Persuasive Technology: Expanding Boundaries

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https://www.youtube.com/watch?v=ClHybq6Cq3I

Persuasion → Changing Behaviors

Persuasion → Changing Behaviors

Relationship: Persuasive and Coercive

- Persuasive = Coercive
- Persuasive ≥ Coercive
- Persuasive ≤ Coercive
- Persuasive != Coercive

Relationship: Persuasive and Coercive

- Persuasive = Coercive
- Persuasive ≥ Coercive
- Persuasive ≤ Coercive
- Persuasive != Coercive

- Coercive: negative connotations, patronizing, paternalistic, “we know what’s best for you and you will do it!

Relationship: Persuasive and Coercive

- ~~Persuasive = Coercive~~
- Persuasive ≥ Coercive
- ~~Persuasive ≤ Coercive~~
- ~~Persuasive != Coercive~~

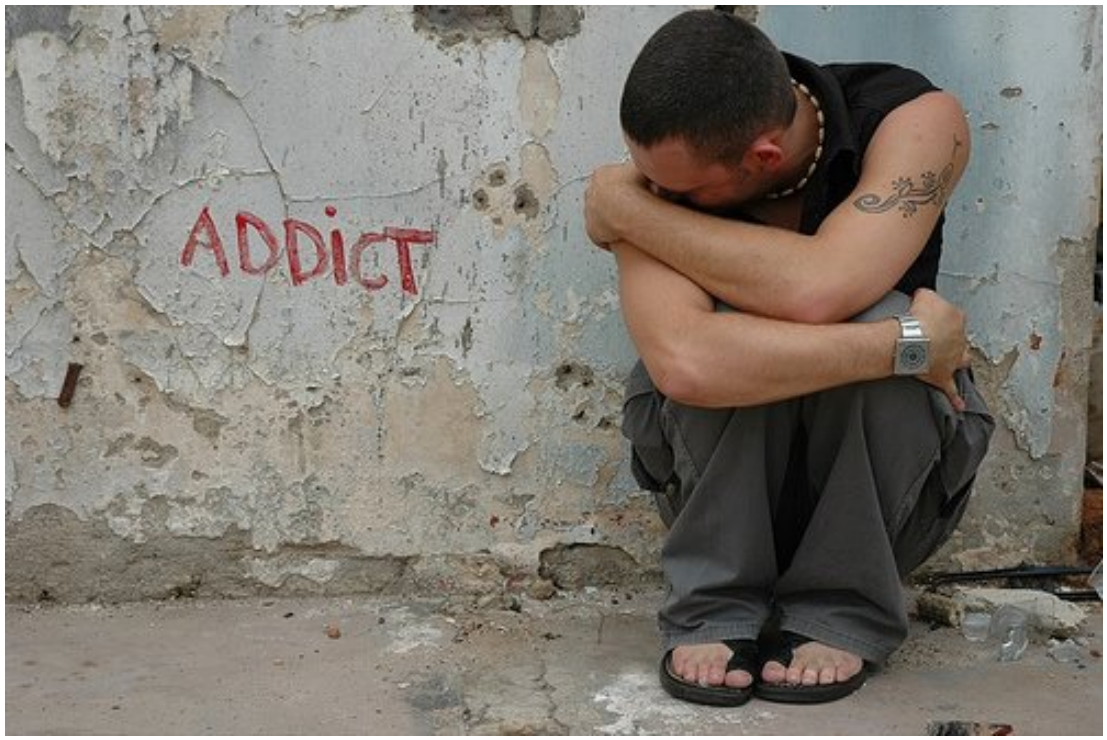
Relationship: Persuasive and Coercive

- ~~Persuasive = Coercive~~
- **Persuasive ≥ Coercive**
- ~~Persuasive ≤ Coercive~~
- ~~Persuasive != Coercive~~

- Examples?

Persuasive ≥ Coercive

Persuasive ≥ Coercive



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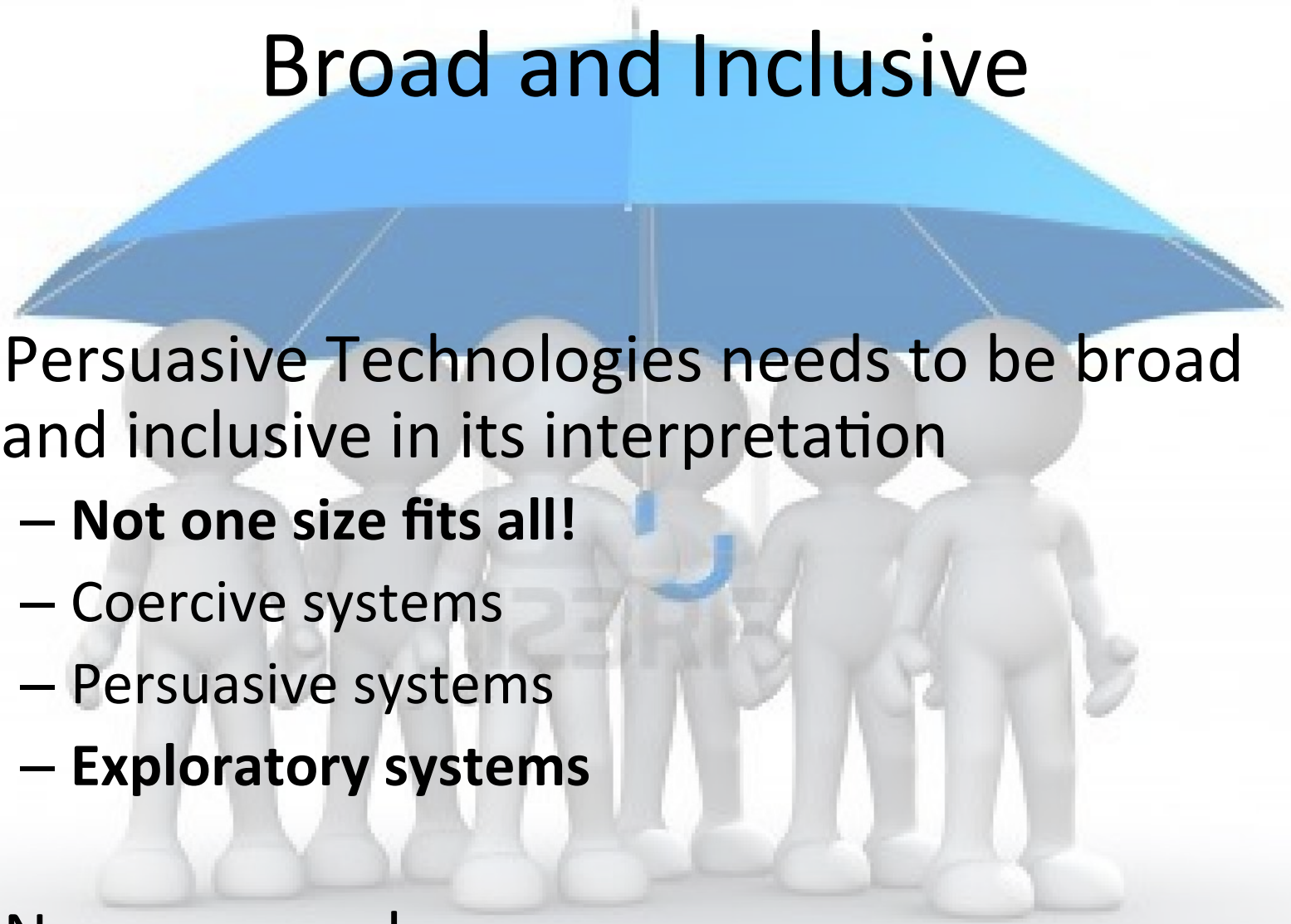
Broad and Inclusive



- Persuasive Technologies needs to be broad and inclusive in its interpretation
  - **Not one size fits all!**
  - Coercive systems
  - Persuasive systems
  - **Exploratory systems**
- New proposal:
  - Behavioral Decision Support Tools

What's needed to support behavior change?

"If you cannot measure it, you cannot improve it."

– Lord Kelvin

Lots of *data* collection devices

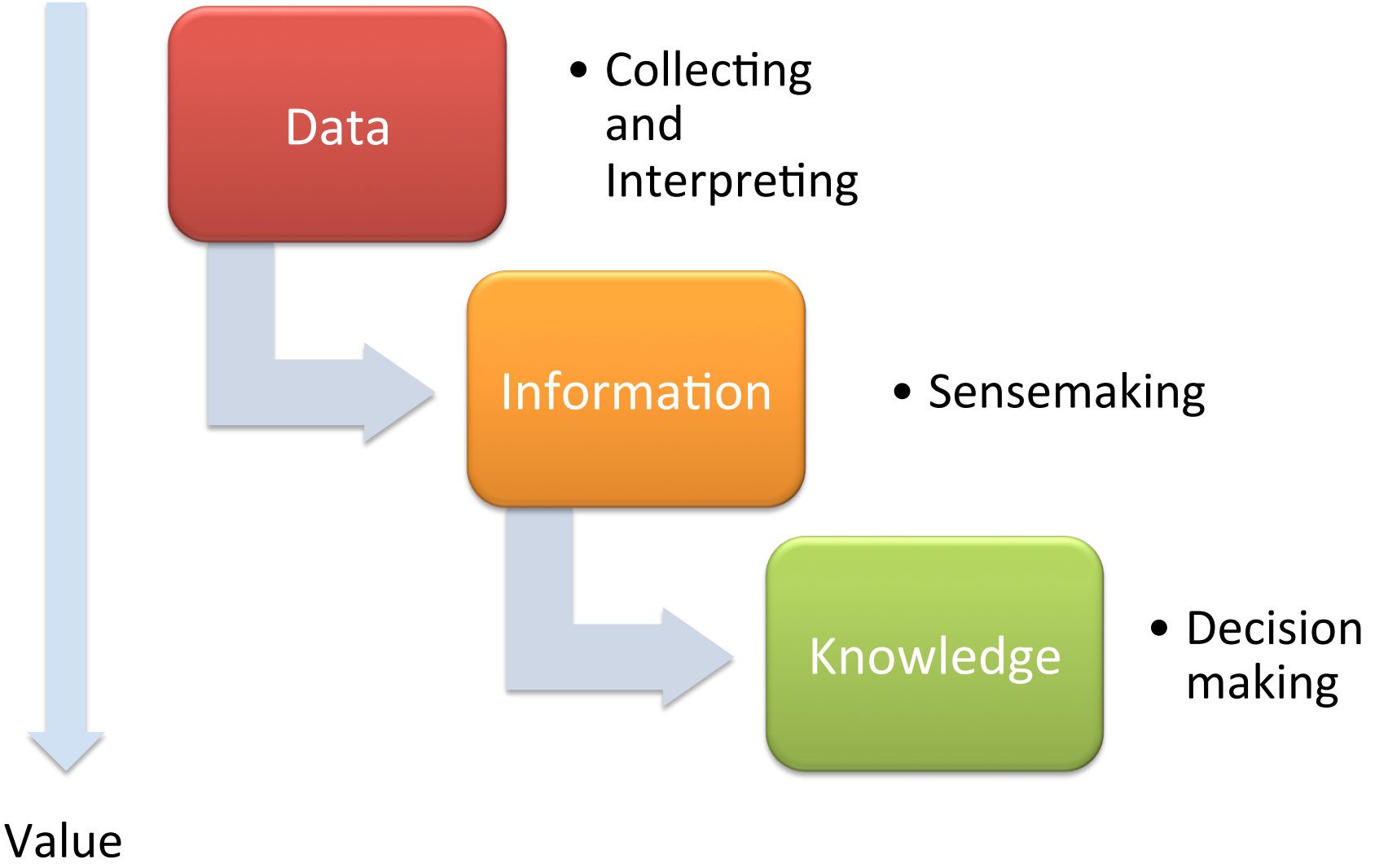
Lo

es


SAMSUNG
12:45
12:45 PM
Thu, March 14
London
Sunny
59 °F
Google
Email
Camera
Samsung Apps
Play Store
Phone
Contacts
Messaging
Internet
Apps


