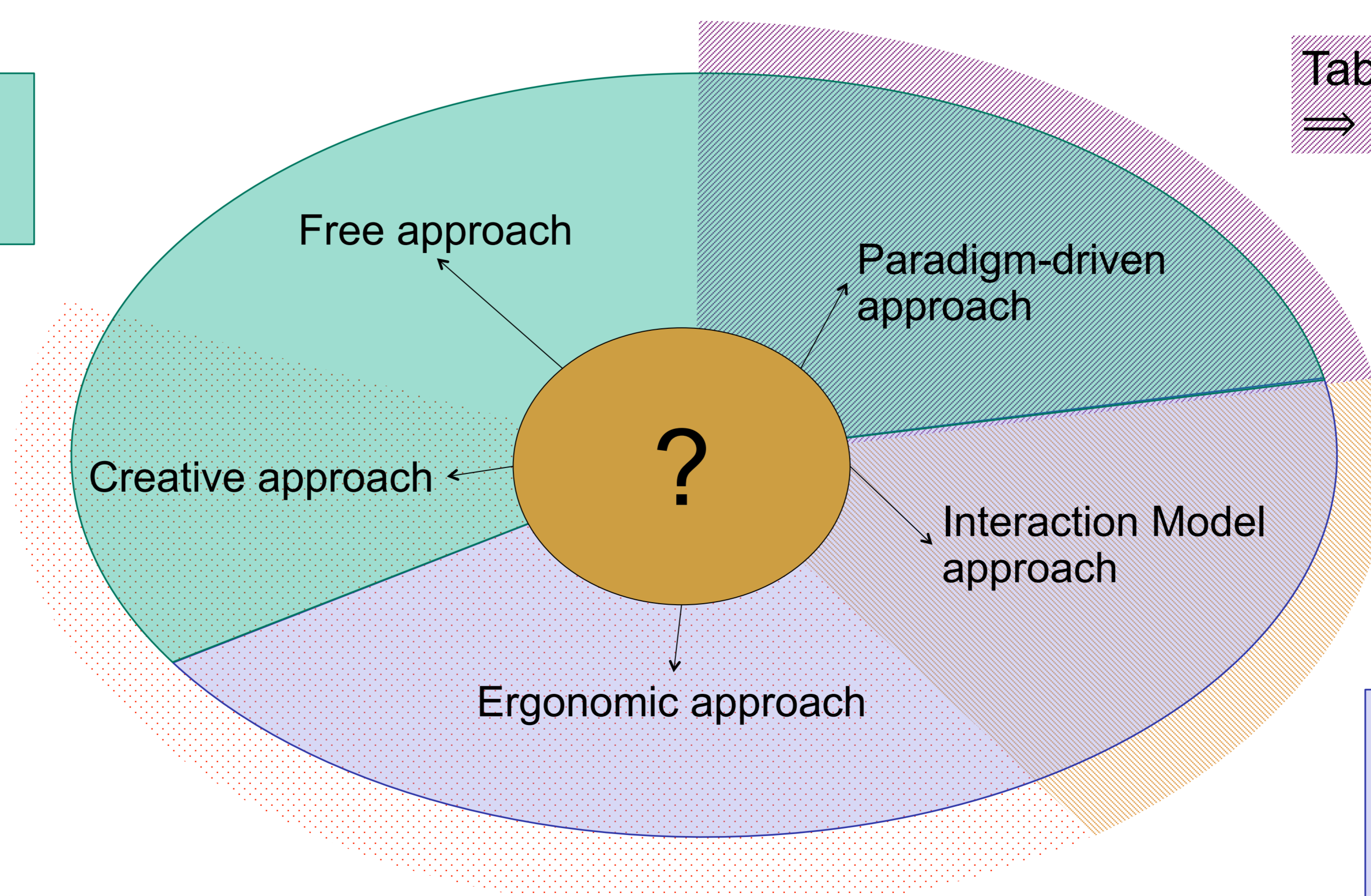
Design Groups Outcomes

Creative Approach	Paradigm-driven approach: Tabletop	Interaction Model approach	Ergonomic Approach	Free approach
Minimally-intrusive solution <ul style="list-style-type: none"> • Hotel keycard(s) placed in an array of slots, standing for scenarios, e.g., a welcome state, sleeping, etc. • Common devices, e.g., switches, overrule scenario setting • Graphical multi-touch interface integrated in the desk to control the lighting of the room 	Set of tangible tokens representing meaningful groups of lights, e.g., cooking area, living room or child's bed <ul style="list-style-type: none"> • Placed on the surface displaying the controls, e.g., the color space, in order to modify the lighting in the corresponding area • Keep control of private areas by hiding tokens, e.g., under a pillow or in a pocket 	Numerous solutions <ul style="list-style-type: none"> • Miniature room for pointing at lights and areas • Keycard of the hotel • Wall painting where a color or an ambiance can be selected • Spherical object with a laser <ol style="list-style-type: none"> 1. Orient to point at a target 2. Scale up/down to modify the light intensity • ... 	Minimally-intrusive + focused on relaxation <ul style="list-style-type: none"> • Only group having modified the initial hardware setup: proposed a ceiling covered with LEDs • User can draw lines on a tablet computer that are reproduced on the ceiling by the LEDs • Bath salts that control the color of light in the bathroom 	Personal object called Magic Light <p>User points towards its target, gestures from there:</p> <ol style="list-style-type: none"> 1. In opposite directions to turn on/off the light 2. Perpendicularly to change the color of the light 3. Can use a magic gesture, e.g., bump the wand, in order to retrieve its personal favorite light settings 4. Skin conductivity sets the light according to the affective state of the user

Workshop Results: Discussion

Low threshold: No effort, quick
⇒ Dependent on users' skills, difficulty to repeat

Forces studying existing interaction
⇒ Existing light switches kept
⇒ Good when large number of existing UIs



Tabletop constraint
⇒ Support for multiple users

- Proposed several design alternatives
- Redundancy with results from different approaches
⇒ Good for generation

High threshold: Learning effort, time consuming
⇒ Less dependent on users' skills, more easily repeated