# Human-Computer Interaction

Termin 6:
Designing Usable Systems

readings:

Dahm: „Grundlagen der MMI“, chapt. 7 and 8

Shneiderman: "Designing the User Interface", chapt. 2

Dix et al.: „Human Conputer Interaction“, chapt. 5+7

# Key questions for today

- What is a „good" system?
- How can we build it?

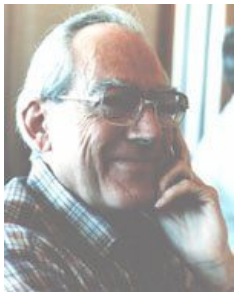
# Usability

- utility -
  will the system do what is needed functionally?

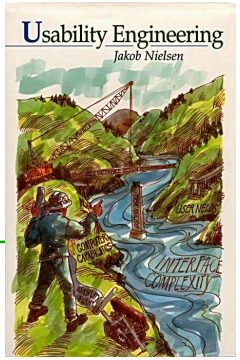
- usability -
  will the *users* actually work it successfully?
  Deutsch: „*Gebrauchstauglichkeit*“
  (zentraler Begriff der Software-Ergonomie)

  - Shackel (1991):
    „*Usability is the capability to be used **easily** and **effectively** by the specified **range of users**, given specified **training** and user support, to fulfil the specified **ranges of task**, within the specified **range of scenarios**.*“

- Shackel (1990): 4 measures
  - **effectiveness** - performance in accomplishment of tasks--the access to potential utility
  - **learnability** - degree of learning to accomplish tasks - the effort required to access utility
  - **flexibility** - adaptation to variation in tasks - the range of tasks for which there is utility
  - **attitude** - user satisfaction with system - the manifestation of potential likeability



- Nielsen (1993): 5 measures
  - **effective** - can do things you want to get done
  - **efficient** - can do things with appropriate effort
  - easy to **learn** & to **remember**
  - **safe** to operate in all possible contexts
  - user **satisfication**

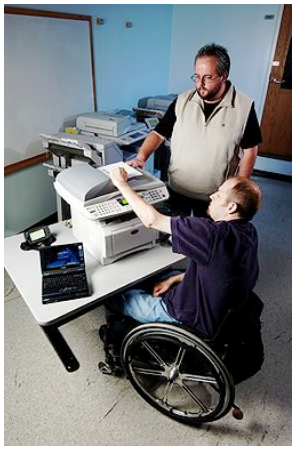


# Ergonomics of Human System Interaction Standard ISO 924

- Overview:
  - General Introduction, Guidance on task requirements
  - *Hardware*:
    Visual display requirements, Keyboard requirements, Workstation Layout and postural requirements, Environmental requirements, Display requirements with reflections, Requirements for displayed colours, Requirements for non-keyboard input devices
  - *Dialogues*:
    Dialogue Principles, Usability Statements, Presentation of information, User guidance
  - *Special dialogues*:
    Menu dialogue, Command dialogues, Direct manipulation dialogues, Form filling dialogues

# Accessibility & acceptability

- **accessibility** (*Barrierefreiheit*)
  - is the system always accessible for everybody, esp. for handicapped people?
  - physical, conceptual, economical, cultural, social



- **acceptability** (*Markt-Akzeptanz*)
  - does the system fit into people‘s life?
  - politically acceptable, convenient, cultural and social habits, useful (beyond usable, useful in context?), economic

# Engagement / Joy of use

- When a system is accessible, usable, and acceptable, **engagement** concerns all qualities that make it memorable, satisfying, enjoyable and rewarding
- several key elements (Shedroff, 2001):
  - identity & authenticitiy (are you a „Mac person“?)
  - adaptivity with change of difficulty, pace, movement
  - narrative (tells a good story)
  - immersion (gives feeling of being wholly involved)
  - flow (gradual change between states, keeps you in)

# The main goal of interaction design

designing for maximum **usability**

there can be other secondary goals, just as important

- engagement and fun, e.g. in computer games
- …

# Designing interactive systems

Design **interactions** not just interfaces

- How the user should be working with the system
- Think not just of the immediate interaction between user and system, e.g. stapler in office – technology changes whole working style
  - manual: write, print, staple, write, print, staple, …
  - electric: write, print, write, print, …, staple

Designing **interventions** not just artefacts

- not just the system, but also …
  - documentation, manuals, tutorials
  - whole experience - what we see, read, say, do, etc.