SAMSUNG
12:45

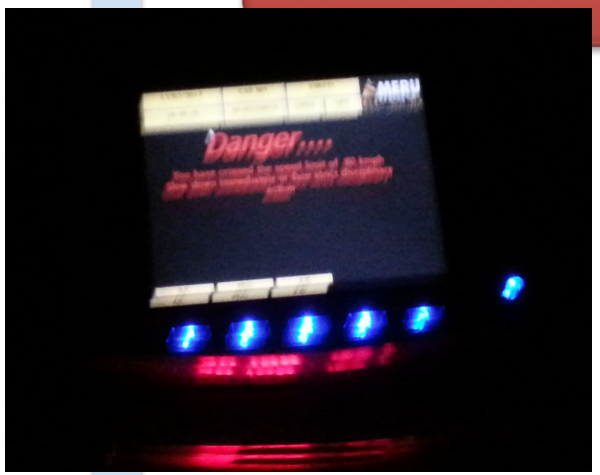
Making Data Actionable



Making Data Actionable

Data

- Collecting and Interpreting



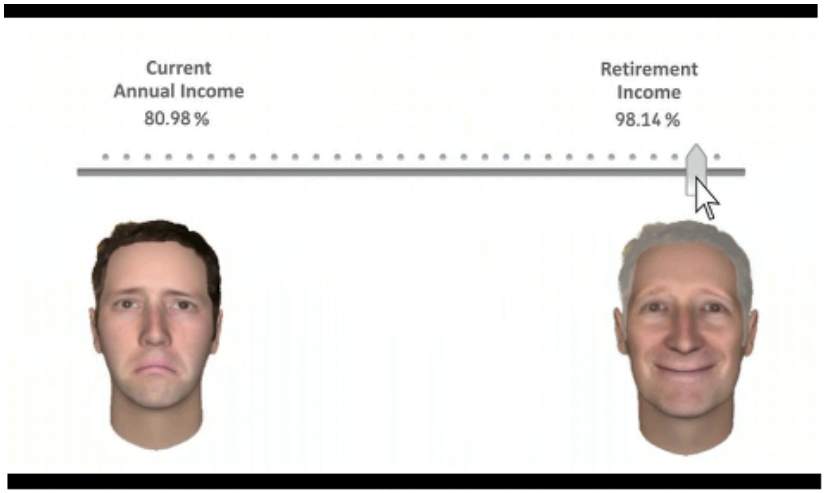
Information

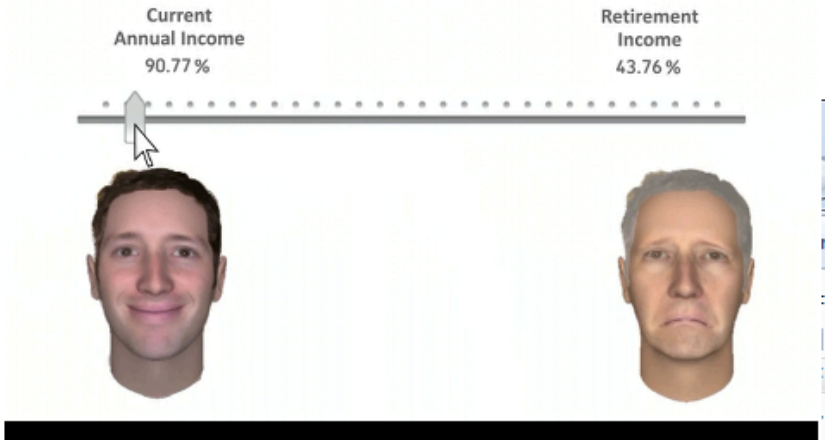
- Sens

Knowledge

- Decision making

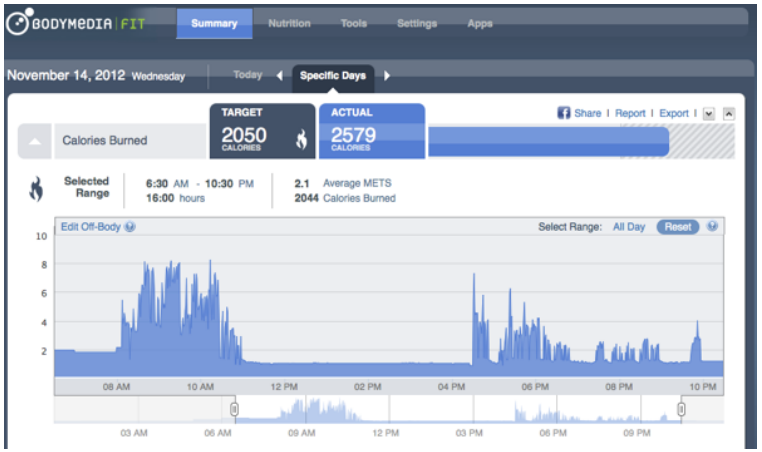
Value

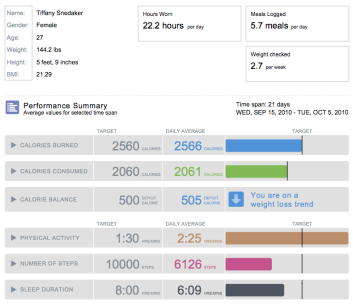


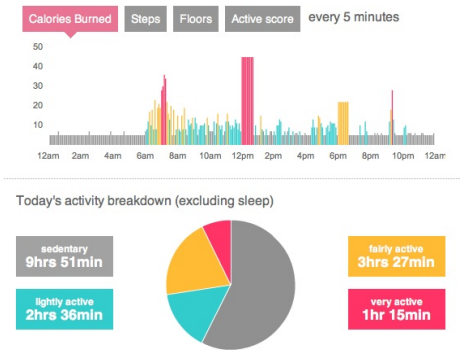


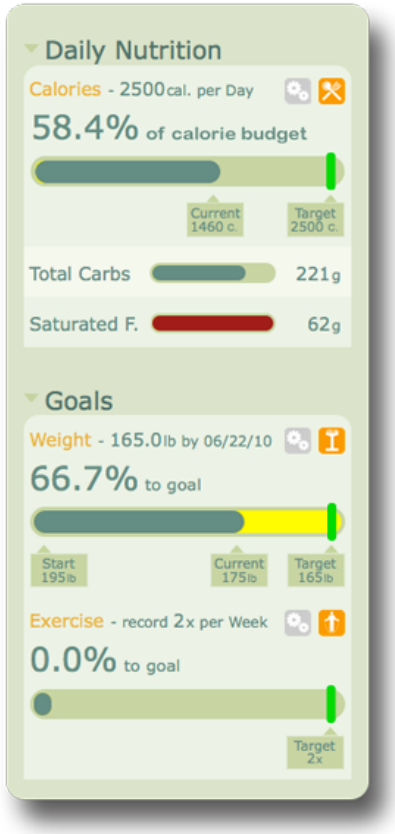
Daniel Goldstein

Most of what we get is data





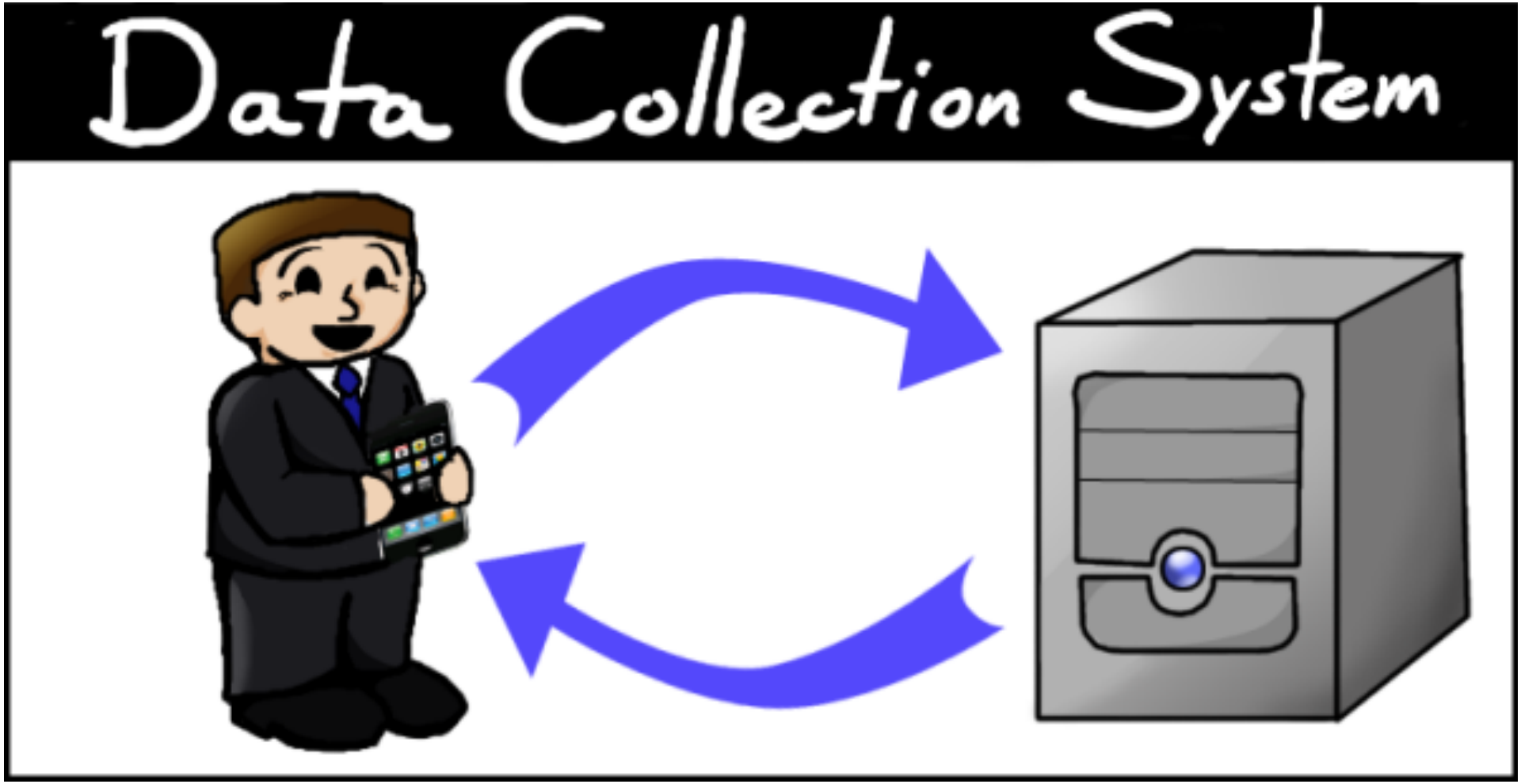





Citizen science

Citizen Science

Citizen Science Reality



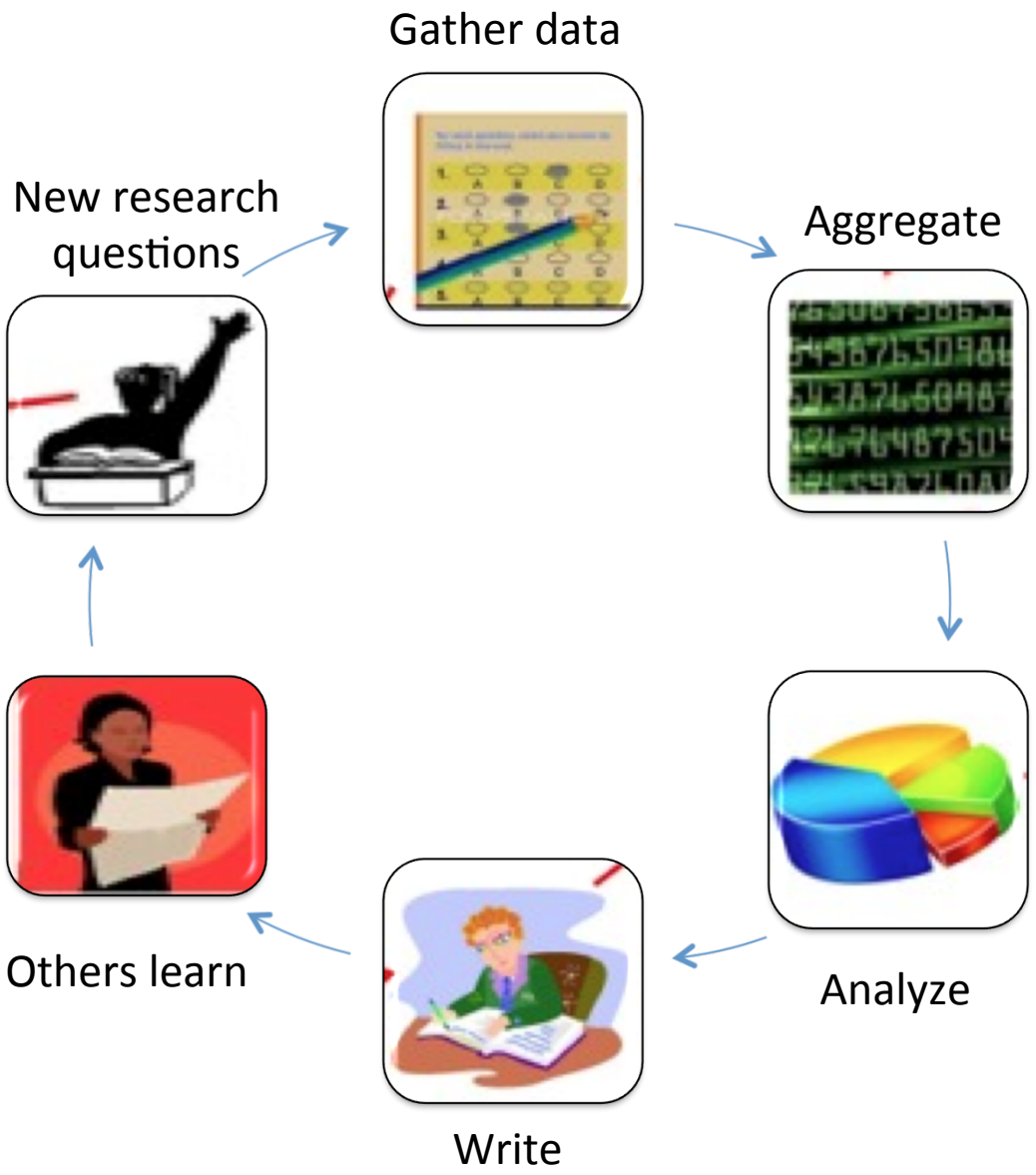
Citizen Science ≠ Science

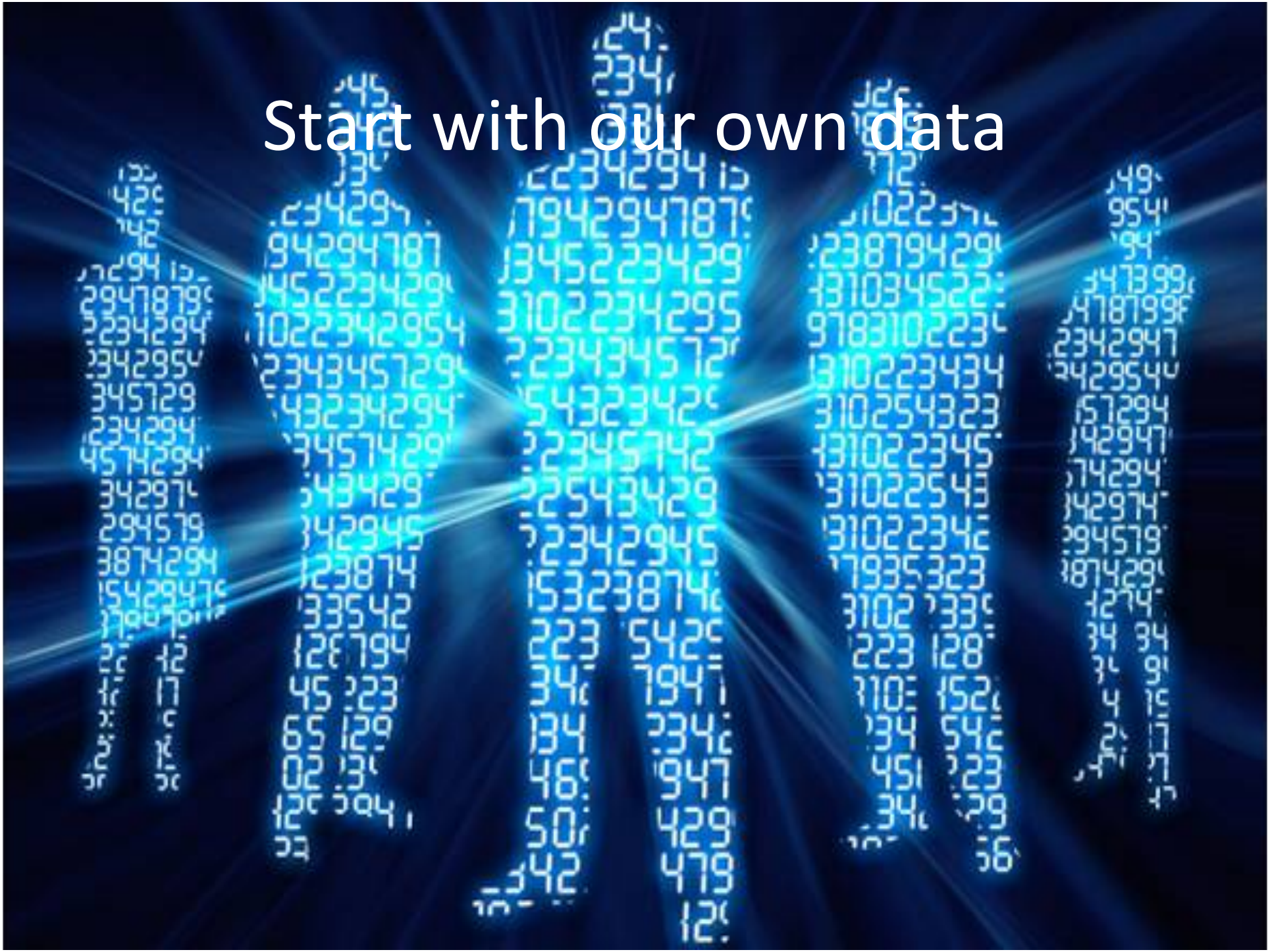

Citizen Science ≠ Science

Simple View of Science

