Simulator-based Help for Training Heavy Equipment Operators

Paul Freedman
SIMLOG

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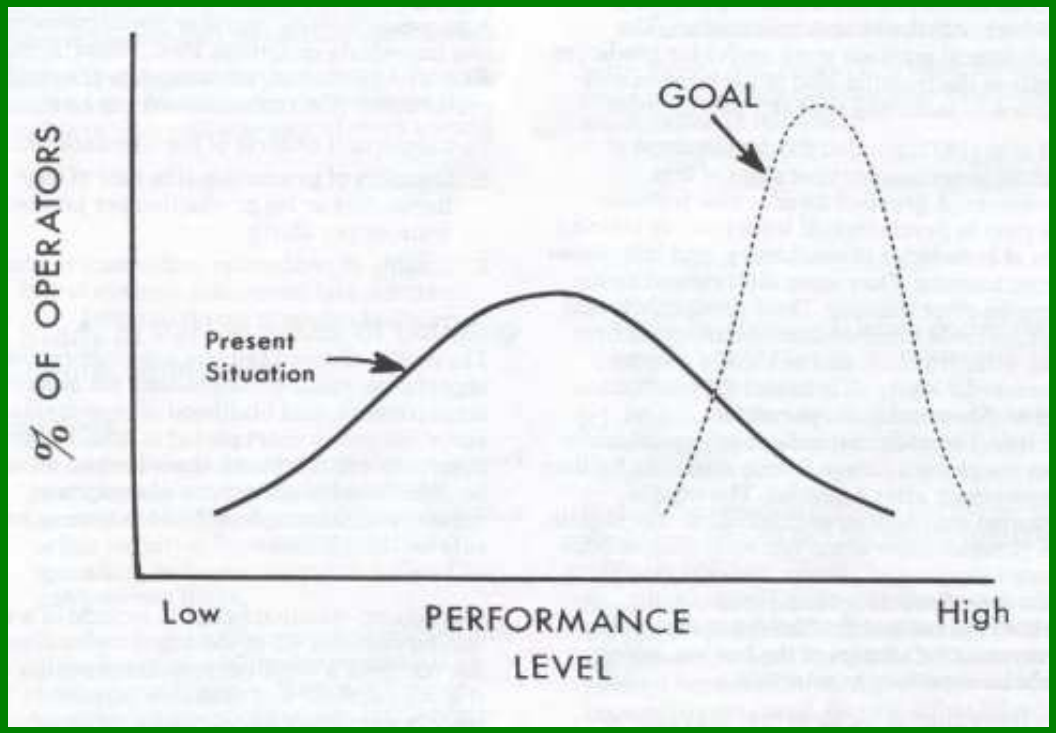
Presentation Overview

- operator training challenges
- using simulation to help train equipment operators
- types of products that are in use
  - “Flight Simulators”
  - “Personal Simulators”
- conclusions

Typical Operator Proficiency



How to

- **reduce variability ?**
- **improve average performance ?**

First Comes “Aptitude”

- "psycho-motor" abilities
  - manual dexterity
  - hand-eye coordination
- "perceptual" and "cognitive" abilities
  - depth perception
  - spatial orientation