# *User-centered* design (UCD)

- design philosophy in which the **needs**, **wants** and **limitations** of the **end user** of a computer product or computer interface are given extensive attention at **each** stage of the design process

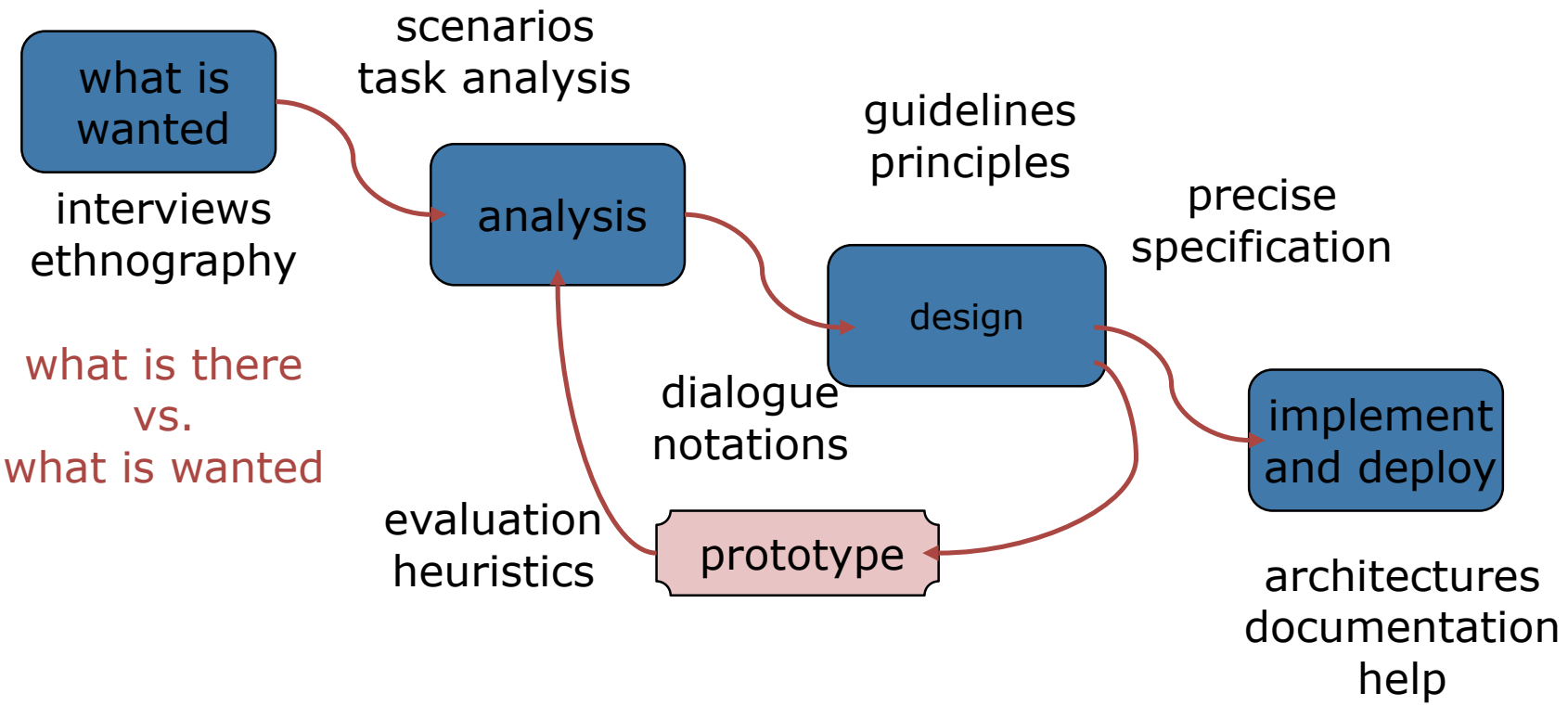
- a **multi-stage** problem solving process that not only requires designers to **analyze** and **foresee** how users are likely to use an interface, but to **test** the validity of their assumptions with regards to real user behavior