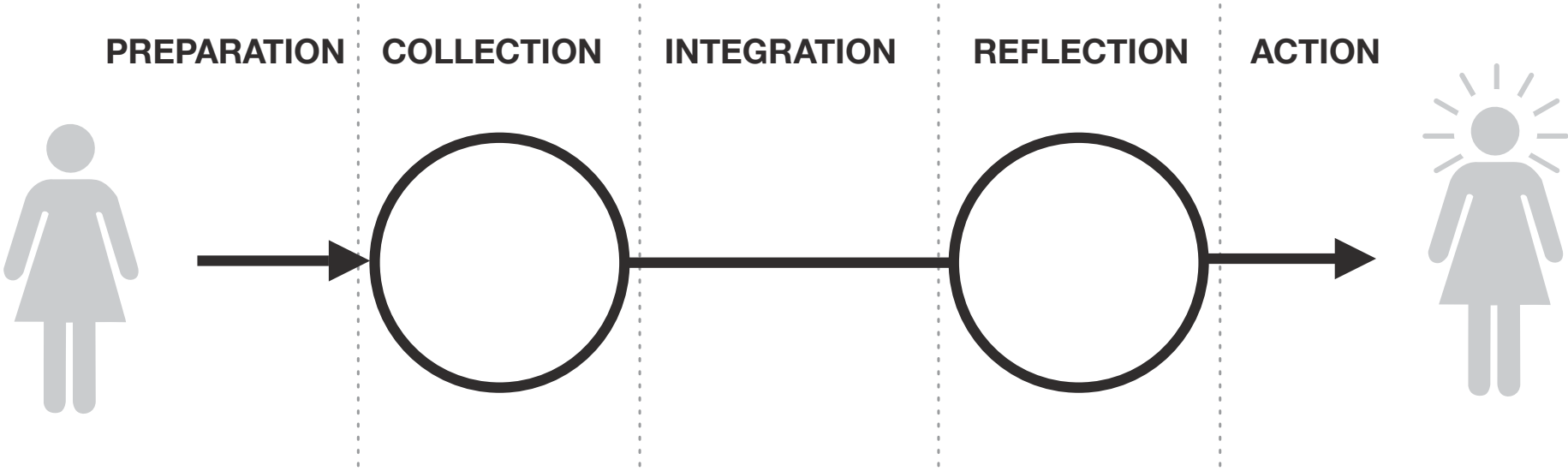
Gather data

Simple View of Science




Start with our own data

Model of personal informatics



PhD work of Ian Li

Model of personal informatics

PhD work of Ian Li
(CHI, Ubicomp, ToCHI)

Physical Activity

Finance

Electricity

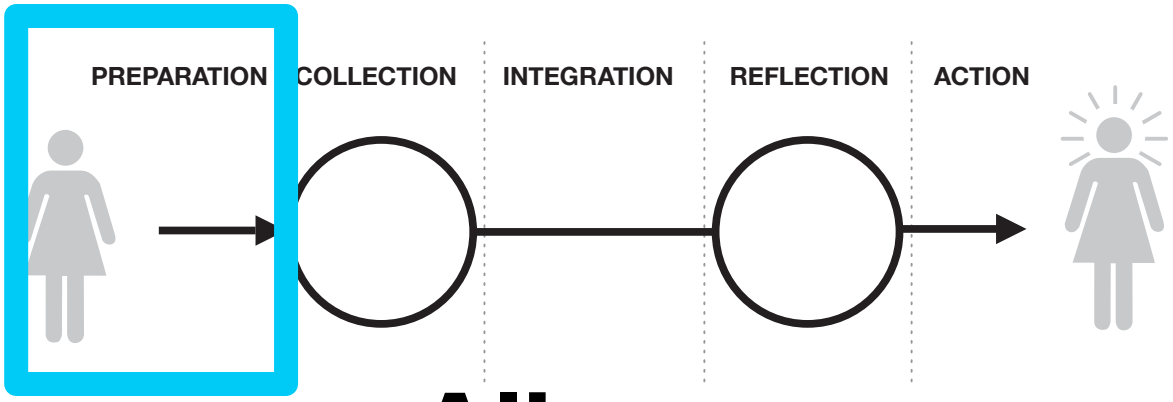
Diabetes

Health

Mood

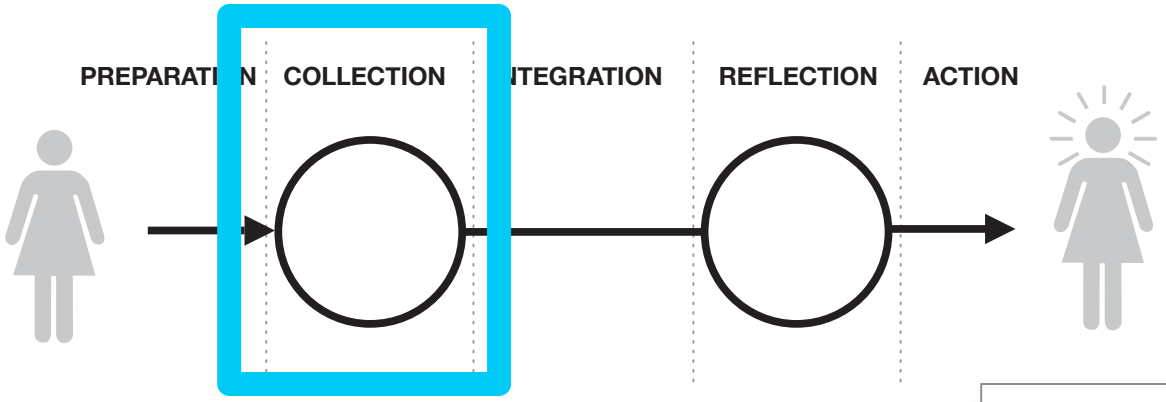
…

http://personalinformatics.org/tools

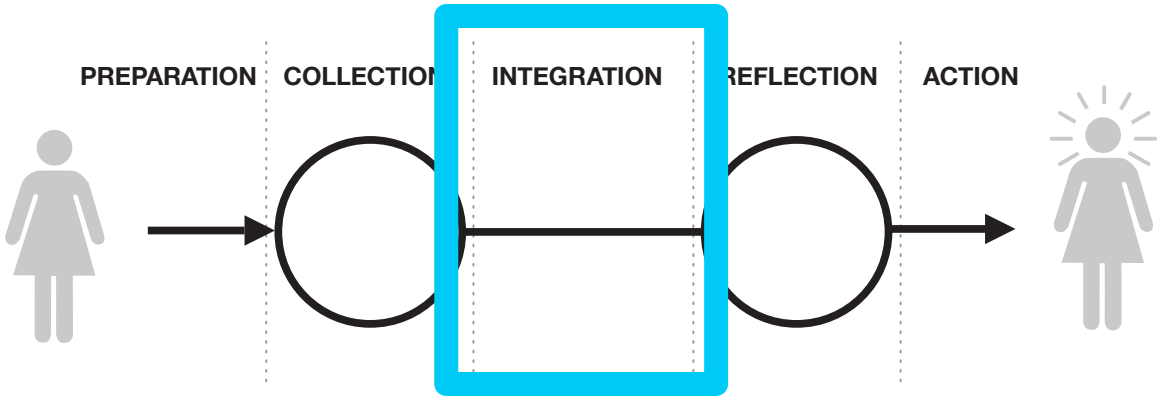


Alice

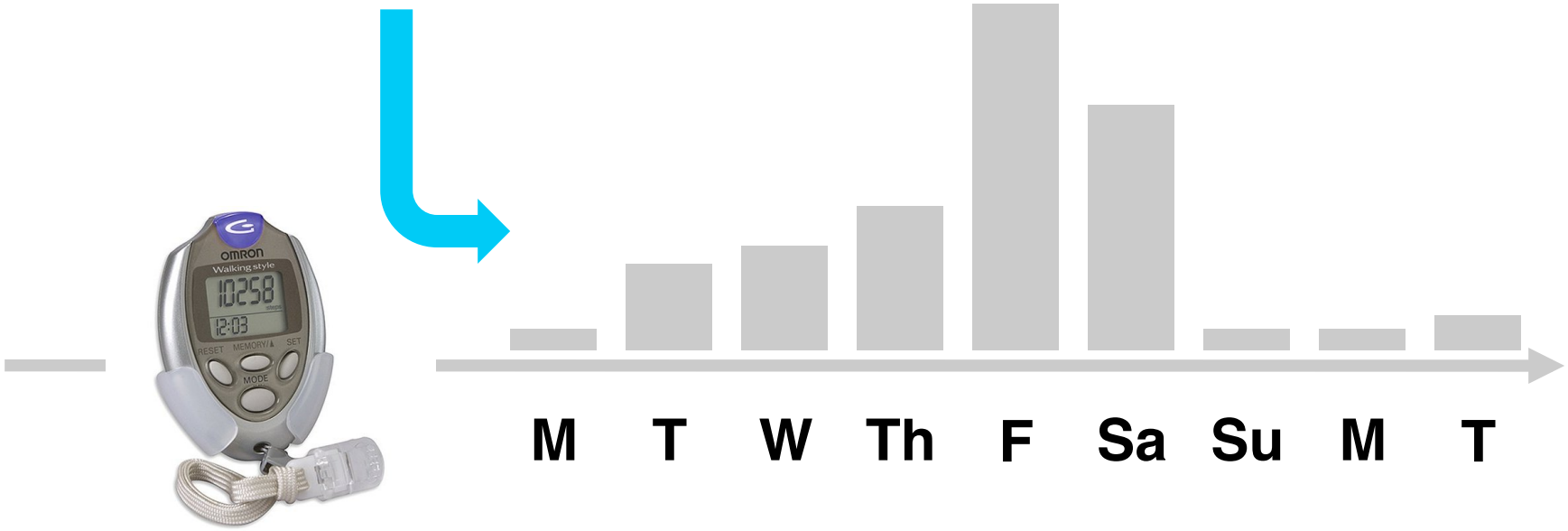
- **Wanted** to become active
- **Decided** to track her physical activity
- **Chose** to track step counts using a pedometer

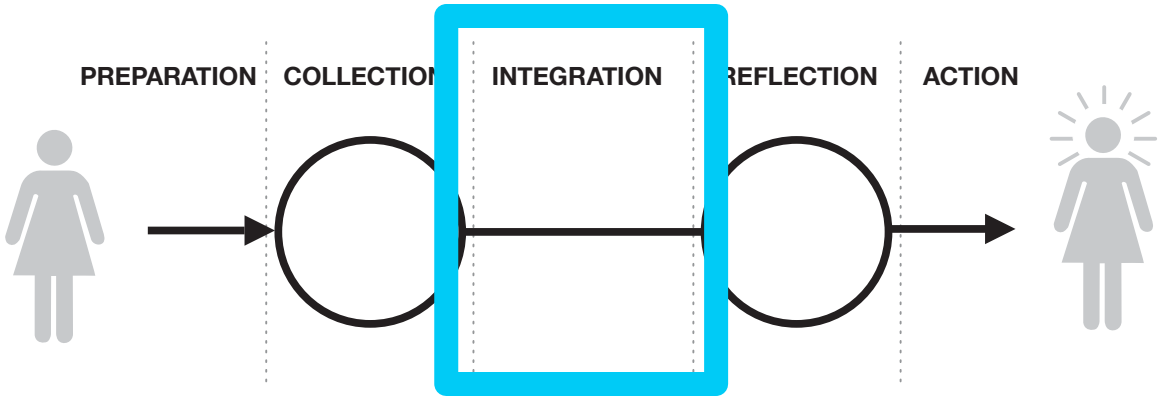


Mon	1573
Tue	4392
Wed	4537
Thu	5842
Fri	10258
Sat	7528
Sun	1368
Mon	1497
Tue	1837

