THE BRAIN AND TECHNOLOGY

Brain science in interface design

LESSON 7. LEARNING

Brian Whitworth, BA (Psych), BSc (Maths), MA (Psych), PhD (IS), Major (Retd.) With illustrations by Jasmin Whitworth

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LEARNING



Never stop learning

PART 1. LEARNING

Learning: The brain changing its own processing:

- Motor processing (new schema, skills)
- Sensory processing (new percepts, concepts)
- State processing (new emotions, feelings)
- **Higher learning** links all three: A new feeling about a new situation that requires a new response
 - Learn that fleeing an agitated dog invites attack it's better to stand tall and back away.
- The Internet lets people learn the less obvious:
 - Free isn't always free.
 - Friends aren't always friends.
 - Safe isn't always safe.
 - Obvious isn't always obvious.

Learning creates new ways of processing information.



Learning is changing brain processing



Friends aren't always friends!

KNOWLEDGE

Knowledge: The result of learning

- **Biological**: *Genetic* (hard-wired learning)
 - Sensory: Redness, line, octave
 - Motor: Baby's suck reflex
 - State: to keep warm
- Personal: Acquired at run time
 - Imprinting—e.g., Geese follow the mother
 - Inclination—e.g., Faces, language
 - Cultural—e.g., Families teach children
 - Individual—e.g., Learning calculus
- Social: Passed on by the society
 - Science factual knowledge
 - Religion cultural knowledge
- Science: A method for querying reality not a set of facts
 - Intelligence: Knowing many facts
 - Wisdom: Knowing what you don't know



"The only true wisdom is in knowing you know nothing." – Socrates



WHAT THE LEARNER BRINGS

Databases trigger knowledge, but don't contain it:

- Knowledge is an **act** not a **fact**, that can be **learned** but not **taught**, and can only be **stored** for a **known reader**.
- Medical databases are meaningful only to doctors.

Learning depends on what the learner brings.

- **Bodhidharma**, the First Patriarch, brought Buddhism from India to China. He sat silently facing a wall for nine years waiting for a pupil.
 - When **Dazu Huike** sought the highest knowledge he replied:
 - "How can you hope for true religion with little virtue, little wisdom, a shallow heart and an arrogant mind? It would just be a waste of effort."
 - When Huike offered his severed left hand he was accepted and later became the Second Patriarch.

• Hui Neng, the Sixth Patriarch, founded Zen Buddhism.

Teaching is still about what the learner, not the teacher, does.



Dazu Huike offering his arm to Bodhidharma. Ink painting by Sesshū Tōyō

BENEFITS

Learning benefits:

- **Sensors**: *Higher cognitions* identify more complex patterns.
- Effectors: Higher skills give more results for less effort.
- **Desires**: Higher emotions realize more subtle values. "When I was a child, I spake as a child, I understood as a child, I thought as a child: but when I became a man, I put away childish things." – 1 Corinthians 13:11

Knowledge tells us:

- What will happen?
 - Can we predict the weather?
- How can we change it?

• Can we change the weather?

- What do we want?
 - Is a constant warm 24° C temperature good?
 - Maybe set AC closer to the outside temperature.



Young learn from old



We learn to adjust the weather

ADAPT TO THE READER

Databases that adapt to the reader

- Non-technical buyer: What this computer can do for me?
- Technical buyer: What are the specs, e.g., RAM?
- Need both because people are different



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For non-technical buyer

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For the technical buyer

PART 2. FEEDBACK CENTERS



- Moving. Manages output skills
- Emotions. Manages state emotions
- Intellect. Manages input concepts
- Knowledge can be:
 - Tacit: Of skills
 - Experiential: Of likes
 - Intellectual: Of concepts
- Three website/app questions:
 - Do they use it?
 - Do they like it?
 - Do they understand it?

The complexity of the brain arises from this division of processing labor.



TRIUNE THEORY

Triune theory: The human brain consists of

- **Reptilian** brain complex (**cerebellum**) that handles instincts such as fight and flight
- Mammalian brain complex (limbic system) that handles emotional fears and aggression
- Neo-mammalian brain complex (neocortex) that handles language, thinking and planning
 - Autism: Is an out-of-control reptilian brain.
 - Anxiety: Is an out-of-control mammalian brain.

Criticisms:

- Oversimplified
 - **Bird** telencephalon cortex mediates perception, memory, decision making, motor control, conceptual thinking, forms of speech and use of tools.
 - Even reptiles care for their young—e.g., crocodiles.
 - The first mammals had a neocortex.
- Presumes each development replaced the previous.
 This model is NOT Triune theory

Paul MacLean Senior Research Scientist Emeritus in the Department of Neurophysiology at National Institute of Mental Health





THREE CENTER THEORY

Brain FB loop has three control centers each with a role:

- Motor: Controls fast motor loops via motor schema
- State: Controls reward loops via body state emotions
- Sensory: Controls loop prediction via patterns/thoughts Each center evolved autonomously, with its own input/output nerves, but they work as a *triumvirate*.
 Any center can take control of the FB loop.
 - Sudden falls: Motor loop schema can roll you safely.
 - Emotional reaction to a word changes your state.

The centers evolved in parallel not in sequence, i.e. one did not lead to or contain the other.

- There always was a cortex, i.e. sensory analysis, e.g. Dinosaurs/birds evolved a **smooth** cortex (intellect) that may have allowed language and thought.
- Mental disorders could be **FB loop control errors.**
 - Autism: Infinite motor loop, like an infinite software loop
 - Chronic anxiety: Rogue background program using up resources



Three centers control one feedback loop.