# Various methods in user-centered design

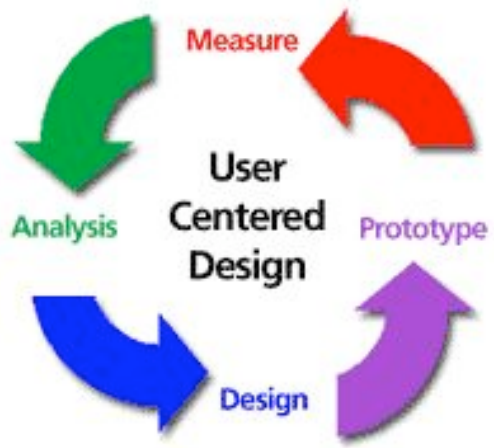
- Field studies (including contextual inquiry)
- User requirement analysis
- Iterative design
- Usability evaluation
- Task analysis
- Focus groups
- Formal heuristic evaluation
- User interviews
- Surveys
- …

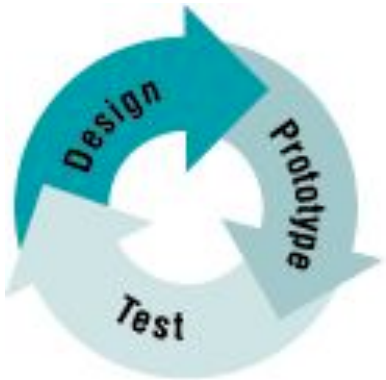
Ranking based on survey among experienced UCD practitioners (103 questionnaires) (Mao et al., 2005)

# The design process



- set up requirements
  - what is there and what is wanted …
- analysis
  - ordering and understanding
  - task/activity, scenario/context
- design
  - what to do and how to decide
- prototyping & testing → iteration
  - you'll never get it right the first time
  - finding what is really needed
- implementation and deployment
  - making it and getting it out there