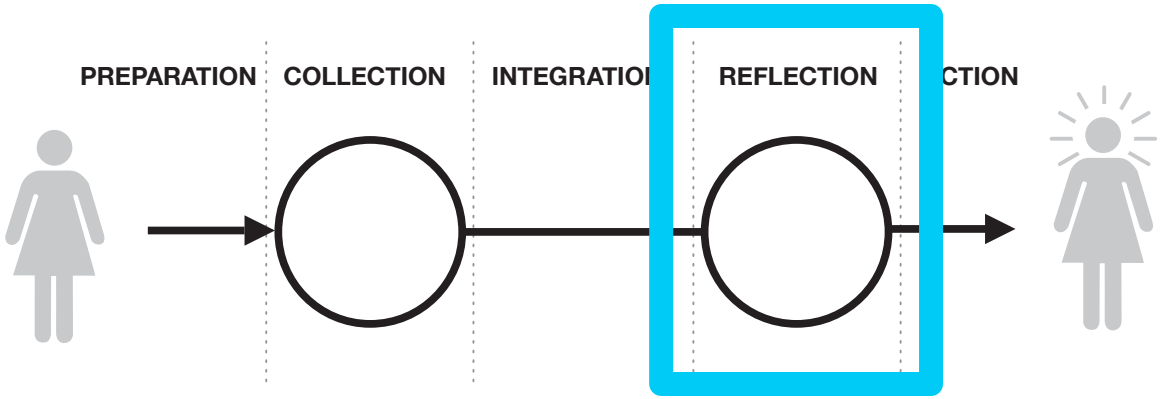


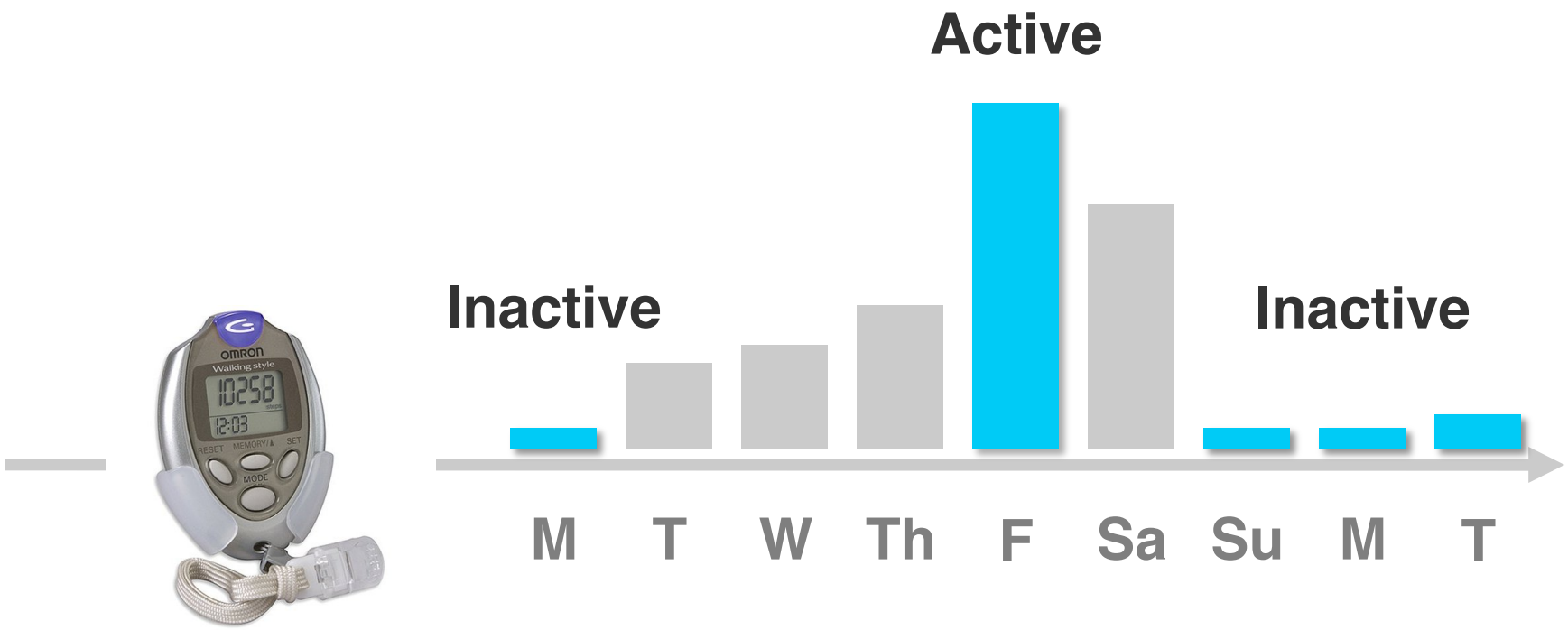
Transcribe to Excel





Synchronize data to web site.


PREPARATION
COLLECTION
INTEGRATIO
REFLECTION
CTION


Active
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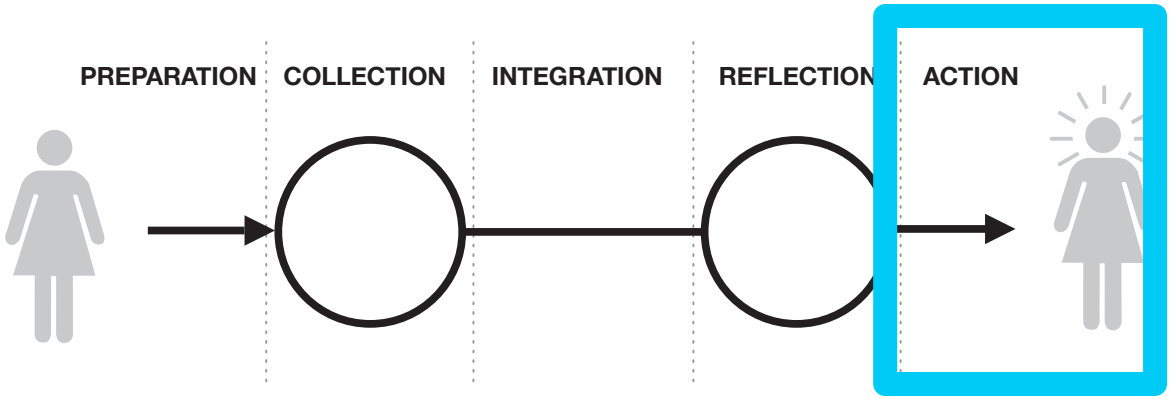
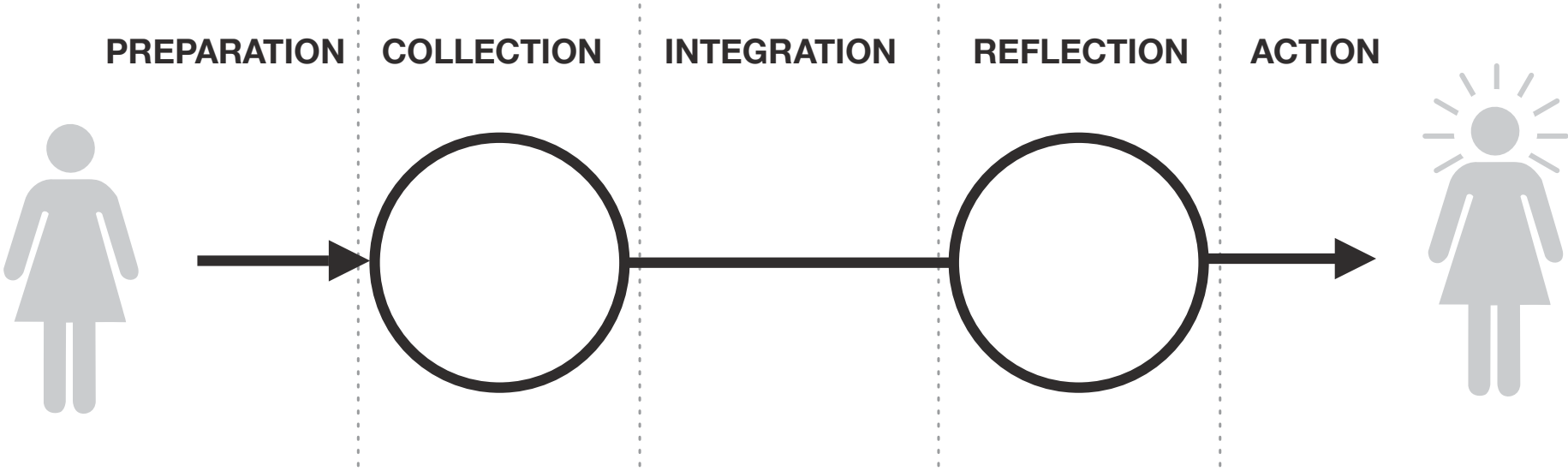


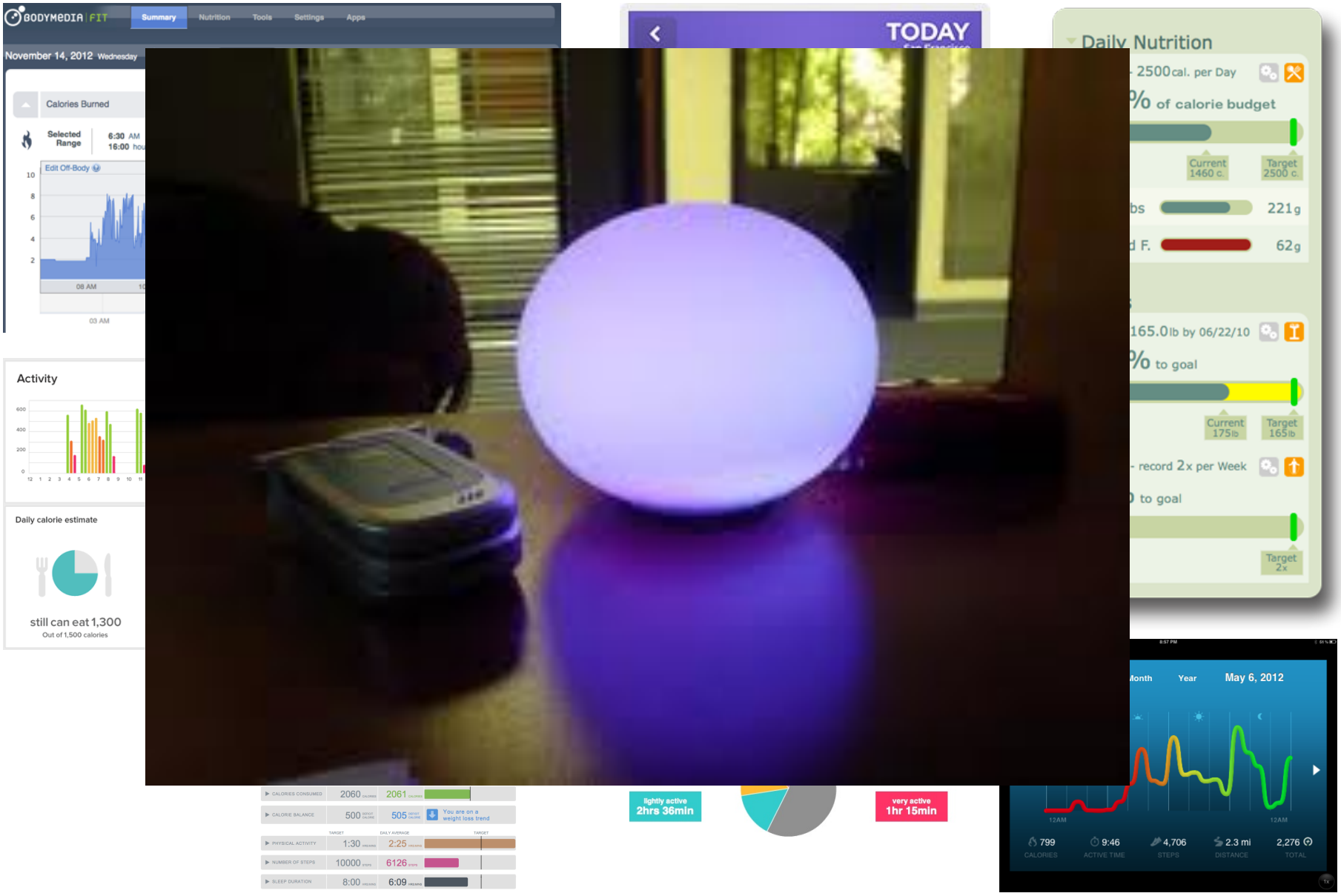
- The stage when people choose what they are going to do with their new-found understanding of themselves.
  - Alerts
  - Incentives
  - Suggestions