CENTRE DEVELOPMENT

Three center theory means three **complementary** learning types:

- Intellectual (thoughts)
- Emotional (desires)
- For the same situation!
- **Psychomotor** (skills) Each center has its own **learning rate**:
 - IQ: Intellectual learning rate
 - To learn a new concept
 - EQ: Emotional learning rate
 - To understand another
 - PQ: Psychomotor learning rate
 - To acquire a new skill
- Learning rate doesn't affect learning result.
 - Tortoise and the hare *slow learners* get the same knowledge in the end
 - Patience and perseverance are virtues.

One center dominating prevents others from developing.



Tortoise and the Hare



Different centers develop differently!

Three centers work together

USE THE RIGHT CENTER

People need to learn to use the right center for the job

- Intellect: To handle information complexity
- Emotions: To understand people and purposes
- Psychomotor: To respond quickly and effectively

Jacob and Wilhelm Grimm's story

 Once upon a time, a mouse, a bird and a sausage happily kept house: The bird flew off to fetch wood, the mouse made the fire, and the sausage did the cooking. One day the bird, after taking advice, felt that everyone should be equal, so the next day the sausage had to fetch wood, the mouse had to cook and the bird started the fire. Unfortunately a dog caught and ate the sausage, the mouse fell in the pot and drowned and the bird let the house catch fire and burned to death. So ended their equality experiment.

High IQ doesn't necessarily imply high EQ or PQ.

- Nerd: High IQ, low EQ and PQ
- **Psychopath**: No idea of others' states (low EQ)
- Analyze your wife and burn down your marriage.





THE CENTERS ARE GATEKEEPERS

Moving center – What do I do?

- Require: Things to do, click, effect, change
- Feedback: Ongoing & fast, like mouse hover effects
- Like: Movement, space, depth, activity, buttons
- Red flags: Nothing is happening, boring
- Emotional center What do I feel?
 - **Require**: Pictures, colors, sounds, faces, people
 - Feedback: Confirming, friendly, welcoming, not rejecting
 - Like: Faces, people, relationships—e.g., a book being read
 - Red flags: No-one is there, lonely

Intellectual center What do I think?

- Require: Summary/abstract, overview, no errors, good spelling
- Feedback: Allow questions, FAQ
- Like: Logical structure, interesting information, consistent rules
- Red flags: Ideas that contradict racism, sexism ...





18th Australasian Conference on Information Systems 5-7 Dec 2007, Toowoomba A Research Publishing Checklist Brian Whitworth

A Research Publishing Checklist for New Authors

Brian Whitworth, Institute of Information and Mathematical Sciences (IIMS), Massey University Auckland, New Zealand

Abstract

Ideas?

While traditionally information systems (15) students graduated then published, today they often publish before they graduate. While publishing seems yet another student burden, it can be a useful learning experience, raise motivation, provide helpful feedback, help grant and job applications, and give student and advisor a common focus. That research publishing is an extra demand suggests the need for a support tool. The research publishing checklist: 1. Chanks knowledge into elements for easier handling. 2. Grounds elements with practical examples and summers statements and 3. Structures the elements in academic formet for some beating. It can be available

TRIGGERING THE CENTERS

How apps/websites trigger the centers:

- Intellect: By thoughts and patterns
 - An initial overview
 - A document structure
 - Explanations in full
 - Words and terms used correctly
- Emotions: By feelings and people
 - Pictures of faces and people
 - People speaking "Hi, I'm ..."
 - Sound context: e.g., background music
 - Relevance, evocation, memory triggers
- Motor: By opportunities for action and results:
 - Obvious what to do right away
 - Movement and navigation easy
 - All buttons pressed go somewhere
 - Immediate feedback for actions

The brain evolved to handle it all.



Feelings

Ideas



D About this volume

PART I: Allocation of decisionmaking responsibility for non-regulatory activities

Chapter 1: Allocation of decision-making responsibility for non-regulatory activities

PART II: Financial statements

Chapter 2: Prospective financial statements and notes

Chapter 3: Funding impact

Financial assistance and support

remission of rates to top-up the rates rebate
remission of rates penalties

Actions

强 📶 🥘 5:35 PM

Dropbox

I'm already a Dropbox user

I'm new to Dropbox

Chapter 11: Rates remission and postponement

provide ratepayers with some financial or other

address circumstances where the rating system

support the achievement of broader council provided in the support of the support o

The council's remission and postponement policy is set

11.1 Policy purpose and overview

The objective of this policy is to:

their obligations

THE THREE SCHOOLS

The three schools of life:

- Habit (all attend)
 - Lessons: Practice makes perfect
 - Motto: Do what you did before.
- Hard knocks (most attend)
 - Lessons: Learn from others experiences
 - Motto: "No pain, no gain"
- Higher principles (some attend)
 - Lessons: Principles like: "Go fast, but don't hurry."
 - Motto: "An unexamined life isn't worth living." Socrates

Avoid the schools of

- Chaos: Love today, hate tomorrow
- Soft pats: You're a good boy no matter what you do.
 - How doting mothers create serial killers

• Big lies:

- We are the master race.
- God wants us to kill infidels.
- Greed is good.





We the undersigned do hereby proudly present this Certificate of Attendance in recognition of an outstanding Attendance record to

John Doe

For their remarkable record of attendance at SCHOOL OF HARD KNOCKS. Awarded on the 1st April 2016 by the undersigned

Socrates – School of principle



PART 3. INTELLECTUAL LEARNING

Children learn object permanence in Jean Piaget's concrete operations phase:

- Infants don't search for covered objects until they learn that objects persist (0-1 years)
- Think a tall glass holds more than a short fat one,

even after seeing water poured between them.

• They learn that volume is conserved.

Likewise, with computers, people **learn** that:

- Reduced windows are still "there".
- Unused apps are still in memory.
- A downloaded file is saved somewhere.

Help the learning:

- File explorer: A text list gives no idea of size.
- Apps: Remember where you put stuff!
- Memory: A running apps carousel.





A carousel

OBJECT RETENTION

Scrolling carousel or rolodex makes other apps or files contextual but still there.