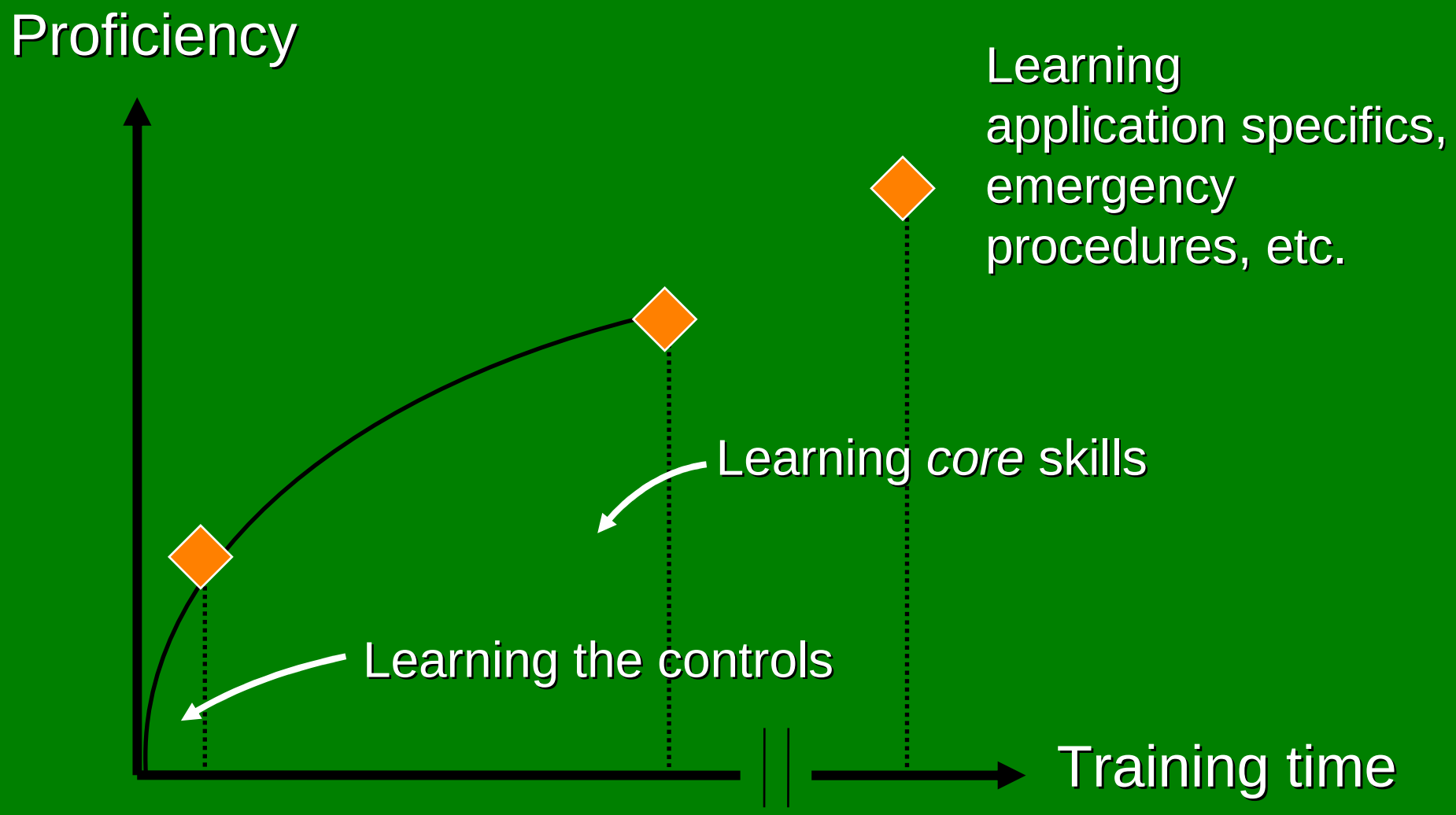
Then Comes Seat-time

But training at the controls is:

- costly
  - fuel, depreciation, insurance, etc.
  - instructor's time
- can put people at risk
- difficult to obtain, since your resources (people, equipment) are dedicated to production

… and that's why it's never long enough!

Operator Training Progression



Simulator-based Help (1)

Better evaluate the “aptitude” of your training candidates

- up to 30% lack the necessary human abilities to become fully proficient

Simulator-based Help (2)

Better prepare your new operators for their time at the controls of your equipment

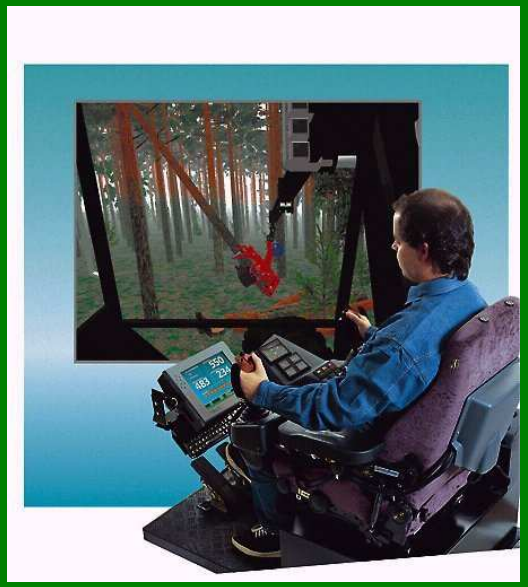
- trainers teach by showing
- trainees learn by doing

Anticipated Outcomes

- make your operator training *safer*
  - accidents “happen” at the simulator
- improve your operator training *quality*
  - everyone is taught the same things, and evaluated in the same way
- reduce your operator training *costs*
  - new operators “ramp up” faster and will meet your production targets sooner!

But what kind of simulator?