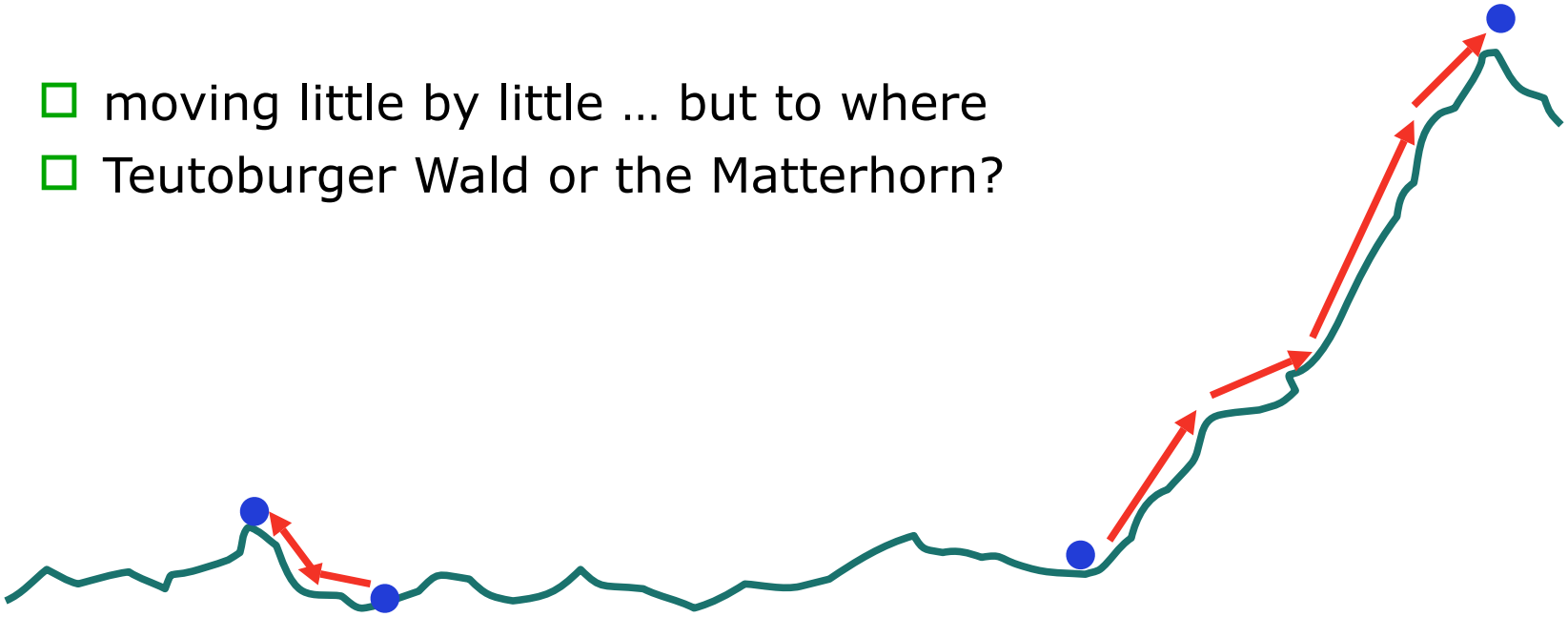


# design rules

# Pitfalls of prototyping & testing

- moving little by little … but to where
- Teutoburger Wald or the Matterhorn?



1. need a good start point → good design rules
2. need to understand what is wrong → good evaluation

# why rules? need a good start point!

- design for usability
  - relies on maximizing benefit of one good design by abstracting out properties that directed it
  - requires both creative insight and principled practice
- design *rules*
  - directions for design
- design *patterns*
  - reuse design knowledge
  - capture design practice, not theory
  - essential common properties of good examples

# Standards and norms

- set by national or international bodies to ensure compliance by a large community of designers
- standards require sound underlying theory and slowly changing technology
- hardware standards more common than software
- high authority, specific rules, but low level of detail
- Example: ISO 9241, ISO 13407

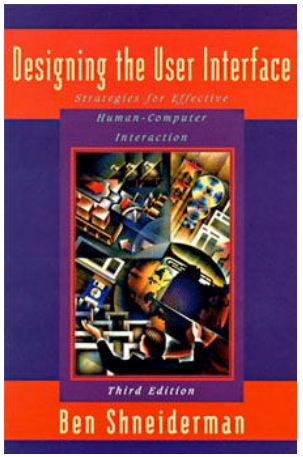
# Principles and guidelines

- "broad brush" design rules
- useful check list for good design
- better design using these than using nothing!

- different collections e.g.
  - Shneiderman's 8 Golden Rules
  - Norman's 7 Principles
  - Nielsen's 10 Heuristics

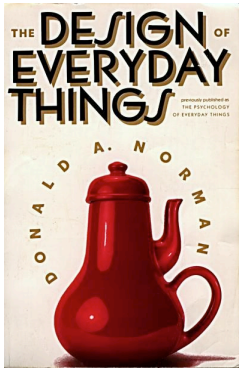
# Shneiderman's 8 *golden rules* of interface design

1. Strive for consistency
2. Enable frequent users to use shortcuts
3. Offer informative feedback
4. Design dialogs to yield closure
5. Offer error prevention and simple error handling
6. Permit easy reversal of actions
7. Support internal locus of control
8. Reduce short-term memory load




# Norman's 7 principles of design

1. Use both knowledge in the world and knowledge in the head.
2. Simplify the structure of tasks.
3. Make things consistent and visible: bridge the gulfs of Execution and Evaluation.
4. Get the mappings right.
5. Exploit the power of constraints, both natural and artificial.
6. Design for error.
7. When all else fails, standardize.