Mac peel-away windows implies they are still there.

Avoids the hidden modal window problem.





INSIGHT

Insight: Re-arranging old ideas to get a new idea:

- Kohler put a banana out of reach of the chimp Sultan who was in a cage with short hollow bamboo sticks.
- After many fruitless attempts Sultan gave up, then suddenly stuck one stick into another giving a long stick to drag in the fruit.
- No trial and error, no practice, just insight
- The "Aha!" experience is sudden.
 - Archimedes leapt from a bath and ran naked through the streets of Syracuse shouting "Eureka" (I found it!) after he sat in a bath and realized that displaced water measures volume.
 - Manipulating **concepts** is easier than manipulating **things**.
 - People enjoy making new mental model combinations.

Reason as the "last in" brain evolution is the "first out" under stress.

- Can only think when it is peaceful—e.g., a bath
- Stress/pressure evoke dominant responses, not innovation.
- Thinking can be developed—e.g. Luminosity





FORMAL INTELLECT

Brain doesn't physically mature until mid-20s and is still making connections and adjusting control throughout life.

Formal intellect: Frontal cortex gets autonomy from sense input to allow abstract thought. (Jean Piaget's Forma Operations)

- Associative cortex: Links different sense events by 5-6.
- Formal intellect: Builds mental models at 11-12 years old.
- Concepts: Concept "three" exists apart from any instance
 - The Arabs had to invent zero as it had no sense basis.
- Logic: Manipulates concepts apart from sensation.
- Mathematics: Symbols with no sense base like infinity.
- **Teenagers** can think beyond their immediate lives:
 - How do others see me? Do I have to be this way?

• Does society have to be the way it is? Reason lets us change the world and ourselves.



Self-Operating Napkin



PART 4. EMOTIONAL LEARNING

Emotions is about good vs. bad consequences:

- Good: Closer to a desired state 🤃
 - Win a lottery, get a promotion
- Bad: Further from a desired state
 - Go to jail, get fired
- Contingency: The situation that caused good or bad
 - Lying to your Mother is bad, but lying to the Gestapo is good.
- Emotional learning:
- Operant conditioning, of reward and punishment, connects contingencies to consequences.
 - Describes adult rat behavior
 - Effective for children from about 3-5 years old.
 - "Don't touch that or you'll be put in your room."
- Classical Conditioning: A motor loop link—e.g., Pavlov's dog
 - Effective at any age
 - No! (said loudly as they touch it)



Carrot and stick

LAWS OF CONSEQUENCES

Reward: Positive feedback encourages a behavior.

• Give a dog a treat when it sits

• Must get the behavior to reward it, e.g. potty training.

Remove reward: Encourages not doing something

Punish: Negative feedback discourages a behavior.

- Choker chokes dog if it pulls ahead
- Can have side-effects such as anxiety

Under stress, people revert to dominant habits.
Remove punish: Encourages a behavior
Ignore: No feedback diminishes all behavior (extinction).

- **Time out:** No physical hurt but is it more benign?
 - Ostracism: Being socially ignored is devastating.

• Isolation: Sensory time out creates insanity. Learning: To form new habits old habits must first be suppressed.

• Army: Break them down then build them up.



RISK AND OPPORTUNITY

Risk: Probability of negative results

- Action error: An action gives a bad result or makes things worse.
- **Inaction error**: Not doing what you should gives a bad result.
 - **Negligence**: Ignoring city maintenance, or aircraft near misses
 - Fear of failure: The social blame game makes people do nothing.
 - **Opportunity loss: Lack of innovation** is a major cause of business failure, e.g. Viscalc, Lotus 1-2-3, Word Perfect, Myspace

Opportunity: Probability of positive results

- Action gain: An action makes things better.
- **Inaction gain:** Not acting makes things better.

Minimizing action errors maximizes inaction errors.

- "Between the great things we cannot do and the small things we will not do, the danger is we will do nothing." (Adolph Monod)
- "It's only those who do nothing that make no mistakes." (Joseph Conrad)
- You can't win a lottery if you don't buy a ticket.

Management spreadsheets:

- **Show**: Action risks and opportunities—i.e., **known** result causes
- Don't show: Inaction errors and opportunity losses—i.e., unknown result
- Not maintaining: Is invisible until the catastrophe!





THE ERROR OPPORTUNITY

Errors are learning opportunities

• An error message is a negative **shock** that inhibits current behavior and allows new learning to occur.

People don't read help to start!

- Why should they?, They only read the instructions If other ways fail – so <u>after</u> an error they will read!
- Take the error opportunity!

"Because Windows was not shut down correctly your disk may have errors. To avoid this message again always shutdown your computer by selecting Shut Down from the Start menu."

Conclusion?

- **Embed Help** in the application and its error messages.
- **Positive help** suggests answers or links to solutions
- **Social feedback**: People help others if public comment is allowed
- **Big brother approach** doesn't work:
 - "Serious error please tell Microsoft ..."



Error 404 – File not found

http://wikimediafoundation.org/404ed

We could not find the above page on our servers.

Did you mean to type http://wikimediafoundation.org/wiki/404ed? You will be automatically redirected there in five seconds.

Alternatively, you can visit the <u>Main Page</u> or read <u>more</u> <u>information</u> about this type of error.

A project of the Wikimedia Foundation

Microsoft Windows The system has recovered from a serious error. A log of this error has been created. Please tell Microsoft about this problem. We have created an error report that you can send to help us improve Microsoft Windows. We will treat this report as confidential and anorymous. To see what data this error report contains, click here. Send Error Report Dont Send

SOFTWARE MESSAGES

Every software message is **seen as** good, bad or irrelevant!

- A COBOL compiler **reward** message:
 - PROGRAM SEVERITY CODE 1 (Translation - "Program compiled ok!")
- ATM messages can be:
 - Neutral: Transaction processed
 - **Positive**: Have a nice day
 - **Negative**: Your funds are insufficient
 - Customizable: "Thank you Master..."

