

Ergonomics of Automation

Jamie Wilkinson

jaq@{google.com,spacepants.org}

@jaqx0r

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SRE

Site Reliability
Engineering in Storage
Infrastructure at Google

SRE is what happens
when you ask a software
engineer to design an
operations function.



Papers

AUTOMATION SURPRISES, Sarter, Woods, Billings,
Handbook of Human Factors & Ergonomics, second edition, G. Salvendy (Ed.),
Wiley, 1997

MABA-MABA or Abracadabra? Progress on human-automation coordination,
Woods, Dekker, *Cognition, Technology & Work, 2002*

Reengineering Work: Don't Automate, Obliterate, Hammer, *Harvard Business*
Review, 1990

Benefits of Automation

- Better results, same system
- Frees up resources: offloads work
- Frees up resources: focus attention on right answer
- Fewer knowledges required by operator
- Machines are autonomous
- System feedback unchanged
- Machines are flexible
- Reduce Human Error

Substitution Myth

MABA-MABA: Men(*sic*) Are Better At/Machines Are Better At

Belief that people and machines have fixed strengths and weaknesses.

But, automation creates new strengths and weaknesses.

(c.f. “Don't Automate, Obliterate.” HBR for other arguments against substitution)

Automation Surprises

- transforms practice of work and roles of people
- create new kinds of cognitive work, often at wrong times
- more threads to track, harder to remain aware of activity and changes
- new knowledge and skills required
- machines are not working in isolation
- new types of feedback required to support new roles
- feature creep creates new demands, errors and paths towards failure
- both machines and humans are fallible, new problems with human-machine coordination

Change in Workload

Many automation systems assist in low load environments but are useless (or worse a hindrance) when help is most needed.

Attention and coordination demands

Compensates for abnormal behaviour in system up to a limit, and then fails or returns control to human when its capacity is exhausted.

Complacency

Mostly reliable systems become trusted to do the right thing even when they are no longer acting reliably.

Training

Rote memorization of training material does not prepare human for activation of knowledge in context.

Make Humans and Automation Place Nicely

Human-centered instead of technology centered.

The automation must become a team player.

- observable
- directable

Why is this important?

HCI is not “UI fluff.”

Outages are caused by clunky automation.

Time to recovery is slowed by clunky automation.