Model of personal informatics



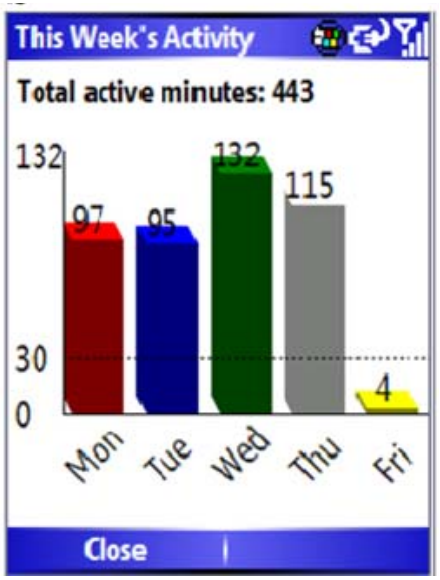
2 Phases: Discovery and Maintenance

Tools support maintenance

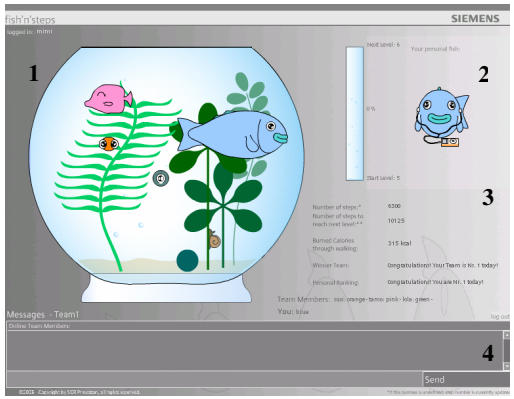


Tools support maintenance

UbiFit
Consolvo *et al.* ’08



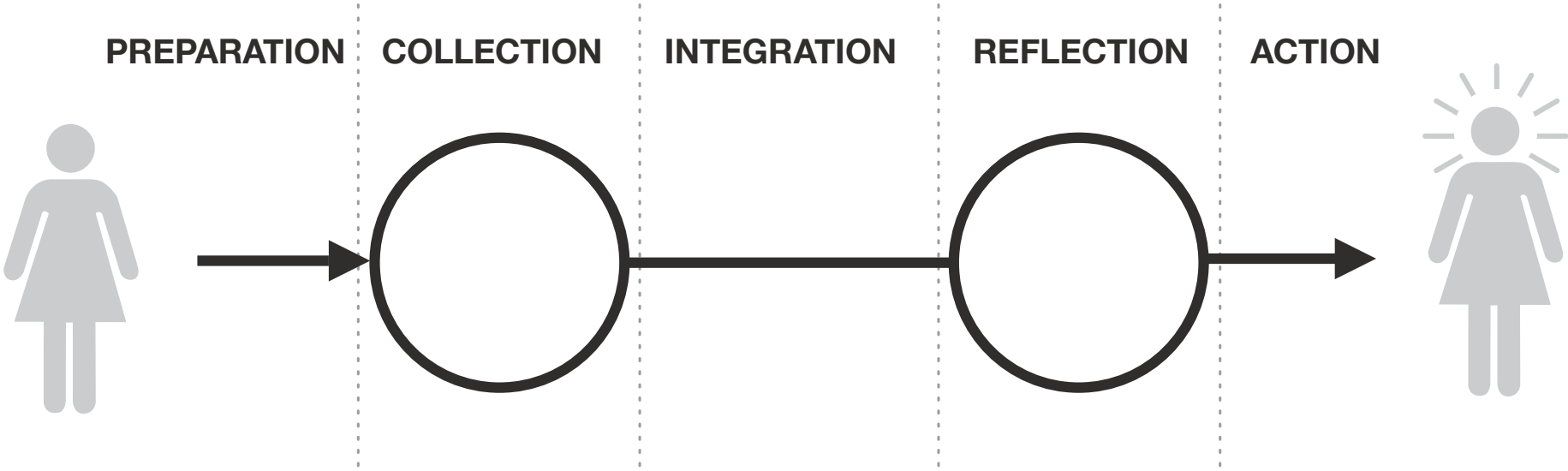
Shakra
Maitland *et al.* ‘06



Fish ‘n Steps
Lin *et al.* ‘06

Stepgreen/UbiGreen
Mankoff et al. ‘09
Froelich et al. ‘09

Model of personal informatics

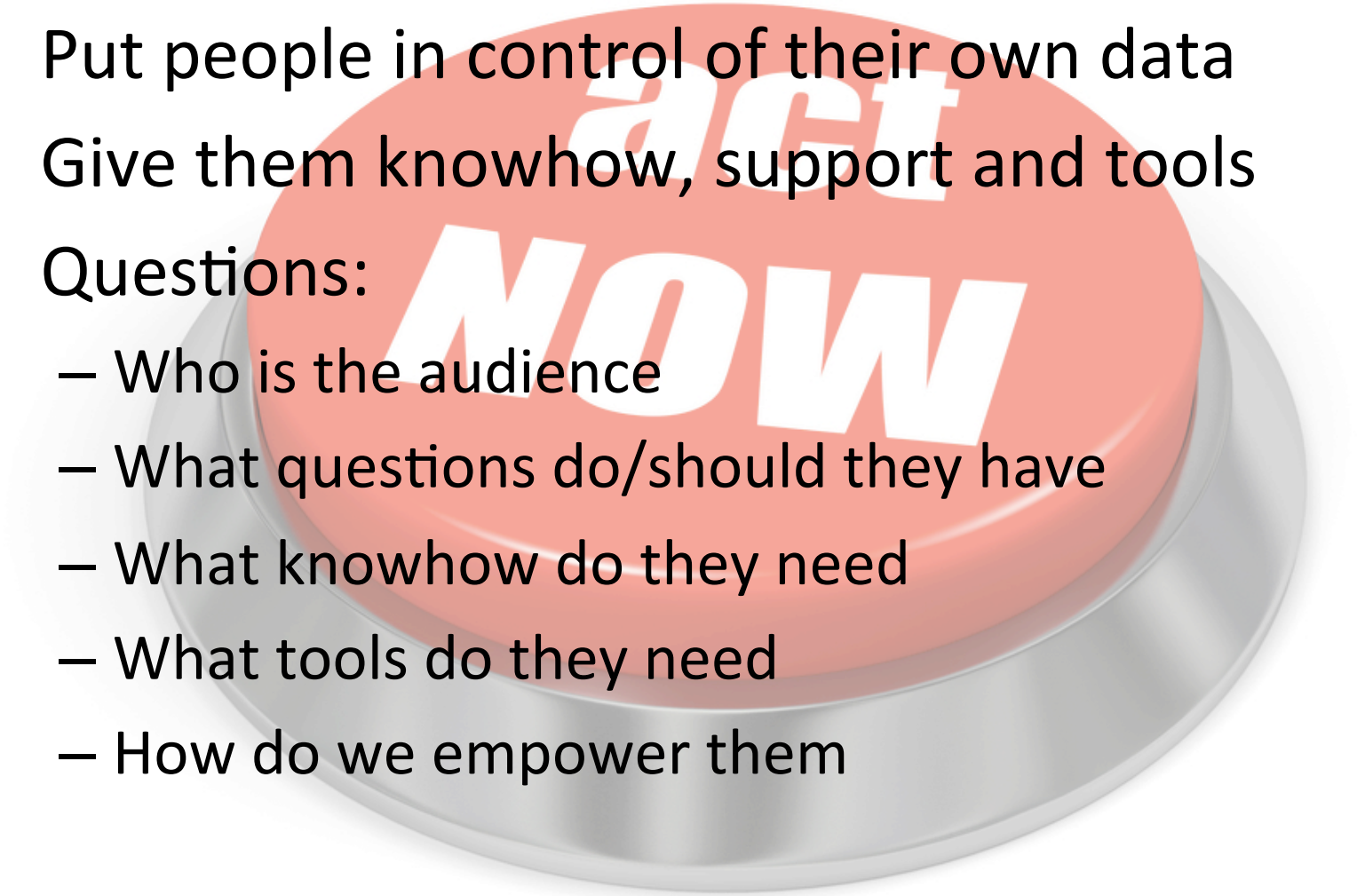


How do we support the entire process?

Move from awareness of data to behavior change based on knowledge

Call to action: new features for persuasive technologies

- Put people in control of their own data
- Give them knowhow, support and tools
- Questions:
  - Who is the audience
  - What questions do/should they have
  - What knowhow do they need
  - What tools do they need
  - How do we empower them



Six Kinds of Questions

- **Status** • What is my current status?
- History
- Goals
- Discrepancy
- Details
- Factors

Six Kinds of Questions

- Status
- **History**
  - What happened in the past?
- Goals
- Discrepancy
- Details
- Factors

Six Kinds of Questions

- Status
- History
- **Goals** • What goals should I pursue?
- Discrepancy
- Details
- Factors

Six Kinds of Questions

- Status
- History
- Goals
- **Discrepancy**
  - How does my behavior compare to my goals?
- Details
- Factors

Six Kinds of Questions

- Status
- History
- Goals
- Discrepancy
- **Details**
- Factors

- What other things happened during a particular point in time?

Six Kinds of Questions

- Status
- History
- Goals
- Discrepancy
- Details
- **Factors**
  - What influences my behavior over a long period of time?

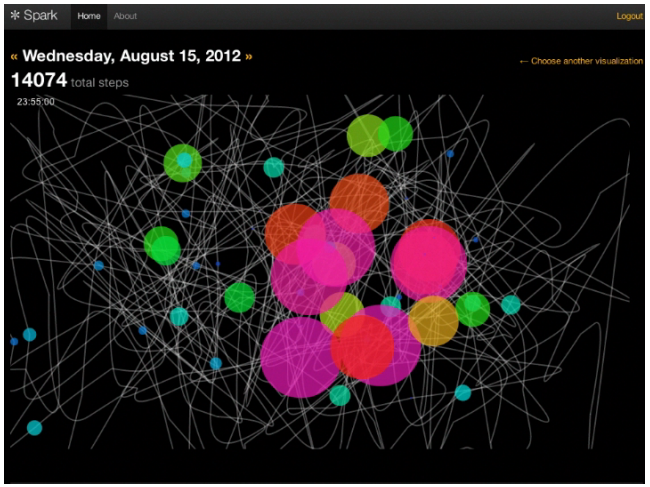
Six Kinds of Questions

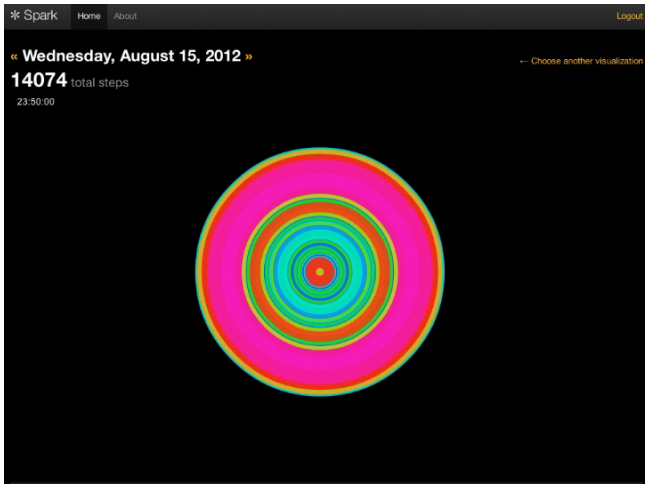
- **Status**
- History
- Goals
- **Discrepancy**
- Details
- Factors

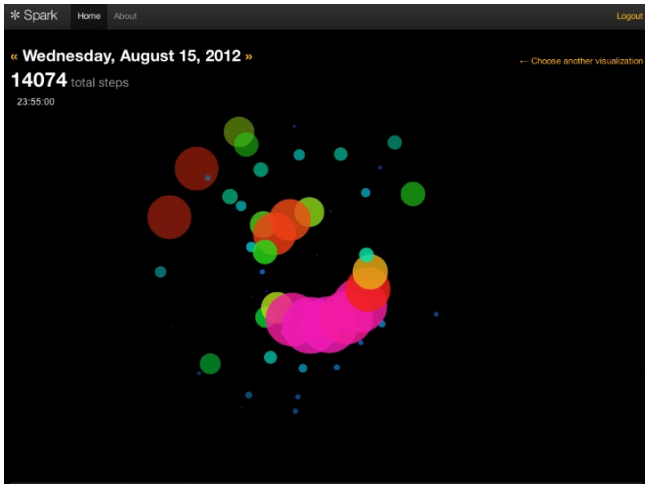
Maintenance

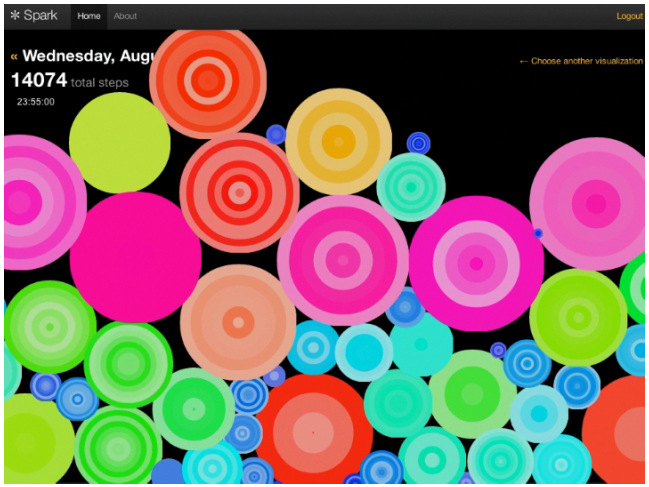
Examples from SparkVis

(www.sparkvis.com, Chloe Fan, Ubicomp)









Six Kinds of Questions

- Status
- **History**
- **Goals**
- Discrepancy
- **Details**
- **Factors**

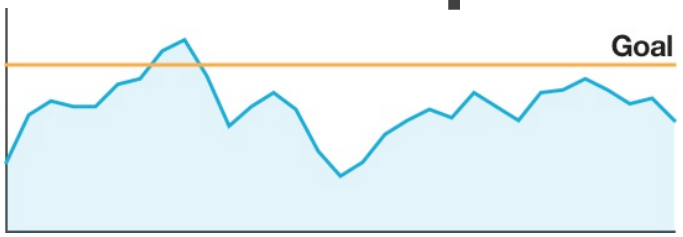
Discovery

- Calls for the use of context to help interpret and sensemake with data

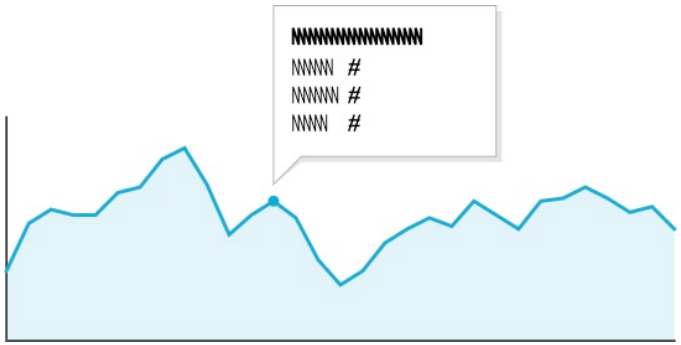
Timeline Sketches

History

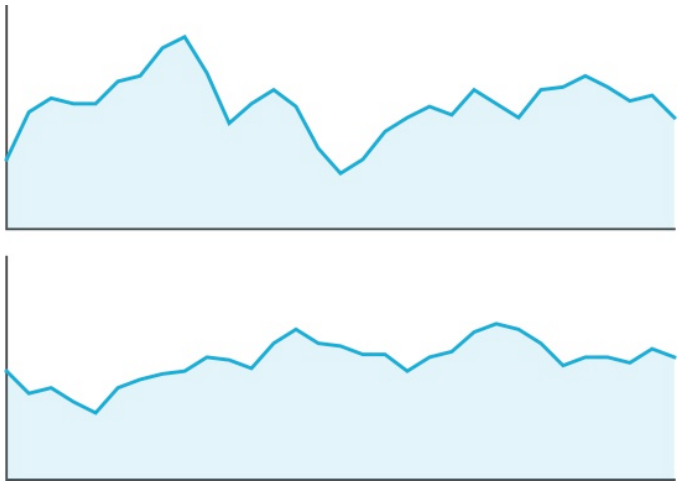
Goals/Discrepancies



Details



Factors

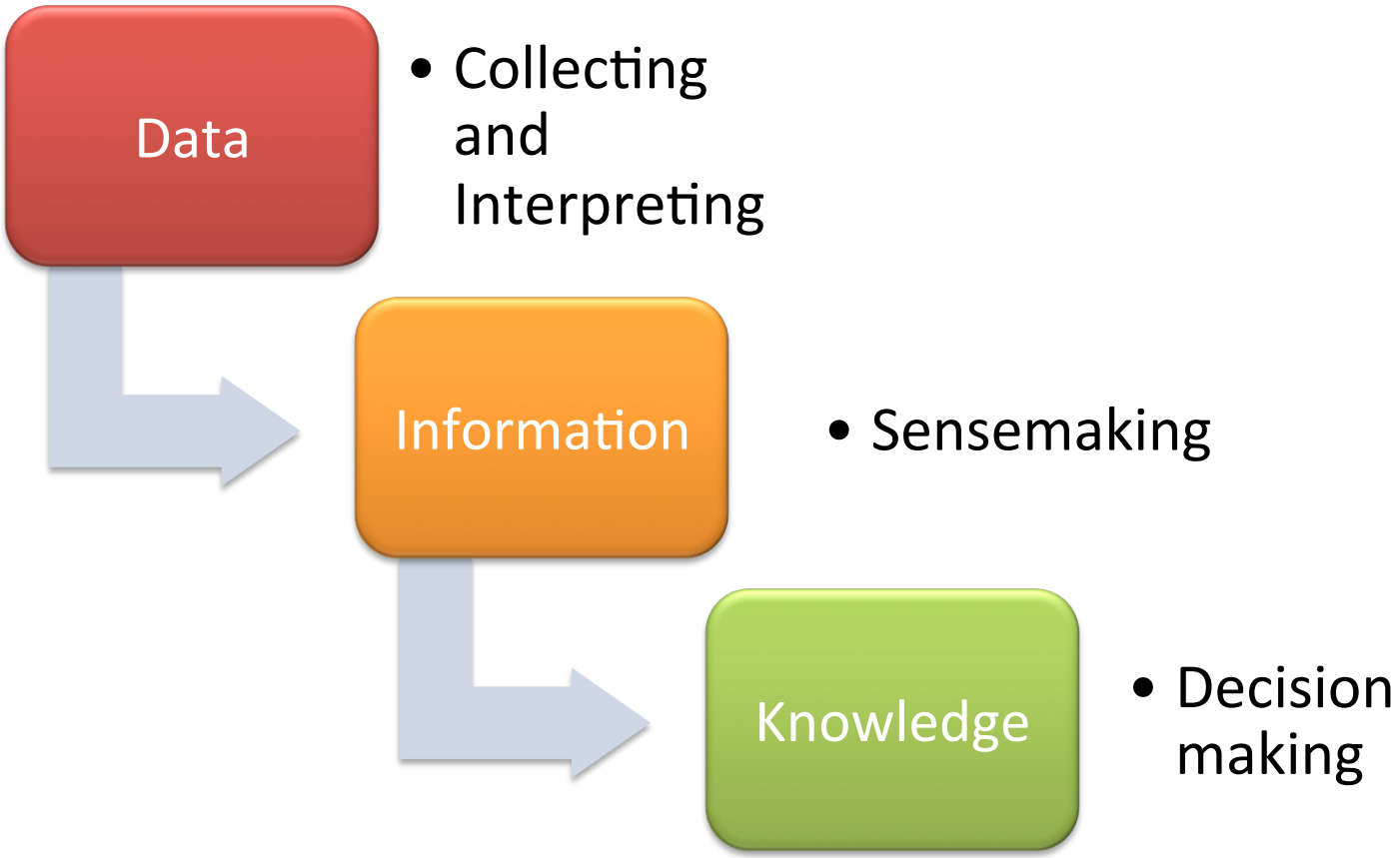


Case Study: dwellSense

PhD work of Matthew Lee
(CHI, Pervasive Health)