Programmers: **Imagine your software message is to a person**:

- Blame? Inexperienced people assume they did something wrong.
- **Unhelpful**: Telling people read manual,WWW or update drivers ...
- Jargon: Error 456 Code 123
- Fear: Errors can make people afraid to do anything.
- Panic: Sudden sounds that shock people



.com/campaign/landing.php?campaign_id=458206487572991&placement=&creative=.

rted

facebook

Sorry, something went wrong.

We're working on getting this fixed as soon as we can.

Go Back

Facebook © 2013 · <u>Help</u>

TO ERR IS HUMAN

Good error messages:

- State the error in understandable terms
 - Can't connect to a printer
- Suggest possible reasons why
 - You may have the wrong default printer.
- Offer one or more error solutions
 - Check power cable is connected properly.
- Provide links that lead to next steps
 - Links to the default printer page
 - Say we have a problem not you have a problem

Bad error messages:

- Tell people what is wrong in jargon terms—e.g., "Low Voltage Error" then depart
- Software that "takes charge" when all is well *leaves you in the lurch* when things go wrong.

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PART 5. THE EMOTIONAL CENTER

The Limbic system: Controls emotional responses.

- Emotions: Are neural memories of body states.
- Feelings: Reactivate the past body state.
- Amygdala directs the sympathetic system.
 - Overactive: Fear, anxiety, panic, sleepless
- Hippocampus handles emotional memories.
- Has its own sensory input and state output nerves.
- Evolved after the reptile brain (movement, instincts).

The emotional center:

- Can override the reptilian (survival) brain.
- Arose before the cortex fully developed.
- Can change the body's chemical state.
- Can remember, think and learn by itself.
- Emotional memory is not *cognitive memory*.

The Limbic System



THE EMOTIONS

Baby's first emotion is excitement at any unexpected change.

- Within a month, this differentiates into:
 - Delight: Smiling, relaxation
 - Distress: Tension, checked breath
- These later differentiate into other emotions:
 - Anger: Goal frustration causes violence
 - Fear: Imminent danger activation
 - Laziness: Tiredness, torpor
 - Depression: Injured, hurt, sad
 - Greed: Want more
 - Power: Want control
 - Dependence: Want nurture, to be looked after

Emoticons:

- Facebook's new emoticons: Love, Wow, Haha, Sad and Angry
- Forgot the first emotion: Interest, Looking, Huh?, What's that?
- More complex emotions: Jealous, Bored
- **Social**: We need a Sorry emoji (tears).







EMOTIONS INTERPRET BODY STATES

Emotions are neural representations of body states:

- Yet **fight (anger)** and **flight (fear)** are much the same body state (adrenaline, pupil dilation, raised heart rate, ...)
- Schacter's 1962 study:
 - Subjects were told adrenaline was vitamins in two situations.
 - Happy with a happy stooge
 - Angry with an angry stooge
 - The reported emotions matched the situation!
 - If told about the drug, they had neither feelings.
 - The Limbic system **interpreted** the **same** body state as **different** emotions depending on the situation.

Thoughts fade if left, but emotions fester if unreleased: e.g., by tears.

- Emotional states aren't altered by thought but by other emotions.
- Helping others generates "happy brain chemicals".
- Conflict creates adrenaline, cortisol, norepinephrine and other "fight or flight" stress hormones.



Emotions reflect and create body states



EMPATHY

Children learn concepts such as self, other and group.

• When three-year-olds were asked what is in a sweet box they said, "*Sweets*".

- They were then shown that it contained **pencils**.
- When they were asked:
 - "If we bring in your friend and ask him, what will he say is in the box?"
 - They all answered **Pencils**!
- Children can't see another's view until 4-6 years old.
 - Sensitive people feel for others easily.
- Psychopaths missed this emotional growth step. **Emotional center** that **reveals** our state can also reveal another's:
- Parallel play becomes **working together**. **Empathy:** Lets us truly feel another's hurt:
 - When we empathize, we cannot hurt them.
 - To hurt others, we must first demonize them (Hate sites).

Socially: To reveal one's emotions is political weakness.

• Insincerity: We lie better when we believe the lie



We have to learn self, others and culture.





EMOTIONAL GROWTH

Thinking: When cortical analysis separates from sense data. **Empathy:** When limbic analysis separates from body data.

- Emotional center can "put ourselves into another's shoes" by **feeling what they feel**, by recreating another's internal state **in oneself**.
- People call helplines as much for empathy as help. **Empathy helps people better bear loss**
 - An associate uses me on the outside:
 - I am a just a "piece on their checker board".
 - To be **known** by a stranger is a surprise.
 - A friend understands me on the inside:
 - To be **used** by a friend hurts.

Social evolution requires emotional growth.

- **Tolerance:** As more people feel for minorities
- Alienation: People feeling they don't belong to the group.



PART 6. SKILLS

When babies reach for a thing the whole body thrashes.

- Motor system learns by trial and error.
- Blunderbuss method (use all barrels)
- With time, it learns to reach with one hand—i.e., minimum action for maximum effect.

FB loop calibration: Knowledge of the I-O connection

- Upside-down glasses
 - Down retinal image is **calibrated** as "up".
 - Subjects with goggles that reverse left/right and up/down found walking at first difficult
 - After 4-5 days, a Professor cycled to class with them!
 - Brain can learn any constant **action-effect** relation getting wobbly is just losing **calibration data**.
- Bad weather accidents occur when people don't recalibrate their motor loops to the conditions: see "<u>Riding Safely, Rain</u>"



The eye actually sees the world upside down!



