The INDEED project

Interdisciplinary Design and Evaluation of Dependability

a short introduction

IFIP WG 10.4 research report - Lorenzo Strigini

Outline

- what INDEED is

- some of the interesting topics we at City work on

General background

INDEED is a collaborative project funded by the U.K. Engineering and Physical Sciences Research Council

Universities of York, St Andrews, Edinburgh and
City University, London
(PIs: Alan Burns, Ian Sommerville, Stuart Anderson, Robin Bloomfield)

to develop knowledge, methods and tools that contribute to the understanding of socio-technical system dependability, and that support developers of dependable systems. The project continues some of the successful work from the *DIRC* project (www.dirc.ac.uk)

Four main directions

- Timing and Structure

- Adaptation and Diversity in Socio-Technical Systems

- Responsibility and Trust in Socio-Technical Systems

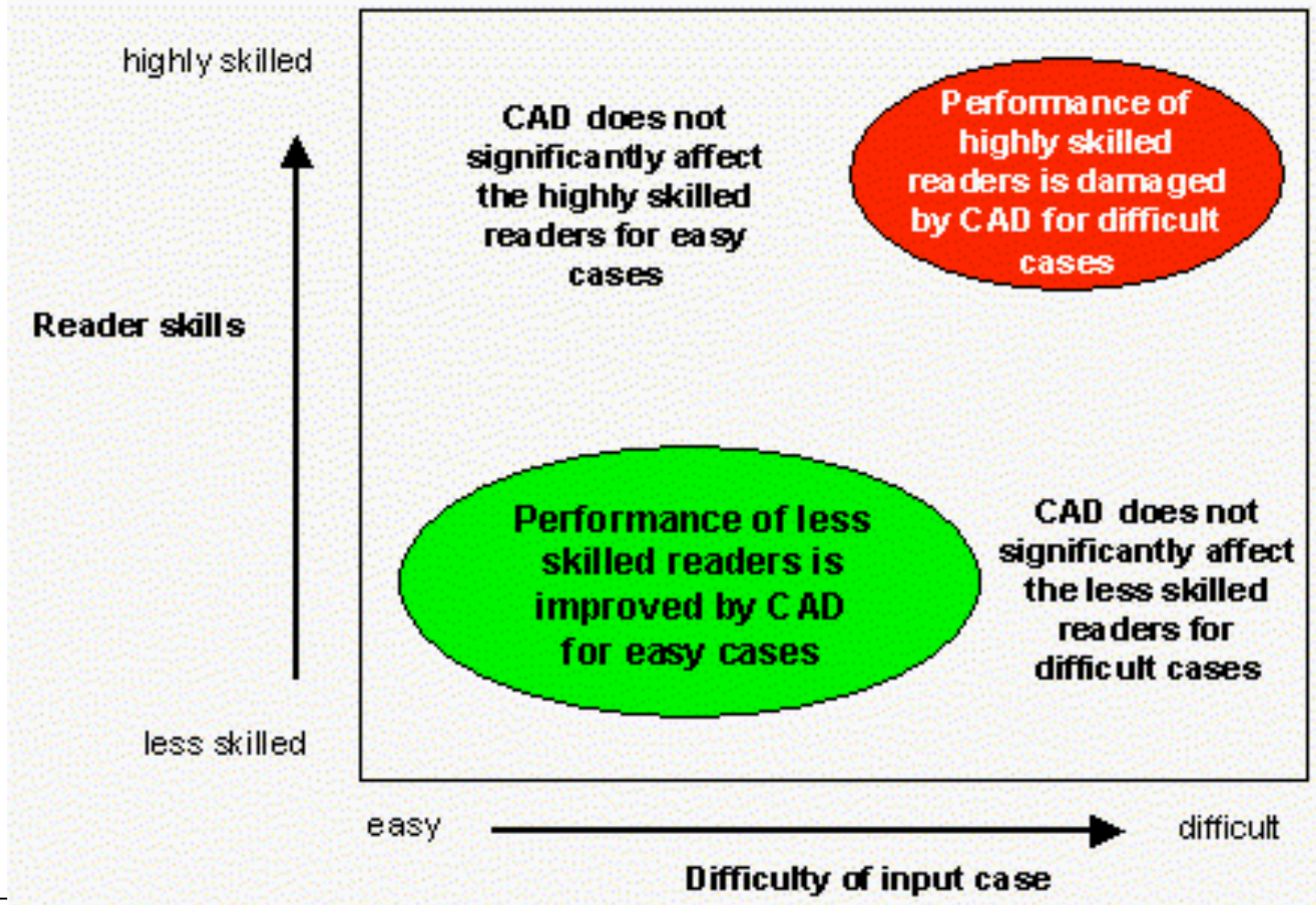- Confidence in Dependability Cases

Adaptation and **Diversity** in Socio-Technical Systems

Objective: to give designers of socio-technical systems *quantitative* insight into two phenomena:

- robustness comes from redundancy between people and machines: *diversity* between their potential failures is key.
  - subtle effects, e.g.: improving individual computer components or people may bring no benefit *or even harm* if undermining diversity
  - [L. Strigini, A.A. Povyakalo and E. Alberdi. "Human-machine diversity in the use of computerised advisory systems: a case study", DSN 2003]

- people adjust to the *perceived* context of their tasks, and this may affect diversity
  - e.g., over-reliance on automation: reliable computer aid impairs users' coverage its own errors
  - people's self-adjustment may have very diverse effects (good and bad) over time and across people and demands
  - cf earlier case study: E. Alberdi et al, "Automation bias and system design: A case study in a medical application", IEE People & Systems Symposium, London, November 2005.

  http://www.dirc.org.uk/research/DIRC-Results/MammographyCity.html

people's self-adjustment may have very diverse effects ...

Adaptation and diversity, cont.d

- at the current state of knowledge, designers *of socio-technical systems* receive
  - generic push for redundancy
  - plenty of warning that bad things happen
    - + "surprises of automation", "automation bias"
  - but little guidance about the trade-offs involved
- we focus on improving on this situation w.r.t. two sets of topics:
  - how the effects of diversity change with the different structures of socio-technical systems
  - how people's self-adaptation evolves over time after change events

Confidence in Dependability Cases

Objective: a method for structuring confidence-based dependability cases, based on a probabilistic interpretation of confidence.

- Confidence based dependability cases
  - correct propagation of confidence in rigorously stated cases
- Structure – timebands and diversity
  - structuring of complex cases with proper formalisation
- Trust and communication
  - sociological and psychological issues in making a sound case a convincing one

http://www.indeedproject.ac.uk/