Technical Revolution: data

A Healthy Individual

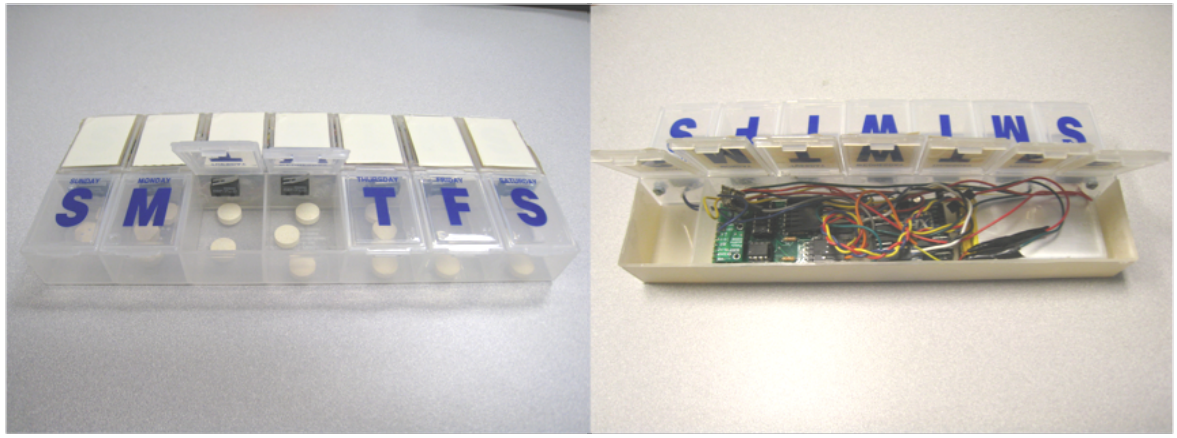


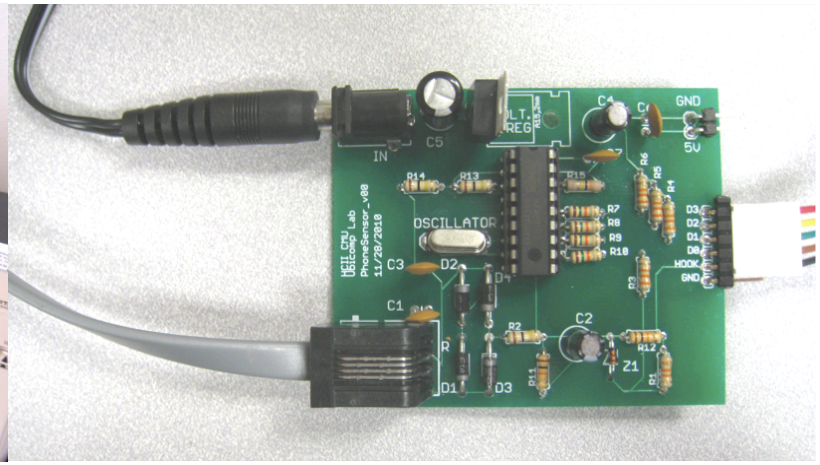
context, questions, hypotheses

focus on routines

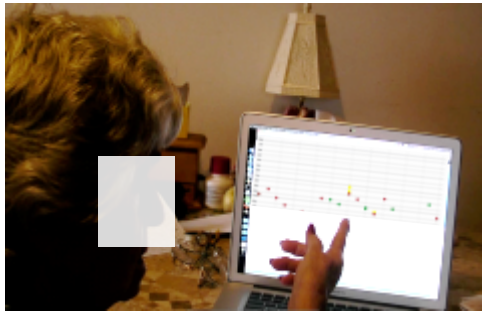
A Healthy Home

dwellSense





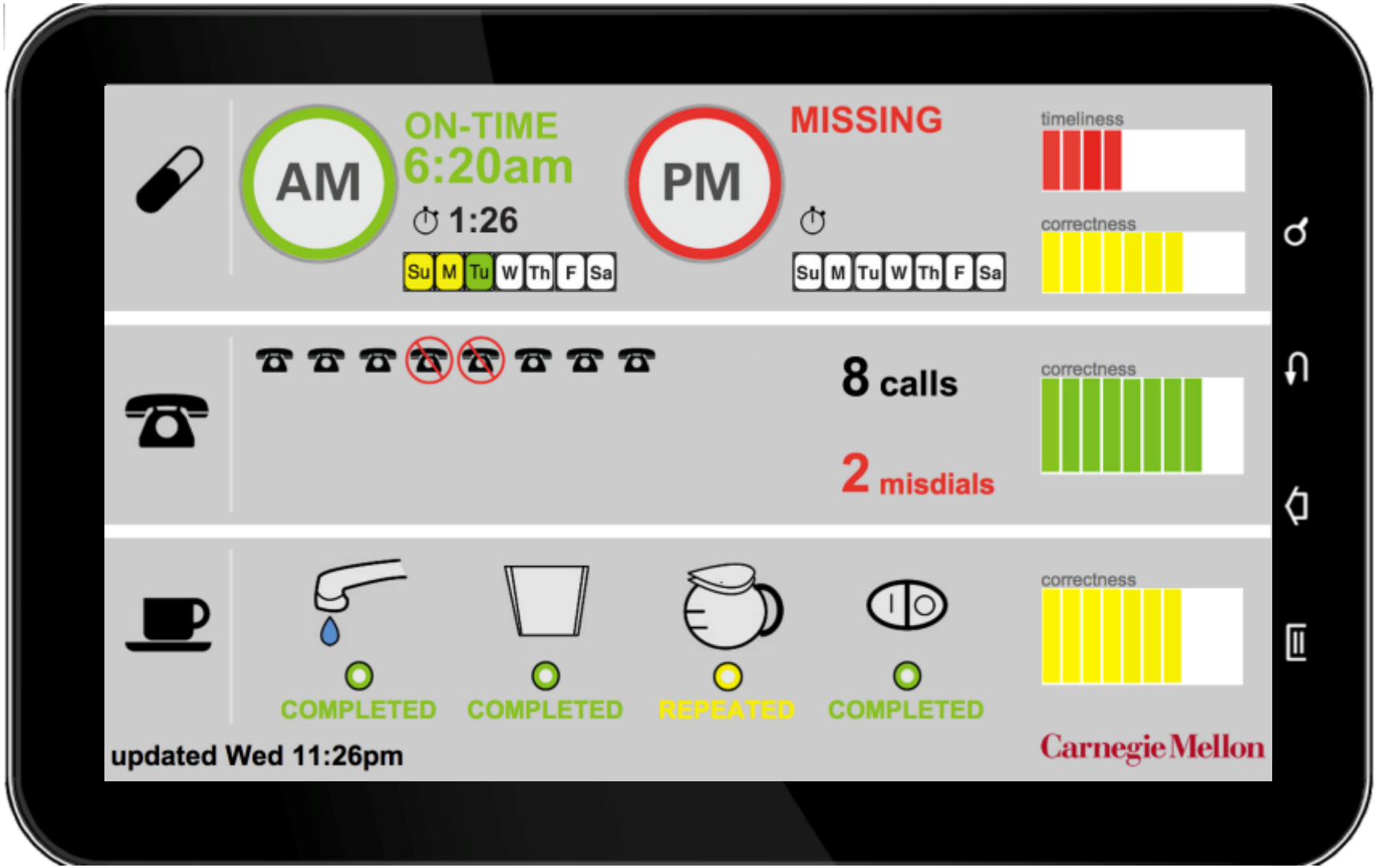
dwellSense architecture



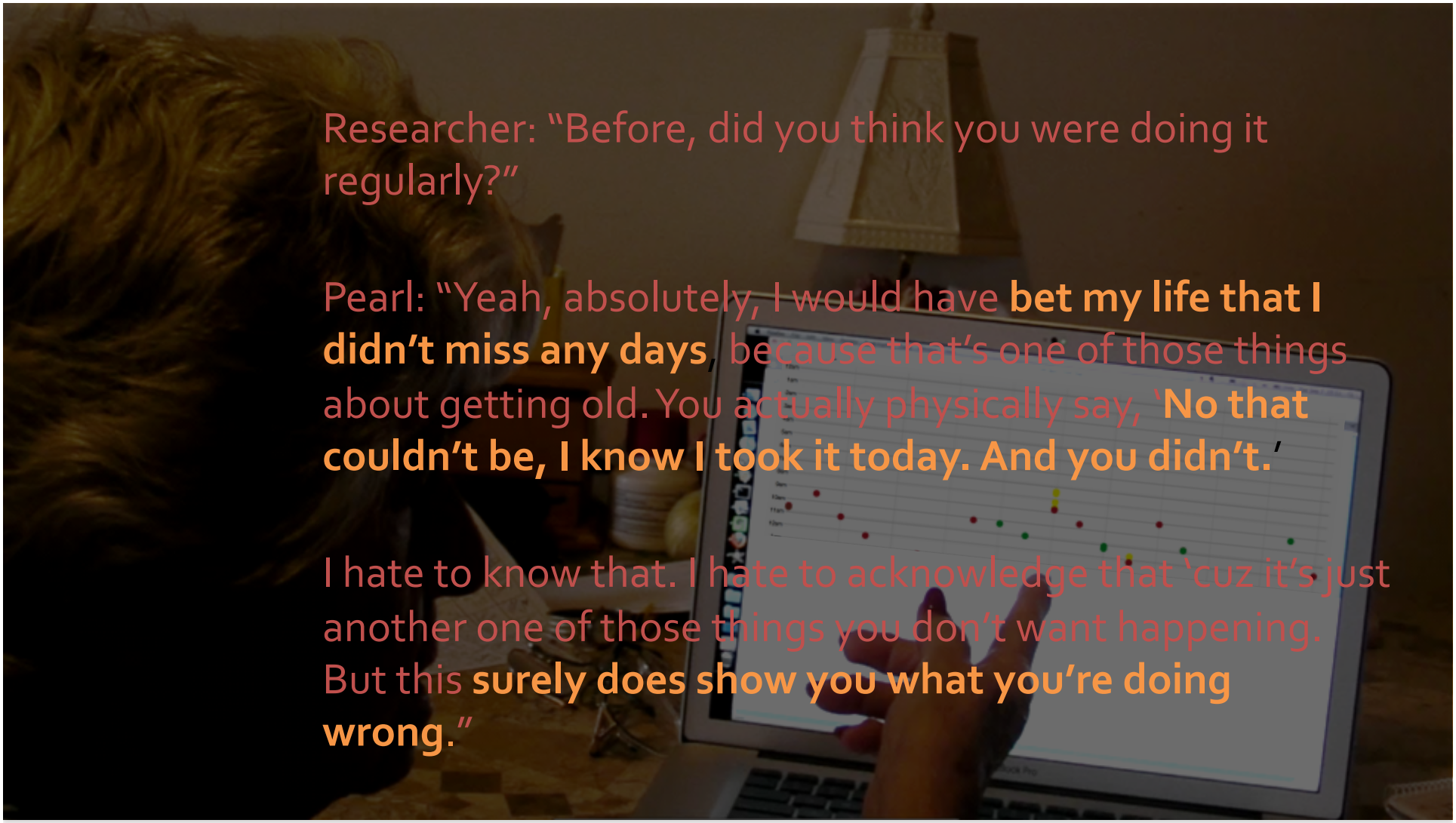
Cloud-based
Analytics

dwellSense deployment

dwellSense


AM
ON-TIME
6:20am
1:26
Su M Tu W Th F Sa
PM
MISSING
Su M Tu W Th F Sa
timeliness
correctness
8 calls
2 misdials
correctness
COMPLETED
COMPLETED
REPEATED
COMPLETED
correctness
updated Wed 11:26pm
Carnegie Mellon

Reorienting an inaccurate awareness

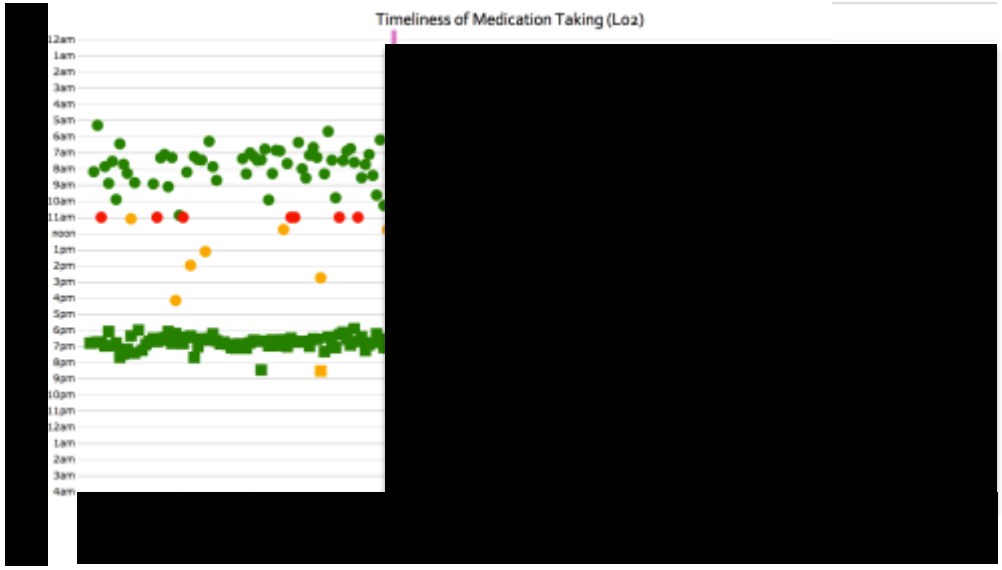


Researcher: "Before, did you think you were doing it regularly?"