SCHEMA

Schema: An abstract representation of a set of motor acts

- As abstract thought separated from sensations, so abstract schema separated from muscle acts.
 - Can sign your name with a broomstick, or your foot
- Walking, riding a bike are abstract motor feedback loops. **Cerebellum** learns motor feedback loops using schema
 - Over half the neurons of the brain are in the cerebellum.
 - Cerebellum has its own sensory input as it constantly registers your body space, e.g. lest something falls on you, or you fall.
 - Cortical analysis is too slow for fast motor loops.
 - Limbic system is too generic as it affects the whole body.
 - Brain stem strokes: Stumble and slur speech.
 - Procedural learning (of motor loops) isn't lost in dementia.





HABIT

The Habit Effect:

- Habit: Doing what was done before is easier.
- **Tradition:** Society doing what it did before is easier.
- Rites of passage: Each generation passes its pain onto the next by making it a condition of joining the society

Emotional habits:

- Fixed ideas: It is true because I want it to be.
- 60% of drivers rate themselves better than 60% of others (ego)
- Trolls, like Nazis, Al Qaeda and ISIL, believe they are fixing the world.

Computing habits

- QWERTY keyboard was originally designed to slow typists down!
- Save as: Is a very inefficient Backup function.
- Public Inbox: Email lets anyone dump mail in your inbox.
 - Prime social directive is "Who are you?"
 - NZ Maori Haka is a "welcome" that says don't mess with us
 - Telemarketers say, "Hi Brian, how are you?"; I say ,"Who are you?"
 - Need a Known vs. Unknown Inbox—See Channel email.





COMPUTER HABITS

ANSI keyboard was designed by engineers for reasons like **redundancy**:

- Three navigation areas
- Two number sets
- Two Shift, Ctrl and Alt keys

Human factors were not an issue:

- Size: Biggest key is Space (not Enter)
- **Grouping: Insert mode** is in the navigation group.
- Feedback: Capslock key mode lights up a feedback light on the other side!!
- Habit: What does Scroll Lock or Pause Break do?

Mobile phones

Number Pad for Text Entry was a mode trick fail

Esc		F1		F2	5	3	F	4	I	F5	F6	F7		F8		F9	F	10	F11	F12	Prt Som Sys Rq	Scroll Lock	Pause Break	٠		Ö	
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KEYS ARE FASTER

Keys are faster:

- Tab key is faster than a mouse indent, Ctrl/Z is faster than a mouse menu undo.
- Bruce Lee's "one-inch punch" is the computer expert's one-key act.
- Unfortunately key associations are harder to learn and easier to forget.

Mouse is easier:

• A motor FB loop is easier to remember than a cognitive association

Laptops simplified the keyboard.

- Reduced navigation and number keys
- Put Capslock light on the Capslock key
- Added touch feedback (touchpad)

Smartphones simplified the Screen Keyboard

• Press **Sym** mode for symbols is clear







F1 could be colored?

If there were an Undo key?

ACTION STANDARDS

Keyboard, Mouse & Touch screen standards **Kinesthetic?**

- Turn rotates screen works
- Clap to turn on lights didn't work!
- Shake to stop phone in a meeting
- Wave means what?
- Holographic screens?

Issues

- Volume control?
- Repeat acts?
- Task control?
- Touchpad vs. USB mouse confusion

Action	Keyboard	Mouse	Touch
WAKE	Press Enter key	Left click	Swipe - not tap!
SLEEP	-	Main menu	Cover, close
SELECT	Shift+Arrows, Ctrl/A	Click, Shift/Click, Click lasso	Тар
ACTION	Enter	Double click	Double tap?
UNDO	Ctrl/Z	Back button	Right smart key
EXIT, CLOSE	Esc, Alt/F4	Window close	Home to app select
MOVE	Cut/paste (Ctrl/X,Ctrl/V)	Drag and drop	Drag and drop
ZOOM	Ctrl/+, Ctrl/-	Scroll wheel	Finger expand
HELP	F1	Button	Icon
CONTEXT MENU	None	Right click,	Left key, Press/hold
MODES	Shift, Fn, Ctrl, Alt	Cursor modes	Flight mode
VOLUME CONTROL	Volume keys	Volume slider	Long side button
TASK CONTROL	Ctrl/Alt/Delete	App manager	Four-finger swipe

MOVING CENTER GROWTH

Automation: Transfer of cortical motor skills to the cerebellum

- With more nerves than the rest of the brain put together, the cerebellum is like a whole brain in itself.
- Thoughts and emotions interfere with its operation.
 - Penalty kicks are best if the mind is blank & you don't care.
- Automation frees up the intellectual mind:
 - Pianists playing a complex piece can converse because they learned the piece "in their fingers".
- How to use this system: Get out of the way! Just do it!
- Modern society **undervalues** the **moving center**
 - Falling: The main cause of elderly injuries
 - Intellect is too slow and emotions tense muscles and break bones.
 - Moving brain rolls you out of trouble.
 - **Posture**: The cause of most back problems:
 - Haptic or kinesthetic systems can sense posture.
- Driving: Music can calm interfering emotions but cell-phones distract. Moving center: "Man's Intuition" being in the right place at the right time.





Computing posture sensor

PART 7. SOCIAL LEARNING

Social learning: Is shared and passed on by a community.

- Social invention: A community acquires new knowledge
 - Washing potatoes: One monkey invented it and the group kept it.
 - Lemmings: One fool leads others astray—e.g., Hitler.
 - Leadership: One genius finds a better way
- Social retention: Sustaining past knowledge
 - Passed on by parents, teachers, schools, stories, myths, drawings
 - Knowledge becomes **normative**—i.e., required.
- **Social learning:** Took humanity from minor scavenger to dominance.
 - Socrates invented science that humanity lost then found again.

Technical support for social learning:

- FAQ: Stores group learning.
- **Question boards**: Someone always knows!
- Reduce ridicule: Diversity increases creativity.
- The elderly can recall real-life stories.