Forestry Machine Simulators



Crawler Crane Simulator

Mine Truck Simulator

"Flight Simulators" (1)

- They are complex "turnkey" systems with real operator controls, specialized computers, specialized displays, trainer's station, and even motion platforms.
- They are costly to buy and maintain: *on-going* annual fees e.g. 15-20% of the purchase price.
- They are surprisingly fragile and difficult to move around (even in a trailer).

"Flight Simulators" (2)

- They emphasize machine-specifics and “functional replication”, instead of instructional design for operator training.
- The simulator’s feedback is typically limited to just what the machine would tell the operator.
- A trainer is required to supervise the simulator-based work (at the trainer's station).

Introducing "Personal Simulators"

Getting to true cost-effectiveness:

- you use *your* Windows PC
- you use "USB ready" simulator controls
  - different levels of control realism at different price points

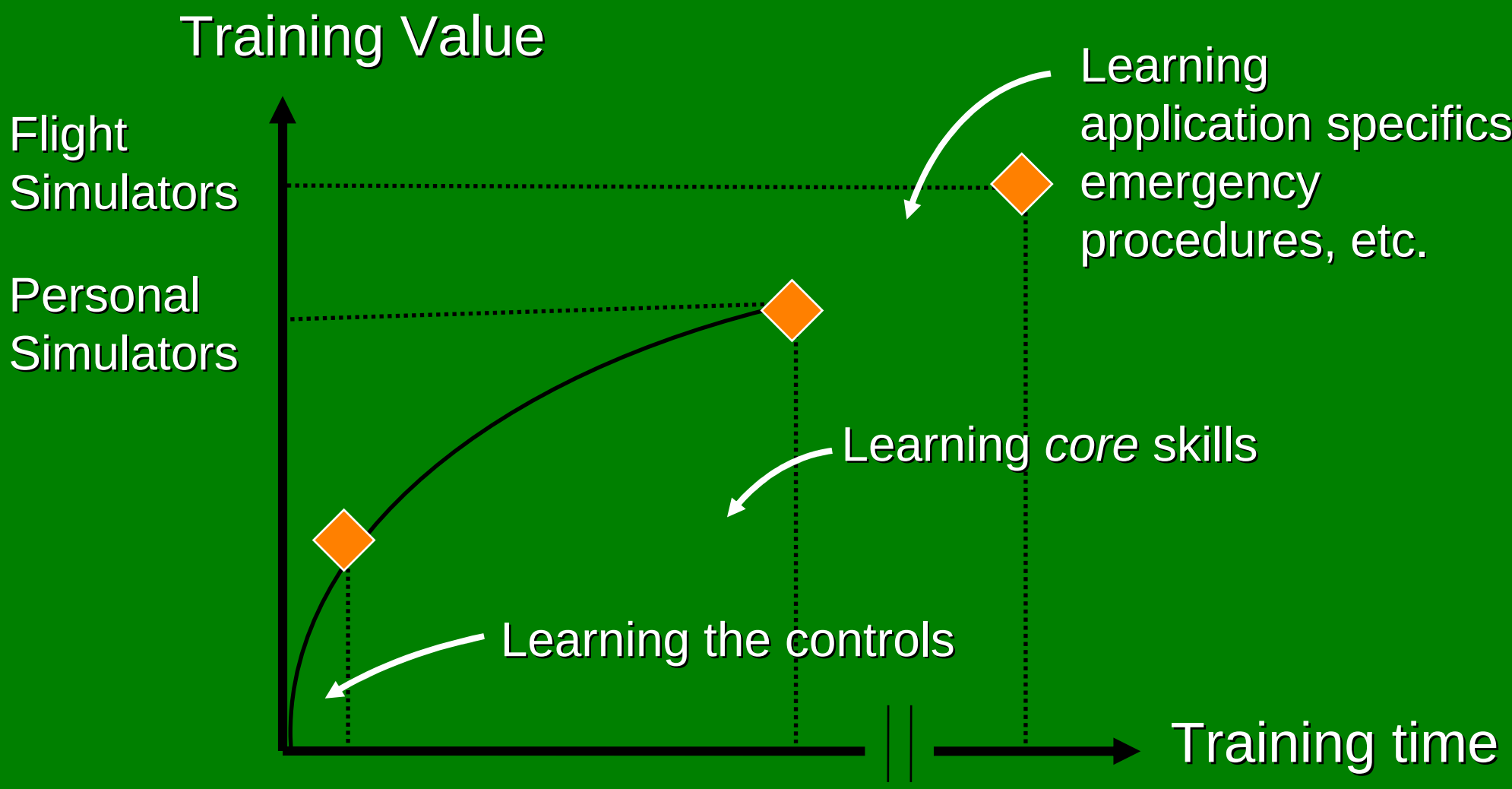
Simulator Control Options

PC Controls

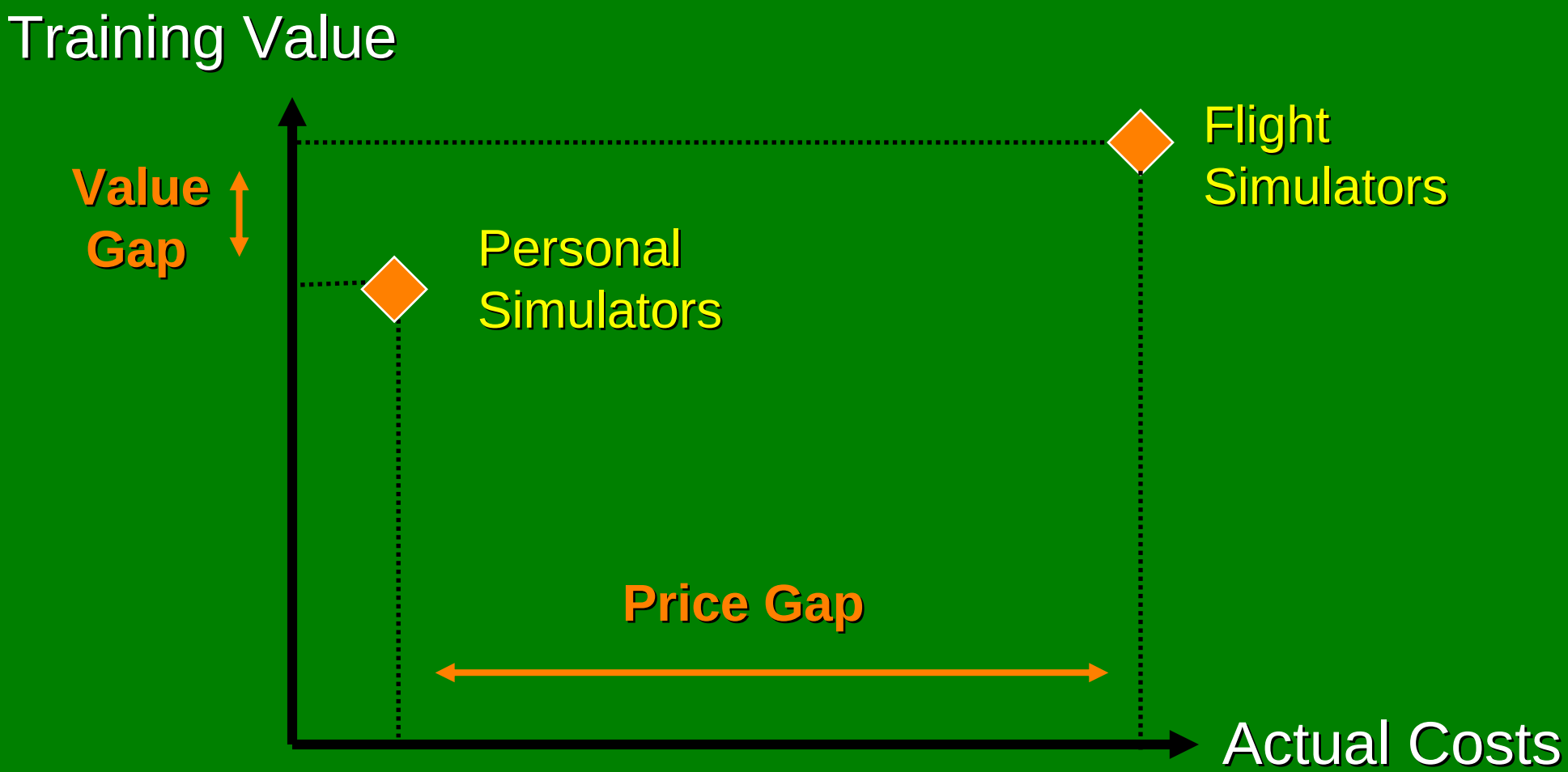
Replica Controls

OEM Controls

Different Value/Price Points



True Cost-Effectiveness



Mobile Crane

Hydraulic Excavator

Off-Highway Truck

Demonstrations

On the horizon: extra operator training help

- Wheel Loader
- Dozer
- Motor Grader

Conclusions

- learning to operate heavy equipment is hard, costly, and can be dangerous
- simulators can help you
  - make your operator training *safer*
  - improve your operator training *quality*
  - reduce your operator training *costs*
- be careful about the tradeoffs
  - instructional help
  - complexity/pricing