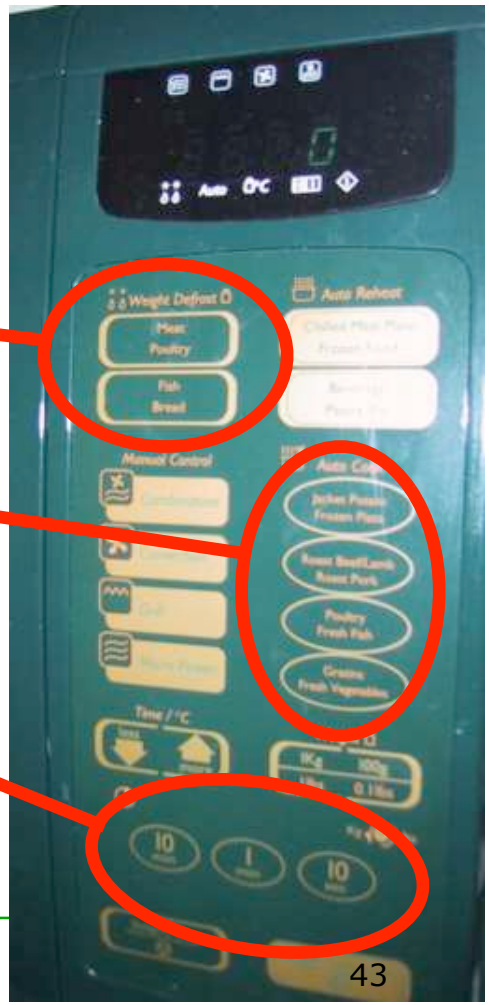

# Guidelines for screen design and layout

- Principles
  - ask: what is the user doing?
  - think: what information, comparisons, steps, order
  - design: *form follows function*
- Tools
  - grouping of items: logically together ⇒ physically together
  - order of items on screen should follow natural order
  - decoration: use fonts, boxes etc. to group and order
  - alignment of items to ease scanning (e.g. align text on left hand side)
  - white space between items

# example: physical controls

- grouping of items

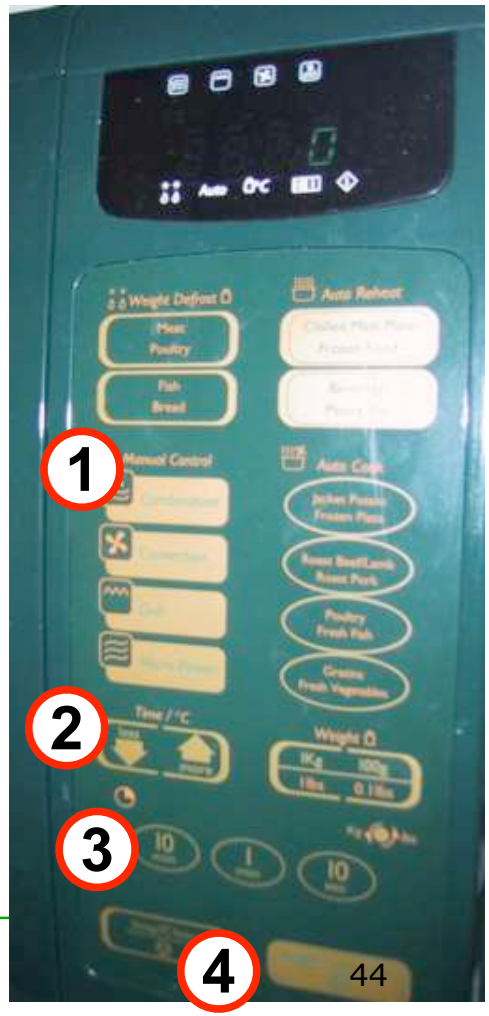
  - defrost settings
  - type of food
  - time to cook