TRUST

Trust: Believing another won't cheat allows trade synergy:

- A Middle Ages trader would call it pure folly to send money to people unseen for goods unseen to come at times unknown.
- "To participate in a market economy, to be willing to ship goods to distant destinations and to invest in projects that will come to fruition or pay dividends only in the future, requires ... the confidence that ownership is secure and payment dependable." Mandelbaum, 2002, p.272
- Knights Templar invented credit because people trusted them.
- Social progress and technical progress go hand in hand.

A world of **suckers** couldn't support **E-commerce**!

- Everyone can't steal from everyone else!
- Link fakes: Meta-tags fake Google analytics search terms.
- Refund fakes: Post to Texas with proof ...
- Warranty fakes: Only applies to the engine ...
- Win the case battle, lose the trust war and sales.





IN THIS WE TRUST

- **1. History:** In ten years I may trust you.
 - Free software builds up a **positive history**.
 - The boy who cried "Wolf!" lost trust
 - Trust is not a tap you can turn on and off.
- 2. Relationships: Do my friends recommend you?
 - "Hey Brian, look at this"?
 - One trusted site can recommend another.
- **3. Community:** What everyone thinks can't be wrong!
- Norms are created by many people over time. Hypersociality: When to attack one is to attack all.

One public complaint can alienate a community.
Motive: Who are you and what do you want?
Trisection: When three independent sources agree.
Conspiracy theories: When trust fails entirely.



Truth Quotes

Would you trust this man?



EXTELLIGENCE

"If intelligence is the ability to use ones own mind, then **extelligence** is the ability to tap into the minds of others in order to generate knowledge collaboratively." Realizing the Power of Extelligence, 2010, p1

Technology lets cheated customers tell others.

Don't buy til you have checked online reviews.

- A reliable **brand** can have an unreliable **model**.
- **Google** "Model xxx review" for community feedback.
- **Expert reviews** are usually one case, for a short time and about general features.
- Ordinary customer reviews are for many cases, over time and about specific features.
 - "I bought this product and ..."
- **Extelligence** works because "You can't fool all the people all the time."

User #384797 5 posts dizzie Participant	Mickle87 I was asking the same question not long ago. I checked out Youtube for some reviews and found that a lot of people have Roomba robotic vacuum and were happy to give their opinion. I have pasted a link below to some of the revews I had found. http://www.youtube.com/results?search_query=roomba+review&aq=8 [°] After watching these I took a look at the Aust Roomba website for more details and found a great vid that explains how it works. I have had mine now for a few months and can't speak highly enough about it, but you can get plenty of opinions at the link above. Roomba website link below http://www.roomba.com.au/roomba530.php [°]	reference: whrl.pl/Rcr02w posted 2010-Sep-30, 4:52 pm
User #21443 2543 posts kevvy2003 Whirlpool Forums Addict	No good for me as it would scare my dogs during the day when I go to work. Perhaps my dog will bite the robot vacuum or destroy it. So I wont able to get it being I am lazy bum.	reference: whrl.pl/Rcr09 posted 2010-Sep-30, 5:13 pm
User #218008 431 posts jedyh	My dogs and my cat dont care about it. Train them to leave it alone.	reference: whrl.pl/Rcr3L posted 2010-Oct-1, 11:35 am
User #7030 7016 posts ChaosWorrier Whirlpool Forums Addict	My bro-in-law has one in a house which also houses a cat. The cat has no issue. That said, I notice that the robo cleaner does miss some areas a bit and the house needs some manual maintenance.	

I Googled "Should I buy a Roomba?"

LAWS OF SOCIAL ACTION

Social force: A set of people wanting a social change

- 1. Law of inertia: A community norm won't change unless acted upon by a *social force*.
- 2. Law of Force: The force varies according to *the number* of people involved and the *amount of change* required.
- **3.** Law of reaction: Every social action creates an equal and opposite reaction.
 - Apple vs. FBI: The government forces a safe builders to give it keys to all its safes, no-one will buy them and nothing is gained.
 - **Monitoring:** The CIA monitors all calls, the terrorists stop using use cell phones, and nothing is achieved again.
- Sticky web sites get you back by the second law.
 - Saying that many people are viewing reposting and commenting on your stuff suggests you are a social force!



PART 8. SUPPORT LEARNING

Factors that affect learning:

- 1. Initiation: Being in control
- 2. **Play**: Results aren't fatal.
- 3. Probability: The likelihood of an effect
- 4. **Delay**: How long until a result?
- 5. Cost: How much effort?

Environments that reduce learning:

- Physical: Stress and war.
 - War produces wastelands
- Emotional: Negative emotions, e.g., fear.
 - Stress favors dominant reactions
- Intellectual: Fixed ideas
 - Science is not a set of fixed "facts"
- Social: Cultures that already know.
 - Our book tells us all we need to know



1. INITIATION

Actively driving a FB loop shows what causes what:

- Links actions to effects
- Confirms/disconfirms expectations
 - Scientific experiments formally do this.

Learning requires initiation:

- Two kittens **saw** the same but one actively **walked**.
 - The active one learned to see depth.
 - The **passive** one didn't learn depth.
- The center that drives the FB loop learns **We ignore** software environments that yell, demand attention and interrupt.

We learn from software that listens to us.

The Internet is a mirror to humanity

Its job is to reflect us, not dominate us.



Turn the feedback loop to learn!



2. PLAY

When errors are expensive

- Tradition dominates.
- Creativity reduces.
- Superstition increases: You must do X, or something really bad will happen.
 - If you always do X, you never know whether it is true!
 - The **Aztec sacrifices** didn't save them!

Play is turning a feedback (FB) loop without fear of permanent negative consequences:

- Children learn by **playing safely**.
- In flight simulators, a plane crash is not death.
- Replay lets you do it again right.
- A programming language is easier to learn in a sandbox, e.g. Code Academy.