Pearl: "Yeah, absolutely, I would have **bet my life that I didn't miss any days**, because that's one of those things about getting old. You actually physically say, '**No that couldn't be, I know I took it today. And you didn't.**'

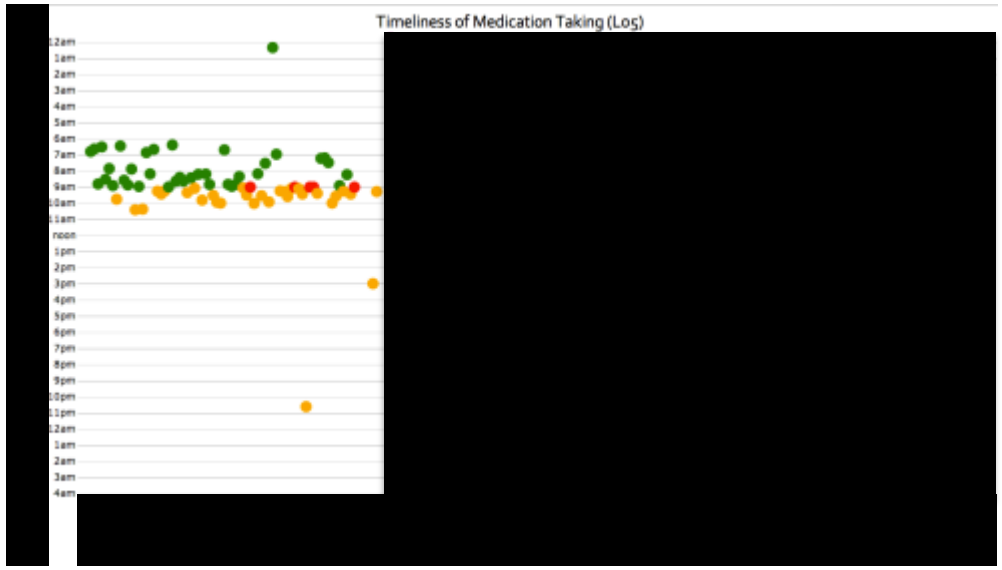
I hate to know that. I hate to acknowledge that 'cuz it's just another one of those things you don't want happening. But this **surely does show you what you're doing wrong**."

Improved medication adherence



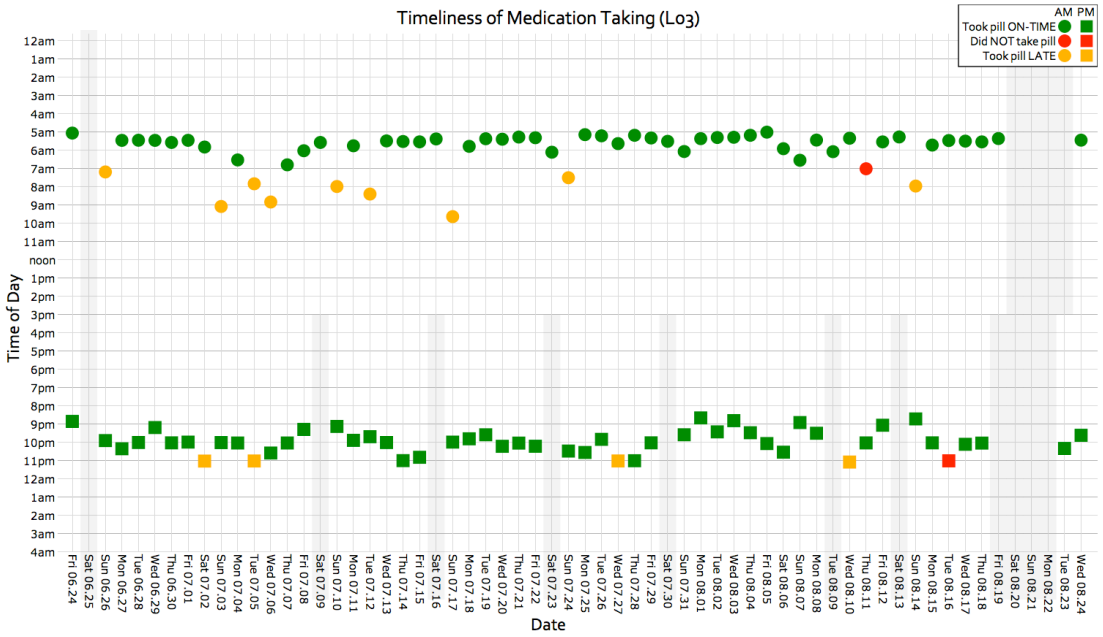
Took pill ON-TIME
Did NOT take pill
Took pill LATE

adherence,
variance,
timelineness



similar
improvements

Real-time vs. Long-term Displays



showed 4 months

served to shock

lasted 3-4 weeks

Persuasive Technology

Improved performance across tasks

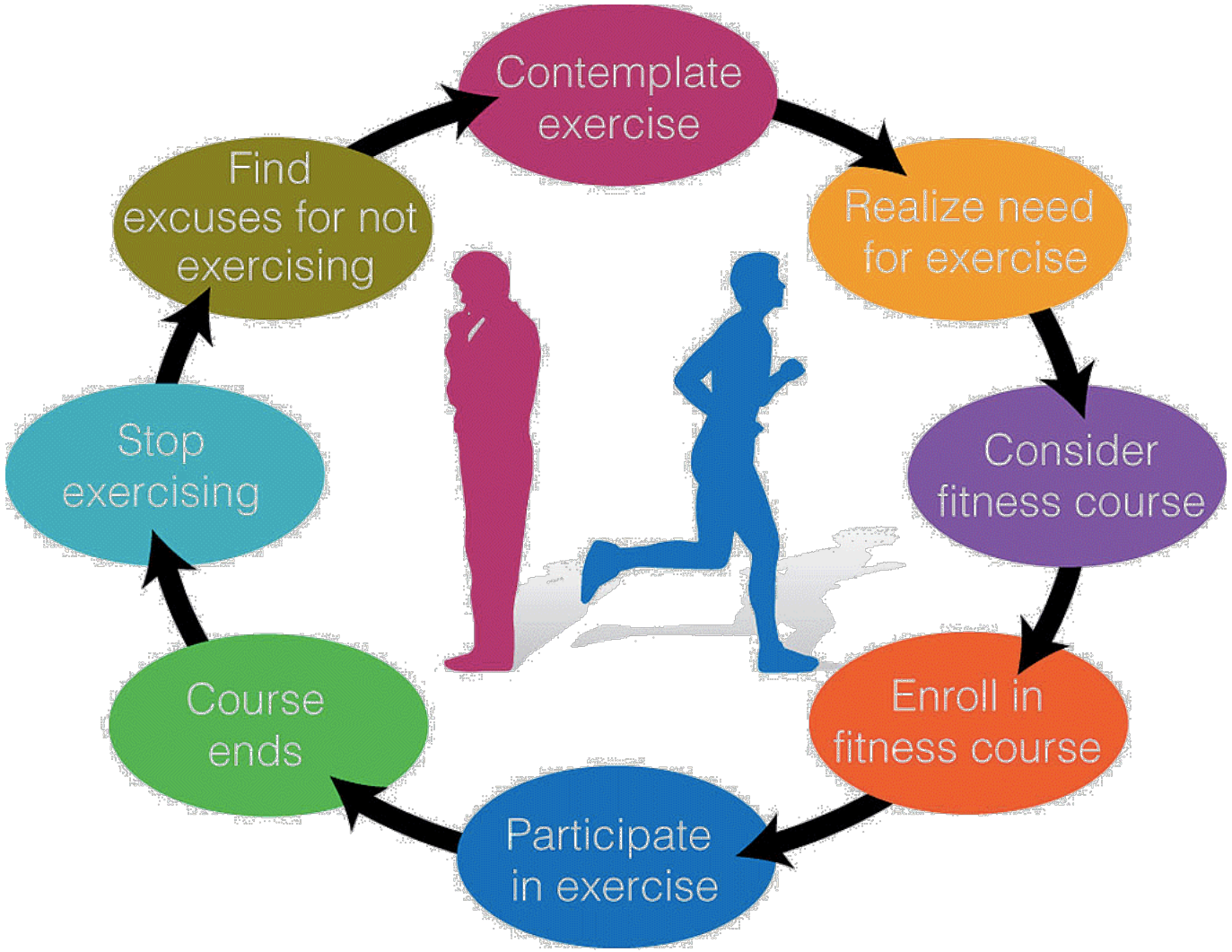
Provides assistance to OTs

Potential to help clinicians

Case study: physical activity

if time

Exercise dropout cycle



- 97% of Americans see a need to incorporate exercise into their lives
- 70% of new and returning exercisers are at risk for early dropout

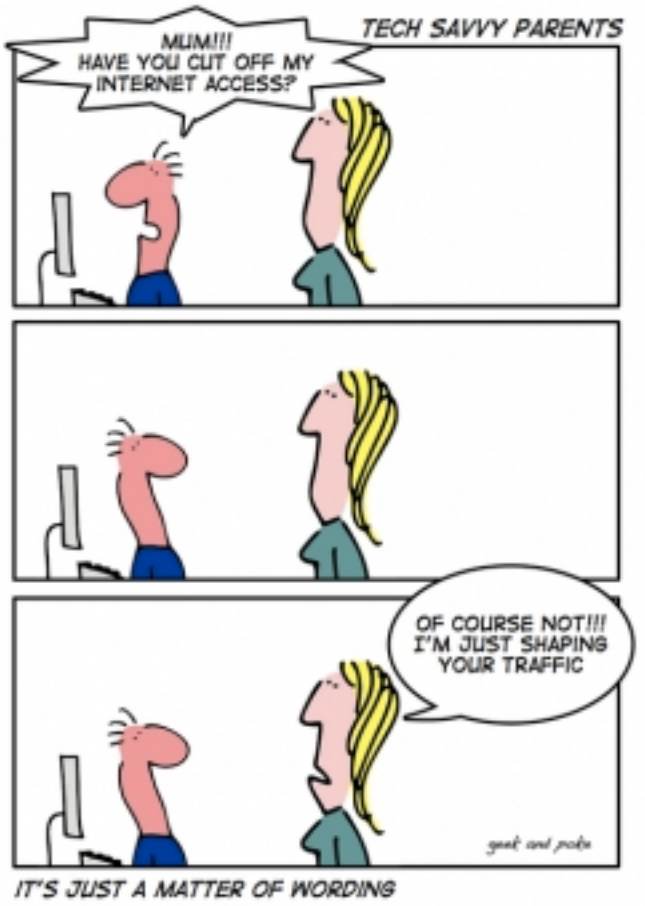
Behavior Modification

- Convincing research is not enough to cause change in people

- The science of behavioral therapy has shown that most behaviors are learned from the environment
  - Home, community, country, and culture
  - Family, friends, and peers; schools and workplaces; television, radio, and movies

Key Term

Behavior modification: The process of permanently changing negative behaviors to positive behaviors that will lead to better health and well-being



Environmental conditions

- We live in a "toxic" fitness and wellness environment
- Physical inactivity is predominant
- Learned behaviors; children watch adults
  - Drive short distances
  - Automatically use elevators, remote controls, etc.
  - Order super-sized fast foods
  - Use recreational time to watch TV or surf the Internet
  - Smoke, drink, and abuse other drugs
  - Engage in risky behaviors, such as not wearing seat belts

Environmental conditions

- Food portions have increased at restaurants
- Patrons consume large amounts of food
  - Food servings are excessive and unhealthy
  - Entire pitchers of soda (pop) or beer are served instead of 8-ounce cups
- Restaurants are colorful, well-lit, and nicely decorated to enhance comfort and appetite

Environmental conditions

- Escalators are more accessible than stairways
- Automatic doors provide unimpeded movement
- Exercise trails are sparse
- Sidewalks do not exist or are in disrepair
- Safety concerns keep citizens indoors during leisure hours

Old Habits Die Hard

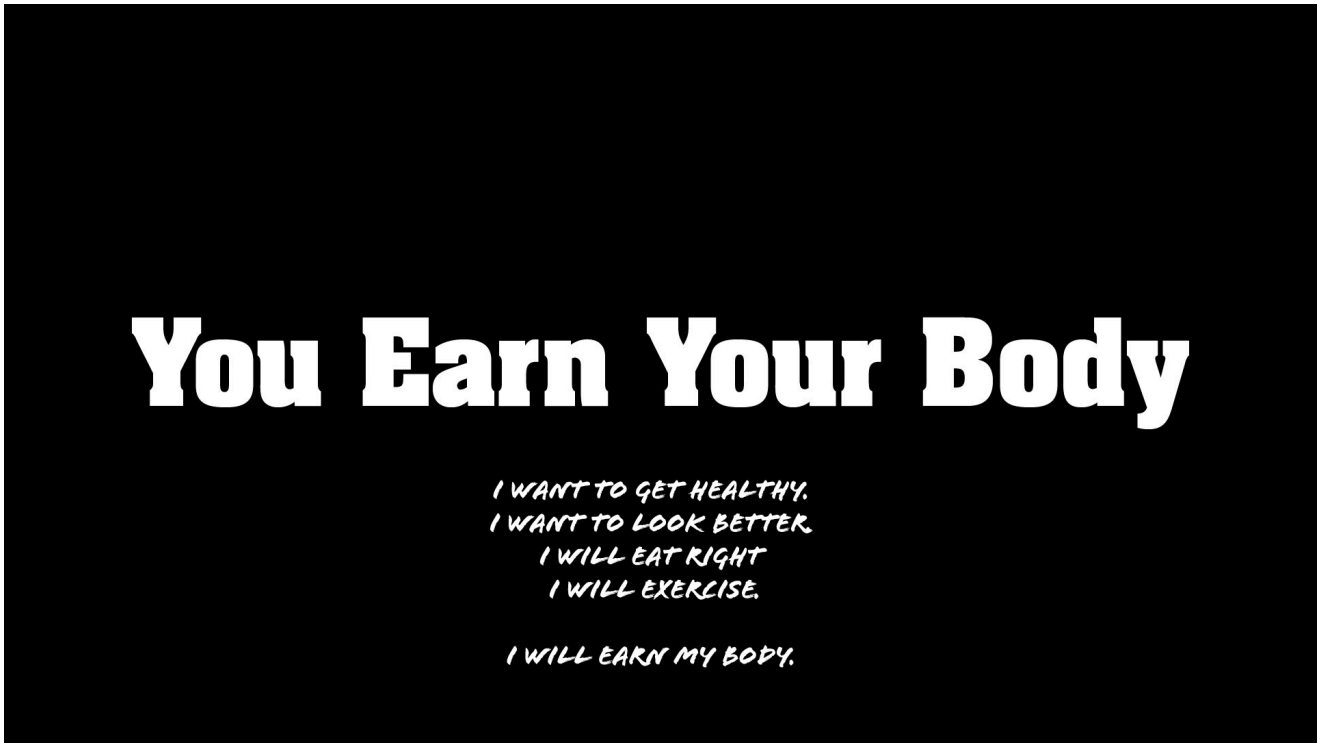
- Most people do not start life with a weight problem
- The time comes, around middle age, when people want to change but find this difficult to accomplish