# physical controls

- grouping of items
- order of items

1) type of heating
2) temperature
3) time to cook
4) start

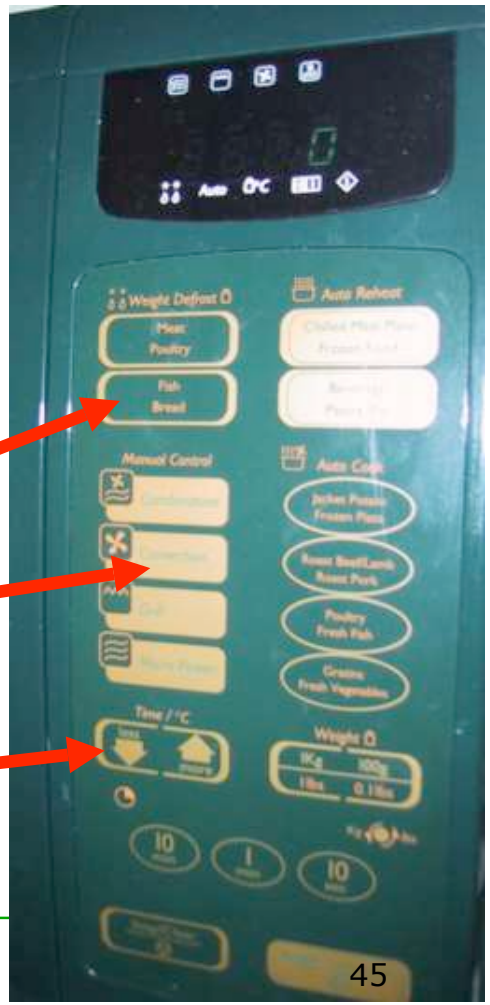


# physical controls

- grouping of items
- order of items
- decoration

different colors for
different functions

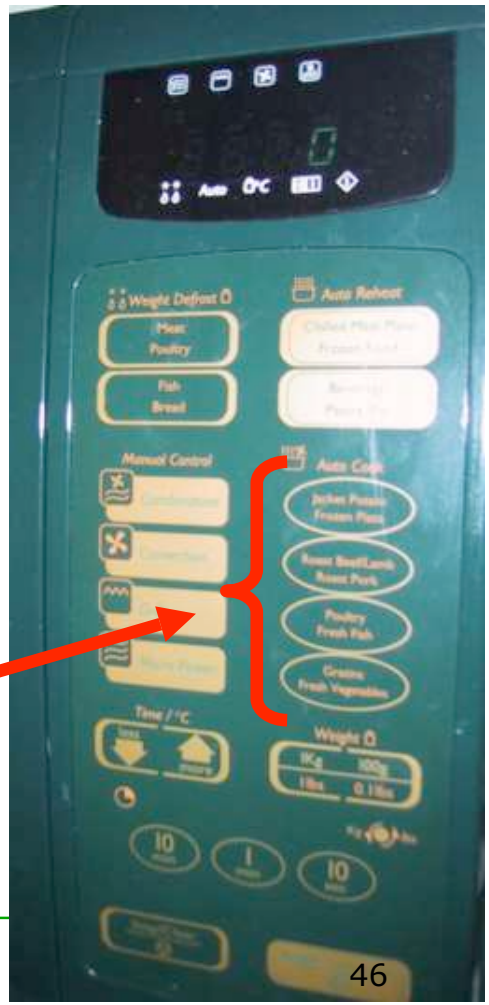
lines around related
buttons (temp up/down)



# physical controls

- grouping of items
- order of items
- decoration
- alignment

centred text in buttons
? easy to scan ?



# physical controls

- grouping of items
- order of items
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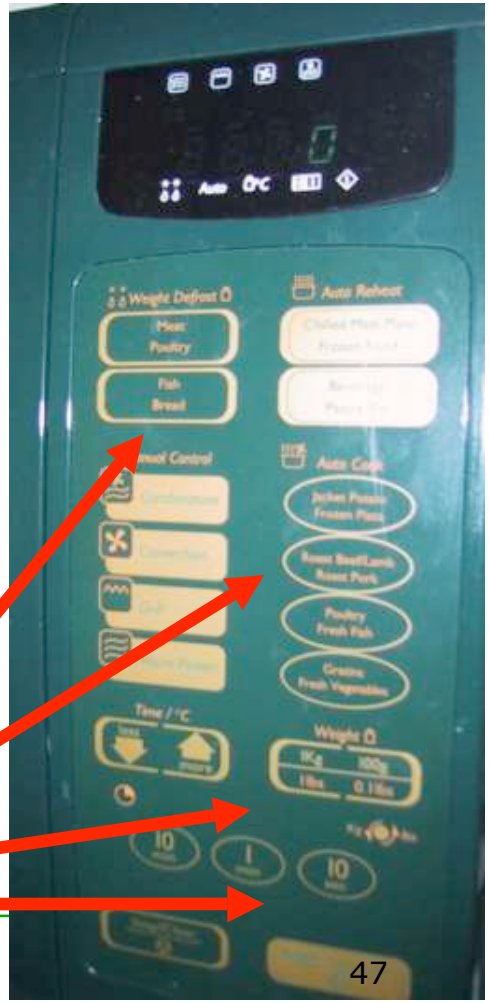

gaps to aid grouping

Ok, that‘s for how to create a good(?) *first* system

Next…

- How to evaluate and improve ??