SUPPORT PLAY

The once harmless web now:

- Sets cookies to record you and runs scripts to phone home the data
- The Internet today is more a jungle, less a playground!

This "wild west" Internet is our creation - time to civilize it!

- Back: Undo navigation errors
- Sandbox: A safe area to try new things
- WYSIWYG: Transparency of action
- Practice submit: Send list message to sender only first
- Undo: Back button for wrong acts, redo to try again
 - **Repost** a post rather than delete and re-add to amend?
 - Resend an email that overlays transparently.
- Version control: Add a new version with prior one viewable (cf Wikipedia)





ANONYMITY

Anonymity: Hides sender/poster identity

• **Tor**: Encrypts and reroutes but using Tor is an NSA flag.

Free speech: The right to express an opinion without fear of retribution encourages social creativity and invention.

 Does not deny accountability – responsibility for one's acts—e.g., libel, slander

Communication:

- **One-to-one**: Personal is never anonymous—e.g., email
- One-to-many: Can be anonymous—e.g., letter to editor
- Many-to-many: Usually anonymous—e.g., voting Bullying: Intentionally hurting others
 - The community **always** knows your identity no-one is ever or has ever been anonymous to his/her society.
 - Hence online communities can rightly banish bullies.





3. CONSISTENCY

Consistent cause-effects: Are learned quickly but lost quickly if they fail

• Child manipulations: Does crying, pleading or whining work? Inconsistent effects take longer to learn but persist longer.

- Inconsistent mothers make whining persist.
- What comes easy doesn't last; what lasts doesn't come easy.
- Exceptions inoculate against failure: "The exception proves the rule."

Value is based on personal effort, not physical status.

- "In June 2005, Qiu Chengwei, a Chinese national, won a virtual sword in the online game **Legend of Mir 3**. He lent the sword to a fellow gamer Zhu Caoyuan who subsequently sold it [on eBay]. When Qiu reported the incident to the police he was told a virtual sword was not real so was not protected by law. Qiu went to the home of Zhu and stabbed him to death a very real crime for which he is now serving a life sentence." (Power, 2010, p.188)
- The stolen sword wasn't physically real, but its effects were!

Information is now real because it has real effects and what takes effort to acquire has **value**—e.g., Bitcoin





4. REDUCE DELAY

Result delay: The time between action and effect

- Long-term effects are harder to learn.
 - Robbing: Get rich now, go to jail later.
 - Studying: Be poor now, get money later.
- Children and dogs need immediacy.
 - Reward dog for not jumping up with a treat.
 - Punish jumping up with voice: NOOO!
- Must wait for bad acts the dog and the washing. **Online business**
 - Short-term sales: Get a large but fickle audience
 - New customer **special deals** ignore loyal customers
 - Long-term loyalty: Smaller but more loyal audience
 - Member only sales and specials



Loyalty cards are big business

5. EFFORT THRESHOLD

Effort threshold: The work one is prepared to do for a result

- Messages: Receiver, title and content.
- Posts: Name or nickname, title and content.
- **Registrations**: Why do you need my age? My address?
 - I don't register to see a movie so why must I register to see a video?

Above the effort threshold people **leave the loop** where:

- Analyzing and understanding is an effort.
- Handling emotional negativity is an effort.
- Clicking, scrolling, typing is an effort.

Depending on their effort threshold people leave:

- Hard-to-understand web sites
- Nasty discussion boards
- Many click purchases or registrations

People will do **whatever** to get **critical bank results** but leave if an easier alternative is available, e.g. Word replaced Word Perfect, Excel replaced Visicalc and Facebook replaced Myspace by being easier.

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	- Select One	(optional)
	India Afghanistan	(optional)
City *	Albania	
State *	Algeria Andorra	
Pin/Zip *	Angola Anguila	
Country *	Select One	3
Qhoon .	Viel Contraction of the	

The effort threshold: Is the result worth my effort?

RECAP

Learning increases when:

- 1. Choices are given: Don't tell; ask!
- 2. Play is allowed: Back, undo, restart
- 3. Causes are consistent: Network hassles!
- 4. Results are immediate: Network status?
- **5.** Action is easy: Point and click, drag and drop. Types of learning:
 - Intellectual. Learn to think.
 - Thoughts **recognize** hidden patterns.
 - Emotional. Learn to feel.
 - Emotions **discern** hidden motives.
 - Psychomotor. Learn to act.
 - Actions **reveal** hidden options.

E-learning by interactive games, Sim-City.



PART 9: SELF CHANGE

Self-change: A system's ability to change itself, but a system that changes itself inevitably loses itself.

• Most programs are changed but the brain changes itself. Self-improvement apps/websites:

- **Diet:** Change eating habits 70% of the US is overweight.
- **Exercise:** Change moving habits 75% of the US don't exercise regularly.
- **Drugs**: Quit alcohol, tobacco etc. Over half regularly use some drug.
- Phobias and anxieties: Fear of spiders, of talking to others, ...
- Depression: Feeling worthless, sad About 10% (20M) are depressed
- Shopaholics, hoarders, worriers, gamblers the list goes on Traditional technical support
 - Give advice: Tell people what they should do and why.
 - Break down goals: e.g., Everest
 - Give feedback: Report on steps taken, heart rate, sleep, study ...
 - Reminder messages: Can make people feel bad!
 - The videoing drunks effect



Arachnophobia: Fear of spiders





Quantified Self

Body feedback devices

ABRAHAM MASLOW'S HIERARCHY OF NEEDS



LEARNING TRANSFER

Learning transfer: Transferring learning from one part of the brain to another.

- Automation: An intellectually learned act is by practice transferred to the moving center: e.g., viola, driving ...
- **Self change**: To intellectually change the emotions is hard—e.g., to stop backbiting, caviling, greed, anger, etc.