Barriers to Change

- Procrastination
- Preconditioned cultural beliefs
- Gratification
- Risk complacency
- Complexity
- Indifference and helplessness
- Rationalization
- Illusions of invincibility

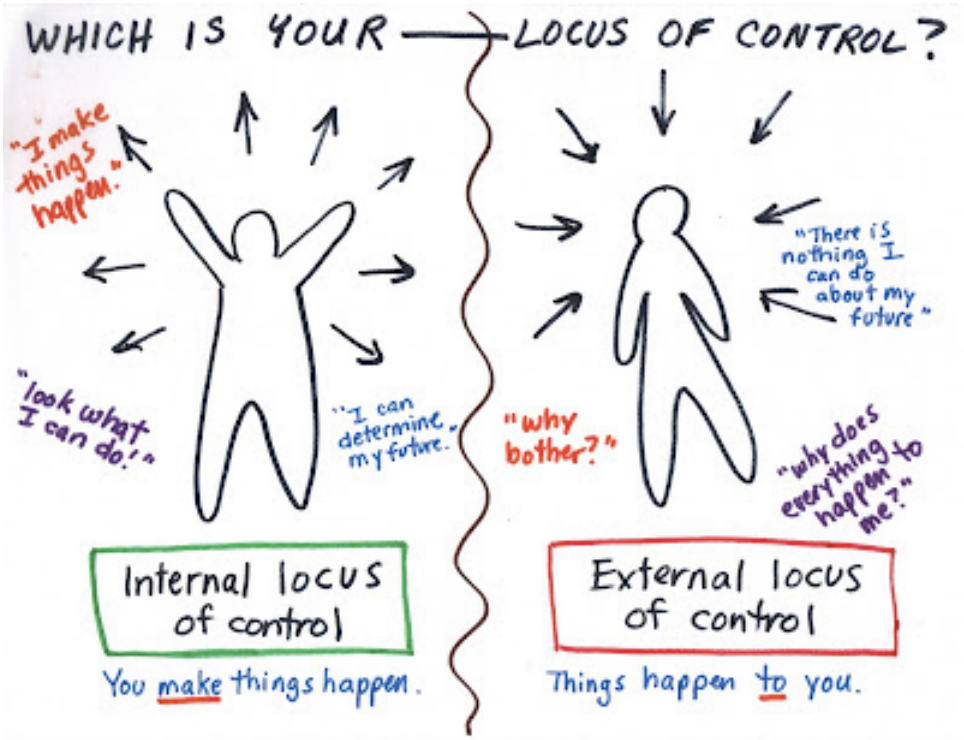
Other Important Terms

- **Motivation:** The desire and will to do something



Other Important Terms

- **Locus of control:** The extent to which a person believes he or she can influence the external environment



Locus of Control

- People with internal locus of control are usually
  - Healthier
  - More successful in adhering to exercise
- People with external locus of control usually
  - Feel powerless and vulnerable
  - Are at greater risk for illness
- Few people have a completely external or internal locus of control

Impediments to Change

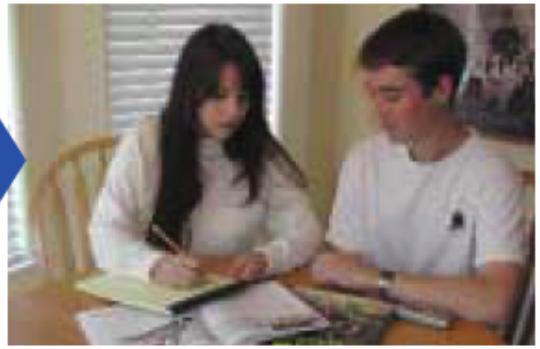
- Problems of competence
  - Work to master skills
  - Select activities where skill exists
- Problems of confidence
  - Give the healthy behavior a fair try
  - Visualize success
  - Divide goals into smaller objectives
- Problems of motivation
  - Gain knowledge about why change is necessary
  - Set goals

https://www.youtube.com/watch?v=iynzHWwJXaA

Transtheoretical Model of Change

Precontemplation
Do not wish to change

Contemplation
Contemplating change
over next 6 months

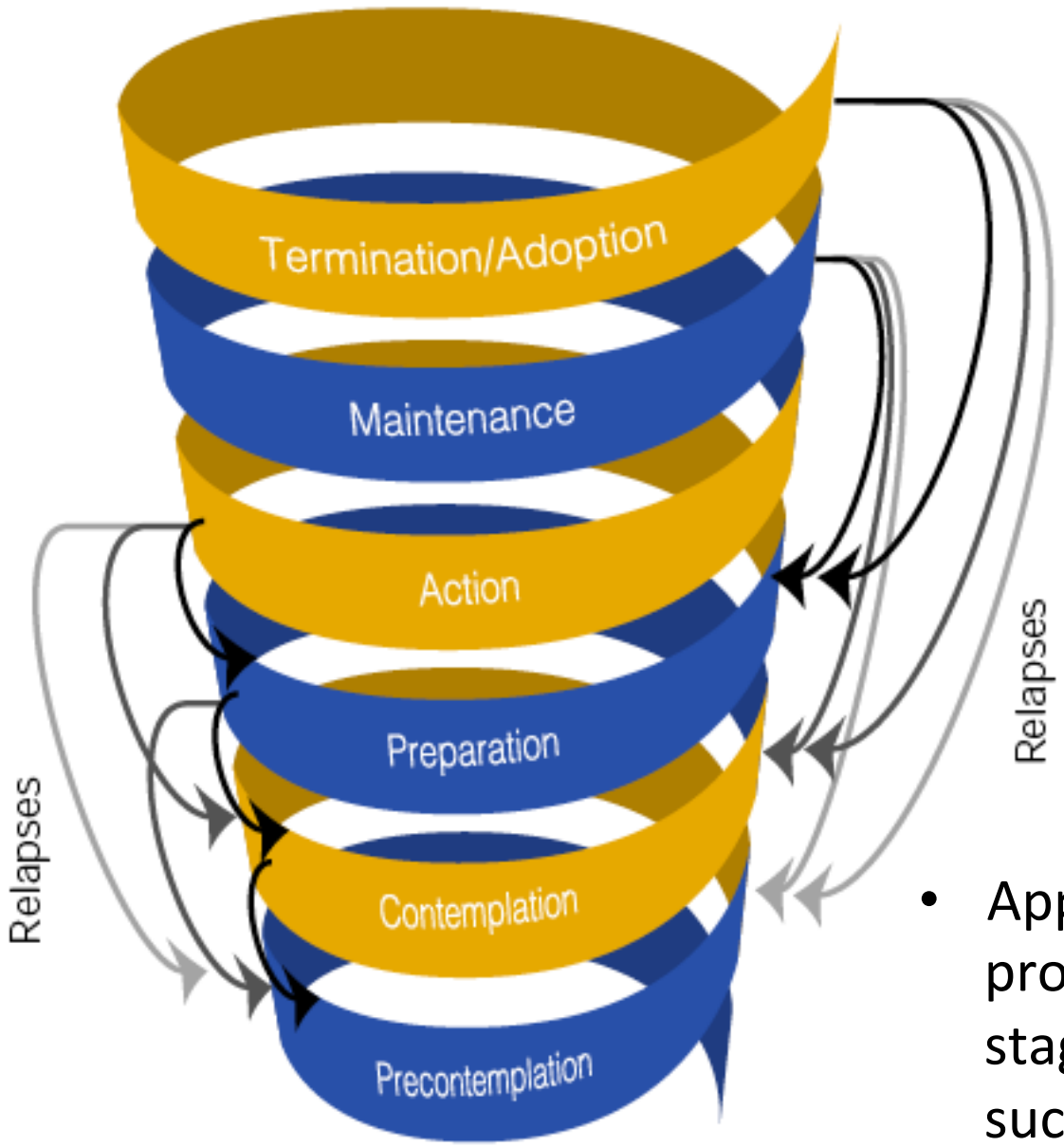


Preparation
Looking to change in the next month

Action
Implementing change for 6 months

Maintenance
Maintaining change for 5 years

Termination/Adoption
Change has been maintained
for more than 5 years



Model of Progression and Relapse

- Applying specific processes during each stage of change increases success rate

Processes of Change

- Using the same plan for every individual who wishes to change a behavior will not work
- Plans must be personalized
- Timing is important in the process of willful change

Applying Processes to Stages of Change

TABLE 2.1 Applicable Processes of Change During Each Stage of Change

Precontemplation	Contemplation	Preparation	Action	Maintenance	Termination/Adoption
Consciousness-raising	Consciousness-raising	Consciousness-raising			
Social liberation	Social liberation	Social liberation	Social liberation		
	Self-analysis	Self-analysis			
	Emotional arousal	Emotional arousal			
	Positive outlook	Positive outlook	Positive outlook		
		Commitment	Commitment	Commitment	Commitment
		Behavior analysis	Behavior analysis		
		Goal setting	Goal setting	Goal setting	
		Self-reevaluation	Self-reevaluation	Self-reevaluation	
			Countering	Countering	
			Monitoring	Monitoring	Monitoring
			Environment control	Environment control	Environment control
			Helping relationships	Helping relationships	Helping relationships
			Rewards	Rewards	Rewards

Source: Adapted from J. O. Prochaska, J. C. Norcross, and C. C. DiClemente, *Changing for Good,* (New York: William Morrow, 1994); and W. W. K. Hoeger and S. A. Hoeger, *Fitness & Wellness* (Belmont, CA: Wadsworth/Thomson Learning, 2002).

Case Studies

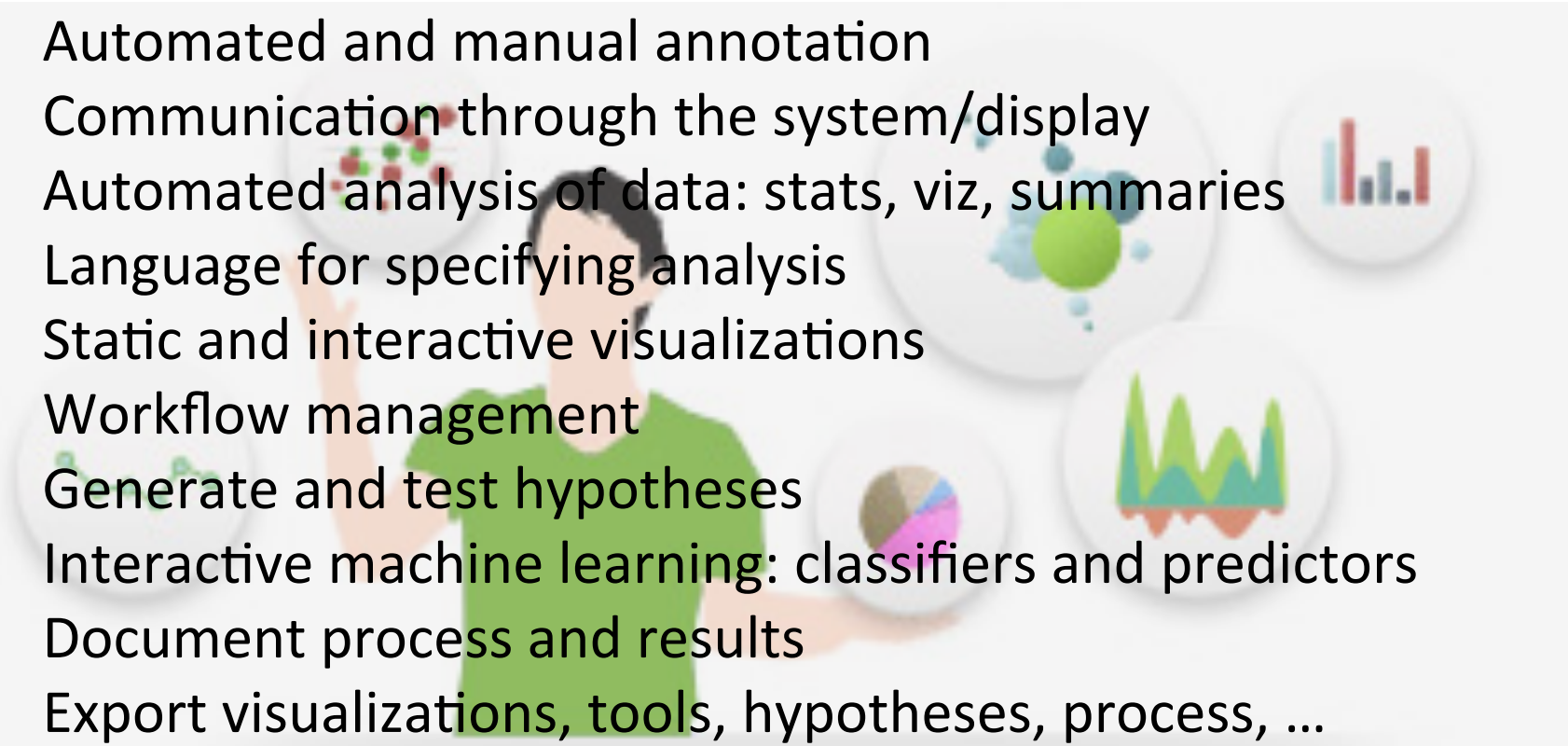
- dwellSense simpler case
  - More than just increasing awareness
  - Demonstration of behavior change

- Encouraging changes in physical activity
  - Need to demonstrate behavior change
  - Don't have set of generalizable tools (yet!)

- Spectrum of support:

from commanding systems
to
static visualizations of *data*
to
dynamic exploratory interfaces for *knowledge* creation

Spectrum of support for persuasive technologies



- Automated and manual annotation
- Communication through the system/display
- Automated analysis of data: stats, viz, summaries
- Language for specifying analysis
- Static and interactive visualizations
- Workflow management
- Generate and test hypotheses
- Interactive machine learning: classifiers and predictors
- Document process and results
- Export visualizations, tools, hypotheses, process, …
- Mixed-initiative: scientist support

Transformation

- Persuasive Technologies needs to support behavioral decision support tools
  - Coercive, persuasive, exploratory
- Need to transform data to actionable knowledge
- Tools to let individuals be scientists for their own data
- Also, opportunities for taking principles from other fields about persuading people
- Lots of work to be done!

Science of Persuasion

https://www.youtube.com/watch?v=cFdCzN7RYbw