Will: Ability of frontal cortex to override the rest of the brain

- Will is limited but with success the frontal cortex gains power that it loses if one "gives in", so choose your battles
- If the will controlled the body, the heart would stop in sleep!
- Change via an **earnest wish that** changes the loop control **Learning stages** describe learning transfer.
 - **Repetition**: Rote learning (superficial intellect)
 - Engagement: Agreeing it is important (emotional involvement)
 - Understanding: Inclusion in a mental model (real intellect)
 - Application: Ability to apply in a context (action involvement)

"How can I tell what I think till I see what I say?" – E.M.Forster



How to transfer knowledge between parts of the brain?

SELF-CHANGE ISN'T EASY

Self-change technology needs more than words:

- 1. Involve the learner: Learner must turn the feedback loop.
 - Simulations help social anxiety and phobias
- 2. Get technology in the loop: Can't look at a device while running
 - Sound: Yaay! When milestones occur, or better my voice
- 3. Plan for relapse: Relapse is normal need a response to it.
- 4. Engage the emotions: Some say 95% of diets fail by apathy.
 - Half of people who are obese, smoke, etc. don't want to change.
 - Text exercise reminders aren't useful if we don't want to listen.
- 5. Nature abhors a vacuum: To kick a habit put another in its place
 - Replace depression by walking, replace hate by sending your love.
- 6. Nag yourself: Mantras "Every day in every way I am getting better and better".
- 7. Social support: Online coaches and human feedback
 - Ramadan: Knowing others are fasting helps.
 - Groups: Let two or more friends diet together as a group.



Technology is a mediator, not a Guru!

PART 10. DESIGNER NOTES: LEARNING

Respect the gatekeepers.

• What brain centers do you want to engage?

The error opportunity

• Errors are the best time for learning!

• No response is a response so encourage, list options etc. **Empathy is social.**

• When people give they feel better and society improves.

Design for trust.

• Create trust then ask for things (give now take later model). **Mediate the interpersonal.**

• Put technology between people—e.g., Facebook, E-Bay ...

Support extelligence.

- Let the community or group contribute their learning. Self-change isn't easy.
 - All people want to be better; all life wants to be better.



Your job isn't to write software but to engage brains.

RECOGNIZE THE GATEKEEPERS

Picture evokes the movement/action we all want

Idea of exploration, curiosity driving the new generation

Open space background gives depth

Recognize the object as a person

Explore button to click



THE ERROR OPPORTUNITY

Good error messages:

- State the error in understandable terms
- Suggest possible reasons why
- Offer one or more error **solutions**
- Provide buttons that lead to next steps



THE ERROR OPPORTUNITY

Software takes control on a security issue

But lets you know what it did and why

And still gives you the choice – be it on your own head



Your connection is not secure

The owner of **bangkok.craigslist.co.th** has configured their website improperly. To protect your information from being stolen, Firefox has not connected to this website.

Learn more...



GET BETWEEN PEOPLE

The Strangers Project aims to let people share the story of their lives.

- After an **air accident** an investigation analyses why and people **learn** not to do it again.
- After a car crash or a house fire life accident the dead are called "wonderful people" and there is denial of blame, so no learning occurs, and so it repeats.





DESIGN FOR TRUST

Market places recognize community feedback, e.g. customer reviews on Amazon for Levi's Men's 559 Jeans:

• Top customer review

Most recent customer review

Customer images

• Customer Q&A

• Search customer reviews



Top Customer Reviews

全合な Good replacement for discontinued Silvertab Baggy By Christopher Johnson on May 16, 2010

I wear a size 31 x 34. I have found that most companies that make jeans, make some assumptions about you based on your waist. Most jeans that fit me in the waist choke me in the crotch and thighs. For years, Levi's Silvertab Baggy jeans suited me well. They were comfortable and durable, but were a little too baggy. They also had a slightly tapered leg, a huge fashion faux pas.

So... it was time to move on. And I've found a wonderful replacement in the Levi's 559. They have a straight leg, they're reasonably priced, and they look and feel great. They're a little tighter in the leg and butt than the Silvertab Baggy which is a good thing for me. When I sit down the back of the waist doesn't pooch out, which is also nice.

I have found that different colors will fit and feel very different. I recently ordered "Range (2765)" and "Indie Blue (4258)." Both Levi's 559's, and both 31x34. The Range variety were made in Lesotho. They're much looser in the waist and thighs and the denim fabric feels thicker. The Indie Blues were made in Vietnam. They're tighter in the waist and thighs and the material is thinner and stretchier.

Customer Images



See all customer images

Most Recent Customer Reviews

★슈슈슈슈 The pants run small

I got 3 pairs of these pants 2 of them fit well this pair did not, they were

TRUST

Smooth intro

- Purpose is clear
- Subdued background varies
- Invitation to action
- Why do you need my age again?
- Who are you people?
- How do I contact you?



EMPATHY IS SOCIAL

- Pictures people can relate to
- Explore lets you just look
- Makes people feel good
- When people give, their body state (happiness) improves.
- Web crowd-sourcing can bypass the selfish elite.



USE EXTELLIGENCE

Trustpilot:

- Potential customers check out what others say about an online shop before purchasing.
- Can I trust this online shop based on other people's experiences?
- The community assesses websites.
- They tell others about bad experiences.







USE EXTELLIGENCE

A proud online web shop will include reviews on their site to attract buyers

- Books show **selected** favorable reviews.
- Known reviewers are more effective.
- People expect to see **all** the reviews i.e., bad as well as the good.
- **Extelligence**: Involving the community is a double-edged sword .
- **Metacritic:** Has both expert web reviews **and** ordinary player reviews.
- Scores simplify things.



SELF-CHANGE ISN'T EASY

Everest:

- Aimed to help people achieve their goals by breaking down goals.
- It had \$2.2M funding
- A dedicated team
- A great-looking web site.

Not enough people engaged, so it recently shut down. People didn't want their goals "broken down" – they wanted them built up!

